A piece of equipment which has a ground contact device for working on a ground region located below the ground contact device in the working position of the piece of equipment, a driving device which can be operated by an electric motor in order to produce a working movement of the ground contact device, an electrical energy accumulator, enclosed by a housing for supplying the electric motor with electrical energy, and a covering device for covering the housing and thus the energy accumulator, which covering device is arranged above the energy accumulator in the working position. The piece of equipment may for example be a tamper, a vibration plate, a roller, or a breaker.
ELECTRIC TOOL HAVING A PROTECTIVE HOOD

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention
[0002] The present invention relates to a working device for processing a region of the ground, for example a tamper, a vibrating plate, a roller, or a breaker.
[0003] 2. Discussion of the Related Art
[0004] Working devices for processing the ground are increasingly offered having electric motors, the electric motors being capable of being supplied with electrical energy by accumulators also carried on the working device. Due to the high power requirement, the accumulators have a large performance capacity, and are therefore valuable and expensive components. In order to achieve a good degree of acceptance of such working devices, it is therefore necessary to ensure a long working life and operating time of the accumulators.

SUMMARY OF THE INVENTION

[0005] The present invention is based on the object of indicating a working device for ground processing, supplied with power by an electrical energy storage device that promotes a long working life and operating time of the electrical energy storage device.
[0006] A working device for ground compacting has a ground contact device for processing a region of ground situated underneath the ground contact device, a drive device drivable by an electric motor for producing a working movement of the ground contact device, an electrical energy device, surrounded by a housing, for supplying the electric motor with electrical energy, and a covering device, which in the working position is situated above the energy storage device, for covering the housing and thus the energy storage device.
[0007] The working device can be used for ground compacting and/or ground processing. Working devices for ground compacting are for example tampers, vibrating plates, or rollers. Working devices for ground processing are for example large hammers, or breakers, for processing or breaking up a region of ground.
[0008] In a specific embodiment, the working device can have a mass of for example at least 15 kg. It can be held in the working position by an operator in such a way that the working movement of the ground contact device is oriented substantially vertically downward, in the direction of the ground that is to be processed. The working movement can have a striking, tamping, or vibrating movement.
[0009] In a specific embodiment, the working device is a tamper or a vibrating plate having a ground contact plate situated on the ground contact device. In this specific embodiment, the ground contact plate can compact the ground in a tamping or vibrating fashion.
[0010] In a further specific embodiment, the working device can be a breaker and the ground contact device can have a tool for ground processing. The breaker can be a large hammer that can be held above the ground that is to be processed by the operator. Here, the tool, such as a chisel, can process, or break up, the ground.
[0011] On the tamper, the vibrating plate, or the hammer, the drive device can have an upper mass, a lower mass that is movable relative to the upper mass and is movably coupled to the upper mass via a spring device, and a vibration-producing device for producing a relative movement between the upper mass and the lower mass. The ground contact device, in the form of a ground contact plate or a tool, can be situated on the lower mass.
[0012] In the case of the tamper, the drive device can for example have a crank drive for producing the relative movement between the upper mass and the lower mass. In the case of a vibrating plate, the drive device can for example be fashioned having imbalance masses situated on the lower mass in order to produce the relative movement of the lower mass relative to the upper mass.
[0013] In the case of the breaker, the tool can have an impact device having an impact piston and a snap die on which the impact piston can act, and that impacts a breaking chisel acting as a tool. The impact piston can be driven by the drive device, and can be set into impact movement so as to impact the snap die. For example, the impact piston can be driven by a drive piston of the drive device via a pneumatic spring impact mechanism.
[0014] In a further specific embodiment, the working device can be a roller, the ground contact device having a roller lining and it being possible to compact the ground through rolling action and/or vibration of the roller lining.
[0015] In all these embodiments, the drive device can be operated by the electric motor. The electric motor can be a universal motor, an induction motor, a switched-reluctance motor (SR motor), a direct current motor (DC motor), or a brushless direct current motor (BLDC motor). In addition to the electric motor, additional motors can be provided, for example an internal combustion engine that can be operated optionally or in addition in the context of a hybrid drive of the drive device.
[0016] The electrical energy storage device provides the electrical energy required by the electric motor. This can be an accumulator of a suitable power class, for example a lithium-ion or lithium polymer accumulator. The energy storage device can have electrochemical cells and can be enclosed by a housing, for example a plastic housing. The housing can encapsulate the electrochemical cells and electrical connection devices, as well as, if present, operating and display devices. The energy storage device can for example form a commercially standard unit together with the housing.
[0017] In the working position, the covering device can be situated above the energy storage device, i.e. on a side situated opposite the ground. It can cover the energy storage device, or the housing thereof, essentially completely or partly, at least upwardly. Consequently, in a view of the working device from the top, the energy storage device can be essentially covered by the covering device. In particular, an upward-oriented upper side of the energy storage device, or of its housing, can be covered by the covering device.
[0018] Through the covering of the energy storage device, this device can be effectively protected in rough worksite operating conditions. For example, the covering device can protect to the energy storage device from strong heating by solar radiation when used in warm areas. In this way, a switching off of the working device due to an excessive operating temperature of the energy storage device is prevented, thus increasing the operating time of the energy storage device and thus of the working device. This protection against overheating can also have a positive effect on the useful life of the energy storage device.
With the provision of the covering device, further cooling devices such as an air cooling device can operate at a lower power level, or can possibly be completely omitted, saving costs and energy.

In addition, the covering device can protect the energy storage device from damaging mechanical influences in work site operation, for example given use in a trench, where stones or other objects could fall onto the device. In this case, the covering device can absorb an impact, protecting the energy storage device.

In a specific embodiment, the working device can have a guide device for guiding the working device, and the energy storage device and the covering device can be situated on the guide device.

The guide device can have a guide handle or guide bracket for holding the working device, or can have a guide drawbar for pulling and/or pushing the working device. On the guide device, a guide handle for an operator can be provided, as can operating devices, positioning levers, and/or operating buttons. In addition, a fastening device for fastening the guide device on the working device can be provided. This fastening device can include a vibration decoupling device having vibration damping devices, such as spring devices or elastic buffers (e.g., rubber buffers). In this way, the hand-arm vibrations of the operator during working operation can be reduced, and a smooth guiding can be enabled. The guide device can include the entire assembly at which a gripping zone for the operator is provided. During the working movement of the working device, the situation of the energy storage device on the guide device can have an advantageous influence on the hand-arm vibrations on the guide device or on the guide handle. Through the mass of the guide device, increased by the energy storage device, the introduction of impulses and vibration due to the vibrating lower or upper mass can be reduced.

However, the energy storage device is particularly exposed to various damaging influences at the upper part of the working device, i.e., at the side situated opposite the ground contact device, such as solar radiation or the impact of falling objects. Through the covering device, the energy storage device can be additionally protected in this position. Risks that result from the exposed situation of the energy storage device can be reduced or avoided, and the useful life or operating life of the energy storage device can be increased.

In a further specific embodiment, the working device can have an electronic control device for controlling an operation of the drive device and/or of the electric motor; in the working position, the covering device can be situated above the control device, and can cover the control device.

The provision of an electronic control device makes it possible to use the operating current used at the working device for electronic controlling as well of the working device, of the drive device, and/or the electric motor by the operator. In this way, operating possibilities and convenience are improved. However, the control device is a complicated and expensive component that is susceptible to failure, and has to be protected from the introduction of impulses during working operation. Therefore, for the control device as well a situation on an upper side of the device is advantageous, where it is removed from the ground contact device and is protected from the introduction of impacts. In particular, the control device, like the energy storage device, can also be situated on the guide device. In this position, the control device can be protected by the covering device.

In a specific embodiment, the covering device has an essentially flat covering plate, such that the covering plate essentially covers an upper side, which in the working position is situated at the top on the energy storage device, of the housing of the energy storage device, and/or essentially covers an upper side, which in the working position is situated at the top on the control device, of the working device.

The covering device, which is essentially flat, i.e., has a flat or planar construction over large parts, can effectively protect the named components, for example from solar radiation or from falling objects, without requiring significant additional constructive space.

In addition, the upper side of the working device can be protected by the covering plate in such a way that there is very little possibility for dust and dirt to deposit and penetrate. The working device and its interior, in particular the constructive spaces in which the energy storage device and/or the control device are also situated, are in this way protected from contamination. In addition, the covering plate can improve the attractiveness or the design of the working device.

In a further specific embodiment, the covering device can include a material that protects against heat radiation, and/or can include a coating that reflects heat radiation. For example, a material can be selected that does not conduct the heat radiating in at the top side to the lower side. Alternatively or in addition, a reflecting layer, or a reflective paint, can be applied that reflects the heat radiation.

In another specific embodiment, the covering device can have a material that protects against impacts by stones. In particular, a material such as a metal having suitable strength can be selected that can absorb the impact of a fragment of stone and that prevents the impact from being communicated to the energy storage device or to the control device. This enables an effective protection against falling objects.

Likewise, an embodiment of the covering device is possible in which it is made of a plastic having suitable strength. In this way, greater freedom of design is provided, so that the covering device can significantly improve the design. The color of the plastic, the coating, or the paint can be selected in such a way that the plastic essentially reflects the heat radiation.

In a further specific embodiment, the covering device can have a pivotable part, such that in a pivot position of the pivotable part the energy storage device can be removed from a receptacle device.

For example, the pivotable part can be fashioned as a flap, and can be connected pivotably via a hinge to other components of the covering device. This enables a folding up of the covering device, making a part of the covered area accessible to the operator. After the folding up, the energy storage device can be removed by the operator and can be exchanged or connected to a charge device. In addition, the energy storage device can be fixed or positioned by locking in the pivotable part. In addition, a display area of the control device can be made accessible or visible by the folding up. This enables an effective protection of the energy storage device and of the control device when the flap is closed, and at the same time enables good accessibility to these components for operating and maintenance purposes.

In addition, it is possible to orient the pivotable part in the direction of the solar radiation, in order to protect, in a
working position, the energy storage device, and possibly the control unit, from this radiation as well as possible.

[0035] In a further specific embodiment, the covering device can have a removable part, the energy storage device being capable of being removed from the receptacle device when the removable part of the covering device has been removed.

[0036] The removable part can be fashioned as a cover, and can for example be capable of being locked on the covering device. In the locked position, the cover can protect the energy storage device and/or the control device, and if warranted can also fix them. After removal of the cover, for example the receptacle device for the energy storage device and/or the display area of the control device can be accessible by the operator for operating or maintenance purposes, as described above for the flap.

[0037] In a further specific embodiment, the covering device can have a cooling air flow guidance for guiding a cooling air stream along the energy storage device and/or along the control device. For example, the covering device can be fashioned as a hood that can form and/or limit a flow channel for the cooling air. The cooling air stream can be guided under the covering device, moving along the energy storage device and/or the control device and effectively cooling these.

[0038] In a further specific embodiment, the covering device can have at least one opening for dissipating warm air situated under the covering device. For example, the covering device can have a plurality of openings or ventilation slots, or a ventilation grid. Through a reflecting layer on the ventilation grid, in addition a reflection of the heat radiation can be achieved. The operating heat of the energy storage device, which for example can arise when electrical energy is provided or absorbed, can be dissipated. Overheating of the energy storage device, heat accumulation, or switching off of the working device can be prevented.

[0039] In a further specific embodiment, the covering device is fastened, or is capable of being fastened, to the housing of the energy storage device and/or to a housing of the control device. This makes it possible to situate the covering device in a targeted manner for the protection of the energy storage device or of the control device. Such a covering device can be offered as retrofittable, for example in connection with energy storage devices or accumulators for such working devices, and consequently can be retrofitted without a large assembly outlay.

[0040] These and additional features of the present invention are explained in more detail below on the basis of examples, with the aid of the accompanying Figures.

BRIEF DESCRIPTION OF THE DRAWING

[0041] FIG. 1 shows a tamper having a partially pivotable covering device for protecting an energy storage device and a control device.

DETAILED DESCRIPTION

[0042] FIG. 1 schematically shows, in a lateral sectional view, a tamper 1 having an upper mass 2 and a lower mass 3 that can be moved relative to upper mass 2. Lower mass 3 has a tamper foot having a ground contact plate 4 that acts as a ground contact device. Upper mass 2 includes, inter alia, a drive device (not shown) having an electric motor (not shown) that drives a crank drive (not shown) connected to lower mass 3. Through the crank drive, upper mass 2 and lower mass 3 can be set into an oscillating movement relative to one another, through which ground contact plate 4 is forced into a tampering working movement. Through the tampering, a region of the ground 5 situated underneath tamper 1 and ground contact plate 4 in the depicted upright working position can be compacted in a tampering manner.

[0043] For the guidance of tamper 1 by an operator, a guide bracket 6 is provided on which for example an operator handle can be situated. Guide bracket 6 is situated on upper mass 2. It can be decoupled from vibrations of upper mass 2 during the working movement by a vibration decoupling device 6a, such as a rubber buffer.

[0044] An electrical energy storage device 7 provided in order to supply the electric motor is situated on guide bracket 6. Through the situation of energy storage device 7 on guide bracket 6, the relative mass of guide bracket 6 in relation to upper mass 2 or to lower mass 3 can be increased. This enables a reduction of the vibrations introduced into guide bracket 6 by the working movement of tamper 1. As a consequence, such vibrations are introduced at guide bracket 6 only in damped fashion, and have only an attenuated effect on energy storage device 7, the operator handle, and the arm of the operator. This increases both operator comfort and the useful life of energy storage device 7.

[0045] In addition, an electronic control device 8 is situated on the guide bracket. This makes it possible for the operator to direct control tasks to the drive device via control device 8 with only a slight cabling outlay. In addition, control device 8 can be supplied with power by energy storage device 7 with only a slight cabling outlay.

[0046] In order to protect energy storage device 7 and control device 8 in the exposed position on guide bracket 6 on the upper side of tamper 1, oriented away from ground region 5, a covering device 9 is provided that, in the depicted working position of tamper 1, is situated above energy storage device 7, i.e. directed away from ground region 5. Covering device 9 can protect energy storage device 7 and control device 8 from solar radiation or heat radiation, and can contribute to keeping the operating temperature low. In addition, covering device 9 can protect energy storage device 7 and control device 8 from falling objects, for example when used in a trench.

[0047] In addition, a cooling air flow produced by a ventilator device (not shown) can be conducted underneath covering device 9, moving along energy storage device 7 and control device 8, as indicated by the dashed arrow. This makes it possible to keep the operating temperature of energy storage device 7 and of control device 8 low, and in this way to increase their useful life or operating time. The cooling air flow should be directed away from the operator.

[0048] In the depicted specific embodiment, covering device 9 has a part 10 that is capable of being pivoted along the bent arrow, connected via a hinge 11 to a stationary component of covering device 9. Pivotal part 10 makes it possible for the operator to fold up covering device 9 and to have easy access to energy storage device 7. In this way, an operating display of energy storage device 7 can be monitored, a charge device or external power source can be connected to energy storage device 7, or energy storage device 7 can be exchanged, e.g. for charging outside the device.
We claim:
1. A working device, comprising:
a ground contact device for processing a ground region situated underneath the ground contact device in a working position of the working device;
a drive device that can be operated by an electric motor for producing a working movement of the ground contact device;
an electrical energy storage device, enclosed by a housing, for supplying the electric motor with electrical energy; and
a covering device, situated above the energy storage device in the working position thereof, for covering the housing and thus the energy storage device.
2. The working device as recited in claim 1, further comprising
   a guide device for guiding the working device, wherein the energy storage device and the covering device are situated on the guide device.
3. The working device as recited in claim 1, further comprising
   an electronic control device for controlling an operation of at least one of the drive device and the electric motor, and wherein the covering device is situated above the control device in the working position thereof, and covers the control device.
4. The working device as recited in claim 1, wherein the covering device has an essentially flat covering plate, and wherein the covering plate essentially covers at least one of 1) an upper side, which is in the working position of the top on the energy storage device, of the housing of the energy storage device, and 2) an upper side, which is in the working position thereof is situated at the top on the control device, of the control device.
5. The working device as recited in claim 1, wherein the covering device has at least one of 1) a material that protects against a radiation of heat, and 2) a coating that reflects a significant part of the heat radiation.
6. The working device as recited in claim 1, wherein the covering device has a material that protects against the impact of stones.
7. The working device as recited in claim 1, wherein the covering device has a pivotable part, and the energy storage device is removable from a receptacle device in a pivot position of the pivotable part.
8. The working device as recited in claim 1, wherein the covering device has a removable part, and the energy storage device is removable from the receptacle device when the removable part of the covering device has been removed.
9. The working device as recited in claim 1, wherein the covering device has a cooling air flow guide for guiding a cooling air flow along at least one of 1) the energy storage device and 2) the control device.
10. The working device as recited in claim 1, wherein the covering device has at least one opening for dissipating warm air situated under the covering device.
11. The working device as recited in claim 1, wherein the covering device is fastened to at least one of 1) the housing of the energy storage device 2) a housing of the control device.
12. The working device as recited in claim 1, wherein the working device has a mass of at least 15 kg, and the working device is one of
   1) a tamper or a vibrating plate for ground compacting, and wherein the ground contact device has a ground contact plate,
   2) the working device is a roller, and wherein the ground contact device has a roller lining, and
   3) a breaker, and wherein the ground contact device has an impact device.
13. A working device, comprising:
a ground contact device that processes a ground region that is situated underneath the ground contact device when the ground contact device is in a working position thereof;
an electric motor;
a drive device that is operated by the electric motor to produce a working movement of the ground contact device;
an electrical energy storage device that supplies the electric motor with electrical energy;
a housing in which the electrical energy storage device is enclosed; and
a covering device that is situated in a position that is above the energy storage device when the ground contact device is in the working position thereof and that covers the housing and the energy storage device.