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(54) AUTONOMOUS SELF-ACTUATED PLOUGHING IMPLEMENT

AUTONOMES, SELBSTBETÄTIGTES PFLÜGEWERKZEUG

MATÉRIEL AGRICOLE DE LABOURAGE AUTO-ACTIONNÉ AUTONOME

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Description

Object of the invention.

[0001] The present invention relates to an autonomous self-actuated tillage implement for the farm working of crops.

Application field of the invention.

[0002] The autonomous self-actuated tillage implement object of the invention is mainly applicable in agriculture works and, especially, in cultivation and breaking-up works.

Background of the invention.

[0003] Today, different tillage implements, such as turning plows, chisels, disc plows, cultivators or subsoiling farm implements are used to till the land. These implements are attached behind a tractor that draws them, supplying the necessary power to lift and break up the soil, and perform other operations on the land.

[0004] These working means present several problems, the main one being that operations cannot be automated because the tractor must be driven and handled by a person. Moreover, the need to use a tractor increases investment costs, and tractor maintenance, including the necessary fuel consumption, is considerable.

[0005] Currently, these diesel-engine tractors do not represent an ideal solution from an ecological and environmental point of view, as they release large amounts of carbon dioxide into the atmosphere, use fossil fuel with limited resources, and their handling requires the ongoing attention of a driver or operator, which increases the final cost of the cultivated products.

[0006] Tractors achieve their adherence from the interaction of the tire with the land and as a result of the tractor's weight; this technique requires the use of water-filled tires, counterweights and heavy tractors. This has a compaction effect on farmlands with the consequent loss of fertility. Having to move the tractor's tonnage, which requires an energy consumption that is lost with the tire grip and which is not useful in moving the land, is an inefficiency.

[0007] An ideal solution to at least partially solve the problems of current tractors would be the development of tractors operated by solar energy or directly with electricity; however, developments made in these types of solar or electric power are not applicable to existing tractors, which are of large dimensions, weight and power, since it would be necessary to use a disproportionate number of photovoltaic panels to recharge the batteries and, in the case of electrical power, in addition to having a very restricted range, recharging the vehicle's battery would require the installation of power points in crop fields, which is impractical due to both the cost of the installation and the huge amount of time required to recharge the batteries.

[0008] US 6199000 document describes a self-propelled tractor comprising a telematics central unit comprising a global positioning system (GPS), sensors for the reception of a number of input parameters, a camera for capturing images of the surroundings and a control unit associated to the GPS and to the input sensors which, based on the information provided by both, determines the farm work to be performed and exchanges this information with a data storage unit. Since this tractor has supporting wheels, it causes a compaction of the soil during its movement and the consequent loss of fertility; and fails to satisfactorily resolve the abovementioned problems regarding the consumption of energy used on just the displacement of the tractor.

[0009] Different implements intended to be attached to a tow tractor by different means are also known. For example, document GB 1174622 describes an attachment system for implements employed on a tractor to the structure thereof and highlights the importance that these tools can describe not only a vertical movement but also a lateral movement. This implement requires coupling to a tractor, so it does not resolve either the problems mentioned above concerning soil compaction caused by the tractor wheels, and the inevitable consumption of energy targeted exclusively at engine movement.

[0010] A self-propelled agricultural machine, especially for soil-working, is disclosed in document DE 3221 535 A1.

Description of the invention.

[0011] The autonomous self-actuated tillage implement that is the object of this invention has certain technical features designed to provide means for farm working using their own resources. It does this by achieving a grip on the ground which enables the tool to advance by itself, without using any tractor or additional element that supplies traction power, the implement being mainly powered by solar energy, without ruling out the use of wind energy or internal or external combustion engines.

[0012] Another object of the invention is to equip the implement with guide means for its guiding and displacement without the physical presence of a driver, meaning the implement can be left unattended throughout the working day.

[0013] According to the invention, the farm implement comprises:

- at least one first plow share in a front position, provided with anti-rollback means, and, at least, a second plow share in a rear position, with other anti-rollback means, the plow shares being interconnected by alternating approaching and distancing means with arms,
- a telematic control unit based on a computer system assisted by a global positioning system (GPS) for the autonomous guiding and moving of the imple-

ment.

- a steering system that is formed by an oscillating support that can rotate in a plane perpendicular to the advancement direction of the implement, operationally suitable to lift one of the plow shares in relation to the ground and displace it laterally through the contact this support has on the ground.
- a power supply system connected to the control unit and to the approaching and distancing means to supply drive power, to be selected from photovoltaic panels, wind energy generators or an internal (such as diesel and otto cycle engines) or an external (stirling cycle engine) combustion engine mounted on the implement.

[0014] Thus, the approaching and distancing means can be of different nature, and moved by electric engines or directly in a mechanical way, such approaching and distancing means comprising devices such as a ball screw, a mechanism with a beam and a chain between two pinions, with the arm of a plow share being hooked at a point in the chain; or a scissor mechanism that expands and contracts by the action of one or more reversible engines, causing both plough shares to perform alternative forward movements.

[0015] The anti-rollback means are responsible for said forward direction being unique, providing in each movement an alternating setting of the plow shares with one of the plow shares being static during the displacement of the another plow share.

[0016] The steering system enables the forward direction to be changed to lateral displacement of one of the plow shares, pivoting over the other plow share. The oscillating support is preferably arranged on the approaching and distancing means themselves, with its own drive motor, and is shaped so that in an inoperative position it remains lifted, without making contact with the ground, but in an operating position, descends and, when it makes contact with the ground, lifts one of the plow shares, preferably the front one, and moves it laterally.

[0017] Depending on the rotation direction of this oscillating support, one of the plow shares, preferably the front one, will be transferred to one side or another at a certain step or distance; by means of one or more transfers to the same side, the implement can be oriented in the desired direction, for example, to turn around when reaching the end of a plot.

[0018] The control unit allows the device to be fully automatic, allowing work to be limited to a specific piece of land by controlling the position using the global positioning system (GPS), so that it is easy to demarcate the plot or work area.

[0019] In one embodiment, the anti-rollback means consist of an crampon that swings with respect to a horizontal joint arranged at the plow share rear, so that when a plow share advances, the corresponding crampon slides along the ground, and when the other plow share advances, the said crampon sticks in the ground, thus preventing the rollback of the plow share, which remains static at that time.

[0020] The implement has removable plow shares, which are combinable and interchangeable with moldboards, cultivators, discs, chisels, cylinders, harrows or subsoilers, depending on the work to be carried out.

[0021] The power supply system comprises electric batteries that store electrical energy, allowing energy to be accumulated during downtime hours or providing support when the energy captured, for example by photovoltaic panels or wind energy generator, is insufficient to operate all the mechanisms. These batteries serve to stabilize the electrical power supply to different consumer devices of the implement. These batteries combined with combustion engines make hybrid power mechanisms, as they are recharged by an electric generator and then they supply power with the corresponding electric engine.

[0022] In one embodiment, photovoltaic panels are mounted on the implement using at least one steerable support or solar tracker. This support allows the aforementioned solar panels to be placed in an optimal position with respect to the sun, regardless of the direction in which the implement is moving with regard to the sun.

[0023] The plan is for the implement to have means for the transmission of information on the implement's operation, through a control unit.

[0024] Thus, the implement comprises at least one camera to capture images of the environment, with said camera connected to the control unit. This camera enables the control unit to capture and store work evolution and the place where the farm working has been done, and allows a subsequent inspection directly on the device, or even the real-time transfer of images, so that the implement can be controlled remotely in case of any operative incidents or if the farm work is being carried out improperly.

[0025] The implement also comprises sensors connected to the control unit and which are used to gather environmental parameters and/or parameters of the land to be worked. This makes it easy to detect whether the soil is too wet or hard to be worked, stopping the implement's operation until conditions are optimal.

Description of figures.

[0026] To complement the description that is being carried out and to facilitate understanding of the characteristics of the invention, the present description is accompanied by a set of drawings wherein, for illustrative purposes only, the following has been represented:

- Figure 1 shows a profile view of the implement.
- Figure 2 shows a plan view of the implement.
- Figure 3 shows a view of the implement from the front end.
- Figures 4 and 5 schematically show the two advance positions of the implement.
- Figures 6 and 7 show a plan view from the front end

of the implement in rotation operation through the oscillating support.

- Figure 8 shows a block diagram of the electrical and electronic circuit of the power supply system powered by solar energy and of the control unit of the implement.

Preferred embodiment of the invention.

[0027] As the figures show, the autonomous self-actuated tillage implement of the invention comprises a first plow share (1) in a front position, provided with anti-rollback means, and two second plow shares (2) in a rear position, with other anti-rollback means, the plow shares (1, 2) being interconnected by alternate approaching and distancing means (3) with arms (31), said alternate approaching and distancing means (3) being, in this case, a ball screw protected by an outer cover (32) and associated to an external drive motor (not shown) to provide the alternating movement which causes the implement to move forward. In this case the drive motor is a three-phase motor controlled by a frequency converter (not shown).

[0028] The anti-rollback means in each plow share (1, 2) are formed by a crampon (4) swinging around a horizontal joint (41) at the rear of the said plow shares (1, 2). As represented in Figures 4 and 5, these crampons (4) stick into the ground automatically at the start of the rearward displacement of the plow shares (1, 2) corresponding to each movement of the approaching and distancing means (3).

[0029] The implement comprises a steering system which allows the direction of advance to be changed; this steering system being formed by an oscillating support (5) mounted on a motorized rotation mechanism (51), coupled to the cover (32) of the approaching and distancing means (3), the end (52) of the oscillating support being in the form of an anchor, as represented in Figures 3 and 6. This oscillating support (5) is able to lift the front plow share (1) of the implement, as illustrated in Figures 6 and 7, as the end (52) of said oscillating support (5) can be arranged at a point lower than the lower end of said front plow share (1). So when this end (52) rests on the oscillating support (5) on the ground during rotation, the elevation and counterclockwise transfer of the said plow share (1) occurs.

[0030] The implement comprises a housing (33) at the top and behind the cover (32) wherein the motor and part of the ball screw of the approaching and distancing means (3) are housed. Within said housing (33) there is also the control unit that manages the operation of the entire implement. The control unit is based on a computer system (6), which is connected to a global positioning system (61) or GPS for guiding the implement.

[0031] The implement comprises a solar-energy powering system, comprising photovoltaic panels (7) arranged on the housing (33) by a steerable support (71). The solar-energy powering system further comprises electric batteries (72), in this case arranged within said housing (33).

[0032] The control unit has associate means for transmitting information (62), in this case a radio frequency transmitting equipment connected to the computer system (6).

[0033] The implement control unit also comprises a camera (63) to capture images of the surroundings and remotely transmit these, and sensors (64) that gauge environmental parameters and/or parameters of the land to be worked, such as temperature and humidity sensors.

[0034] Once the nature of the invention as well as an example of preferred embodiment have been sufficiently described, it is stated for all pertinent purposes that the materials, shape, size and arrangement of the elements described are susceptible to changes, provided these do not involve an alteration of the essential characteristics of the invention that are claimed subsequently.

Claims

1. Autonomous self-actuated tillage implement comprising at least one first plow share (1) and at least one second plow share (2), a telematics control unit based on a computer system (6) for the autonomous guiding and moving of the implement, a steering system and a power system connected to the control unit, **characterized in that**:

   - the at least one first plow share (1) is in a front position and is provided with anti-rollback means and the at least one second plow share (2) is in a rear position and is provided with other anti-rollback means, said plow shares (1, 2) being interconnected by alternate approaching and distancing means (3) and by arms attached to said approaching and distancing means (3) and to the plow shares (1, 2), said approaching and distancing means (3) being adapted to move said at least one first plow share (1) and said at least one second plow share (2) closer to and further from each other,
   - the telematic control unit is assisted by a global positioning system (61),
   - the steering system is formed by an oscillating support (5) that can rotate in a plane perpendicular to the advancement direction of the implement, operationally suitable to lift one of the plow shares (1, 2) in relation to the ground and displace it laterally through the contact of such oscillating support (5) on the ground,
   - the power system is also connected to the approaching and distancing means (3) to supply drive power, the power system being selected from photovoltaic panels (7), wind energy generators, electrical engines, batteries, or an internal or an external combustion engine mounted

on said implement.

2. Implement according to claim 1, **characterized in that** the anti-rollback means are formed by a crampon (4) arranged at the rear of the at least one first plow share (1) and arranged at the rear of the at least one second plow share (2) and swinging around a horizontal joint (41) between a first upper position and a second lower position, so that, during a forward movement of a corresponding at least one first or second plow share (1, 2), the crampon (4) is positioned in the first upper position, wherein it slides over the ground, and so that, during a forward movement of the other of the at least one first or second plow share (1, 2), the crampon (4) is positioned in the second lower position, wherein it sticks into the ground to prevent rearward movement of the corresponding at least one first or second plow share (1, 2).

3. Implement according to any of the preceding claims, **characterized in that** the plow shares (1, 2) are removable and combinable with moldboards, cultivators, discs, chisels, cylinders, harrows or subsoilers.

4. Implement according to any of the preceding claims, **characterized in that** the power supply system comprises electric batteries (72) that store electrical energy.

5. Implement according to any of the preceding claims, **characterized in that** the photovoltaic panels (7) are mounted on the implement by means of at least one steerable support (71) or solar tracker.

6. Implement according to any of the preceding claims, **characterized in that** it comprises means for transmitting information (62) on the operation, associated to the control unit.

7. Implement according to any of the preceding claims, **characterized in that** it comprises at least one camera (63) to capture images of the surroundings, said camera (63) being connected to the control unit.

8. Implement according to any of the preceding claims, **characterized in that** it comprises sensors (64), connected to the control unit, for gathering environmental parameters and/or parameters of the land to be worked.

9. A method for the self-actuated tillage implement of claims 1 and 2 to move forwards by advancing by itself, by achieving a grip on the ground, said method comprising actuating one or more engines of the power system to expand and contract the approaching and distancing means (3) to provide an alternate movement of the plow shares (1, 2),
wherein the anti-rollback means stick into the ground automatically at the start of the rearward displacement of the corresponding plow shares (1, 2), corresponding to each movement of the approaching and distancing means (3),
wherein the the anti-rollback means provide an alternating setting of the plow shares (1, 2) in each movement, with at least one of the plow shares being static during the displacement of the at least one other plow share.
wherein during the forward movement of a corresponding at least one first or second plow share (1, 2), a crampon (4) is positioned in the first upper position, and so that, during a forward movement of the other of the at least one first or second plow share (1, 2), a crampon (4) is positioned in the second lower position, wherein it sticks into the ground to prevent rearward movement of the corresponding at least one first or second plow share (1, 2), which remains static at that time.

10. The method according to claim 9, wherein the anti-rollback means swings with respect to a horizontal joint arranged at the plow share when it changes between the first upper position and second lower position.

11. The method according to claim 9, wherein the plow shares (1, 2) are removable and combinable with moldboards, cultivators, discs, chisels, cylinders, harrows or subsoilers.

12. The method according to claim 9, wherein the engines are powered by batteries, solar panels, wind generators, internal or external combustion engines, or a hybrid combination thereof.

13. The method according to claim 9, wherein the implement is oriented in the desired direction by rotating the oscillating support (5) in a plane perpendicular to the advancement direction of the implement, to lift one of the plow shares (1, 2) in relation to the ground and displace it laterally through the contact of such oscillating support (5) on the ground causing the implement to be oriented in a desired direction.

14. The method according to claim 9, wherein the implement comprises means for transmitting information (62) and at least one camera (63) and sensors (64), said means for transmitting information (62) being associated to the control unit, said camera (63) being connected to the control unit, said sensors (64) being connected to the control unit, said method further comprising:

- gathering environmental parameters and/or parameters of the land with said sensors (64),
- capturing images of the surroundings with said

camera (63),
- controlling the position of the implement, storing and inspecting gathered information, and guiding and moving the implement with the control unit assisted by a global positioning system (61),
- transmitting information on the operation of the implement with said means for transmitting information (62),
- stopping the implement with the control unit.

Patentansprüche

1. Autonomes, selbstbetätigtes Bodenbearbeitungsgerät, umfassend mindestens einen ersten Pflugschar (1) und mindestens einen zweiten Pflugschar (2), eine telematische Steuereinheit, basierend auf einem Computersystem (6) zum autonomen Führen und Bewegen des Geräts, ein Lenksystem und ein Leistungssystem, die mit der Steuereinheit verbunden sind, **dadurch gekennzeichnet, dass**:

   - der mindestens eine erste Pflugschar (1) in einer vorderen Position ist und mit einer Rückrollschutzeinrichtung bereitgestellt ist und der mindestens eine zweite Pflugschar (2) in einer hinteren Position ist und mit anderen Rückrollschutzeinrichtungen bereitgestellt ist, wobei die Pflugscharen (1, 2) miteinander durch sich abwechselnde Annäherungs- und Beabstandungseinrichtungen (3) und durch Arme verbunden sind, die an den Annäherungs- und Beabstandungseinrichtungen (3) und den Pflugscharen (1, 2) befestigt sind, wobei die Annäherungs- und Beabstandungseinrichtungen (3) ausgelegt sind, um den mindestens einen ersten Pflugschar (1) und den mindestens einen zweiten Pflugschar (2) aufeinander zu- oder voneinander weg zu bewegen,
   - wobei die telematische Steuereinheit durch ein globales Positionierungssystem (61) unterstützt wird,
   - wobei das Lenksystem durch einen oszillierenden Träger (5) gebildet wird, der auf einer Ebene senkrecht zur Vorschubrichtung des Geräts drehen kann, die betrieblich zum Anheben eines der Pflugscharen (1, 2) in Bezug auf den Boden geeignet ist und diesen lateral durch den Kontakt eines solchen oszillierenden Trägers (5) auf dem Boden verschieben kann,
   - wobei das Leistungssystem auch mit der Annäherungs- und Beabstandungseinrichtung (3) zum Zuführen von Antriebsleistung verbunden ist, wobei das Leistungssystem ausgewählt ist aus Photovoltaikplatten (7), Windkraftgeneratoren, Elektromotoren, Batterien oder einer Brennkraftmaschine mit innerer und äußerer Verbrennung, die an dem Gerät montiert ist.

2. Gerät nach Anspruch 1, **dadurch gekennzeichnet, dass** die Rückrollschutzeinrichtungen durch ein Steigeisen (4) gebildet werden, das an der Hinterseite des mindestens einen ersten Pflugschars (1) angeordnet ist und an der Hinterseite des mindestens einen zweiten Pflugschars (2) angeordnet ist und um ein horizontales Gelenk (41) zwischen einer ersten oberen Position und einer zweiten unteren Position schwenkt, sodass, während einer Vorwärtsbewegung eines entsprechenden mindestens einen ersten oder zweiten Pflugschars (1, 2) das Steigeisen (4) in der ersten oberen Position positioniert ist, wobei es über den Grund gleitet, und so, dass während einer Vorwärtsbewegung des anderen des mindestens einen ersten oder zweiten Pflugschars (1, 2) das Steigeisen (4) in der zweiten unteren Position positioniert ist, wobei es in den Boden sticht, um eine Rückwärtsbewegung des entsprechenden mindestens einen ersten oder zweiten Pflugschars (1, 2) zu verhindern.

3. Gerät nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Pflugscharen (1, 2) entfernbar und kombinierbar mit Schneepflügen, Kultivatoren, Scheiben, Meißeln, Zylindern, Eggen oder Untergrundlockerern sind.

4. Gerät nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Leistungsversorgungssystem elektrische Batterien (72) umfasst, die elektrische Energie speichern.

5. Gerät nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Photovoltaikplatten (7) an dem Gerät mittels mindestens eines lenkbaren Trägers (71) oder Sonnenverfolgers montiert sind.

6. Gerät nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es Einrichtungen zum Übertragen von Information (62) über den Betrieb in Zusammenhang mit der Steuereinheit umfasst.

7. Gerät nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es mindestens eine Kamera (63) zum Erfassen von Bildern der Umgebung umfasst, wobei die Kamera (63) mit der Steuereinheit verbunden ist.

8. Gerät nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es Sensoren (64) umfasst, die mit der Steuereinheit verbunden sind, um Umweltparameter und/oder Parameter des zu bearbeitenden Landes zu sammeln.

9. Verfahren für das selbstbetätigte Bodenbearbeitungsgerät nach Anspruch 1 und 2, das sich durch eigenes Vorschieben vorwärts bewegt, indem es einen Griff auf dem Boden erreicht, wobei das Verfahren das Betätigen eines oder mehrerer Motoren des Leistungssystems zum Ausfahren und Einfahren der Annäherungs- und Beabstandungseinrichtungen (3) umfasst, um eine abwechselnde Bewegung der Pflugscharen (1, 2) bereitzustellen,
wobei die Rückrollschutzeinrichtung zu Beginn der Rückwärtsverschiebung der entsprechenden Pflugscharen (1, 2) automatisch in den Boden sticht, die jeder Bewegung der Annäherungs- und Beabstandungseinrichtung (3) entspricht,
wobei die Rückrollschutzeinrichtung eine abwechselnde Einstellung der Pflugscharen (1, 2) in jeder Bewegung bereitstellt, wobei mindestens einer der Pflugscharen während der Verschiebung des mindestens einen anderen Pflugschars statisch ist,
wobei während der Vorwärtsbewegung eines entsprechenden mindestens einen ersten oder zweiten Pflugschars (1, 2) ein Steigeisen (4) in der ersten oberen Position positioniert ist, und so, dass während einer Vorwärtsbewegung des anderen des mindestens einen ersten oder zweiten Pflugschars (1, 2) ein Steigeisen (4) in der zweiten unteren Position positioniert ist, wobei es in den Boden sticht, um eine Rückwärtsbewegung des entsprechenden mindestens einen ersten oder zweiten Pflugschars (1, 2) zu verhindern, der zu diesem Zeitpunkt statisch bleibt.

10. Verfahren nach Anspruch 9, wobei die Rückrollschutzeinrichtung in Bezug auf ein horizontales Gelenk, das an dem Pflugschar angeordnet ist, schwenkt, wenn diese zwischen der ersten oberen Position und der zweiten unteren Position wechselt.

11. Verfahren nach Anspruch 9, wobei die Pflugscharen (1, 2) entfernbar und kombinierbar mit Schneepflügen, Kultivatoren, Scheiben, Meißeln, Zylindern, Eggen oder Untergrundlockerern sind.

12. Verfahren nach Anspruch 9, wobei die Motoren durch Batterien, Solarplatten, Windgeneratoren, Verbrennungsmotoren mit innerer und äußerer Verbrennung oder einer hybriden Kombination davon betrieben werden.

13. Verfahren nach Anspruch 9, wobei das Gerät in der gewünschten Richtung durch Drehen des oszillierenden Trägers (5) auf einer Ebene senkrecht zu der Vorschubrichtung des Geräts ausgerichtet wird, um einen der Pflugscharen (1, 2) in Bezug auf den Boden anzuheben und diesen lateral durch den Kontakt eines solchen oszillierenden Trägers (5) auf dem Boden zu verschieben, um zu bewirken, dass das Gerät in einer gewünschten Richtung ausgerichtet ist.

14. Verfahren nach Anspruch 9, wobei das Gerät Einrichtungen zum Übertragen von Information (62) und mindestens eine Kamera (63) und Sensoren (64) umfasst, wobei die Einrichtungen zum Übertragen von Information (62) mit der Steuereinheit verknüpft sind, wobei die Kamera (63) mit der Steuereinheit verbunden ist, wobei die Sensoren (64) mit der Steuereinheit verbunden sind, wobei das Verfahren ferner umfasst:

- Sammeln von Umweltparametern und/oder Parametern des zu bearbeitenden Landes mit den Sensoren (64),
- Erfassen von Bildern der Umgebung mit der Kamera (63),
- Steuern der Position des Geräts, Speichern und Prüfen der gesammelten Information, und Führen und Bewegen des Geräts mit der Steuereinheit, die durch ein globales Positionierungssystem (61) unterstützt wird,
- Übertragen von Information zum Betrieb des Geräts mit den Einrichtungen zum Übertragen von Information (62),
- Anhalten des Geräts mit der Steuereinheit.

Revendications

1. Dispositif de labourage auto-actionné autonome comprenant au moins un premier soc (1) et au moins un deuxième soc (2), une unité de commande télématique consistant en un système informatique (6) pour le guidage et le déplacement autonome du dispositif, un système de direction et un système électrique raccordés à l'unité de commande, **caractérisé en ce que** :

- le au moins un premier soc (1) est dans une position avant et est pourvu de moyens anti-recul et le au moins un deuxième soc (2) est dans une position arrière et est pourvu d'autres moyens anti-recul, lesdits socs (1, 2) étant interconnectés par des moyens de rapprochement et d'éloignement alternés (3) et par des bras reliés auxdits moyens de rapprochement et d'éloignement (3) et aux socs (1, 2), lesdits moyens de rapprochement et d'éloignement (3) étant adaptés pour rapprocher et éloigner ledit au moins un premier soc (1) et ledit au moins un deuxième soc (2) entre eux,
- l'unité de commande télématique est assistée par un système de positionnement global (61),
- le système de direction est formé par un support oscillant (5) qui peut tourner dans un plan perpendiculaire au sens de la marche du dispositif, opérationnellement apte à lever l'un des socs (1, 2) par rapport au sol et à le déplacer latéralement moyennant le contact dudit support

oscillant (5) au sol,
- le système électrique est également raccordé aux moyens de rapprochement et d'éloignement (3) pour fournir une puissance motrice, le système électrique étant choisi parmi les panneaux photovoltaïques (7), les éoliennes, les moteurs électriques, les batteries, ou un moteur à combustion interne ou externe monté sur ledit dispositif.

2. Dispositif selon la revendication 1, **caractérisé en ce que** les moyens anti-recul sont formés d'un crampon (4) disposé à l'arrière du au moins un premier soc (1) et disposé à l'arrière du au moins un deuxième soc (2) et balançant autour d'un joint horizontal (41) entre une première position supérieure et une deuxième position inférieure, de sorte que, pendant un mouvement vers l'avant d'un correspondant au moins un premier ou deuxième soc (1, 2), le crampon (4) est positionné dans la première position supérieure, dans laquelle il glisse sur le sol, et de sorte que, pendant un mouvement vers l'arrière de l'autre d'au moins un premier ou deuxième soc (1, 2), le crampon (4) est positionné dans la deuxième position inférieure, dans laquelle il est planté dans le sol pour empêcher le mouvement arrière du correspondant au moins un premier ou deuxième soc (1, 2).

3. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les socs (1, 2) sont amovibles et combinables avec des versoirs, des cultivateurs, des disques, des ciseaux, des cylindres, des herses ou des sous-soleuses.

4. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le système d'alimentation électrique comprend des batteries électriques (72) qui stockent de l'énergie électrique.

5. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les panneaux photovoltaïques (7) sont montés sur le dispositif au moyen d'au moins un support dirigeable (71) ou suiveur solaire.

6. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend des moyens pour transmettre des informations (62) sur l'opération, associés à l'unité de commande.

7. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend au moins une caméra (63) pour capturer des images des alentours, ladite caméra (63) étant raccordée à l'unité de commande.

8. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend des capteurs (64), associés à l'unité de commande, pour réunir des paramètres environnementaux et/ou des paramètres de la terre à travailler.

9. Procédé pour que le dispositif de labourage autoactionné des revendications 1 et 2 se déplace vers l'avant en s'avançant lui-même, en obtenant une adhérence au sol, ledit procédé comprenant l'actionnement d'un ou plusieurs moteurs du système électrique pour dilater et contracter les moyens de rapprochement et d'éloignement (3) pour fournir un mouvement alterné des socs (1, 2),
dans lequel les moyens anti-recul sont plantés dans le sol automatiquement au début du déplacement arrière des socs correspondants (1, 2), correspondant à chaque mouvement des moyens de rapprochement et d'éloignement (3),
dans lequel les moyens anti-recul fournissent une configuration alternée des socs (1, 2) à chaque mouvement, avec au moins l'un des socs étant statique pendant le déplacement du au moins un autre soc,
dans lequel pendant le mouvement vers l'arrière d'un correspondant au moins un premier ou deuxième soc (1, 2), un crampon (4) est positionné dans la première position supérieure, et de sorte que, pendant un mouvement vers l'arrière de l'autre d'au moins un premier ou deuxième soc (1, 2), un crampon (4) est positionné dans la deuxième position inférieure, dans laquelle il est planté dans le sol pour empêcher le mouvement arrière du correspondant au moins un premier ou deuxième soc (1, 2), qui reste statique à ce moment-là.

10. Procédé selon la revendication 9, dans lequel les moyens anti-recul balancent par rapport à un joint horizontal disposé au soc lorsqu'il varie entre la première position supérieure et la deuxième position inférieure.

11. Procédé selon la revendication 9, dans lequel les socs (1, 2) sont amovibles et combinables avec des versoirs, des cultivateurs, des disques, des ciseaux, des cylindres, des herses ou des sous-soleuses.

12. Procédé selon la revendication 9, dans lequel les moteurs sont alimentés par des batteries, des panneaux solaires, des éoliennes, des moteurs à combustion interne ou externe, ou une combinaison hybride de ces derniers.

13. Procédé selon la revendication 9, dans lequel le dispositif est orienté dans le sens voulu en tournant le support oscillant (5) dans un plan perpendiculaire au sens d'avancement du dispositif, pour lever l'un des socs (1, 2) par rapport au sol et le déplacer latéralement moyennant le contact dudit support oscillant (5) au sol ce qui oriente le dispositif dans un sens voulu.

14. Procédé selon la revendication 9, dans lequel le dispositif comprend des moyens pour transmettre des informations (62) et au moins une caméra (63) et des capteurs (64), lesdits moyens pour transmettre des informations (62) étant associés à l'unité de commande, ladite caméra (63) étant raccordée à l'unité de commande, lesdits capteurs (64) étant raccordés à l'unité de commande, ledit procédé comprenant en outre :

- le rassemblement des paramètres environnementaux et/ou des paramètres de la terre avec lesdits capteurs (64),
- la capture des images des alentours avec ladite caméra (63),
- le contrôle de la position du dispositif, le stockage et l'inspection des informations réunies, et le guidage et le déplacement du dispositif avec l'unité de commande assistée par un système de positionnement global (61),
- la transmission des informations sur l'opération du dispositif avec lesdits moyens de transmission d'informations (62),
- l'arrêt du dispositif avec l'unité de commande.

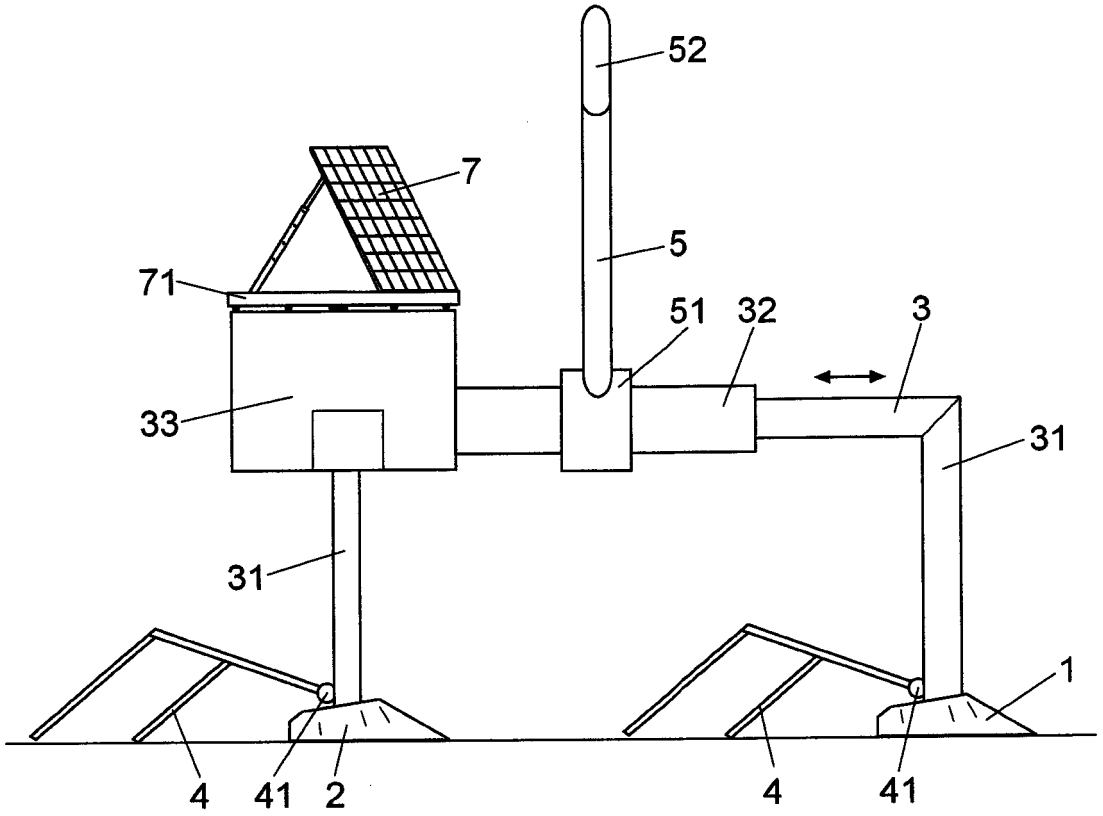

Fig. 1

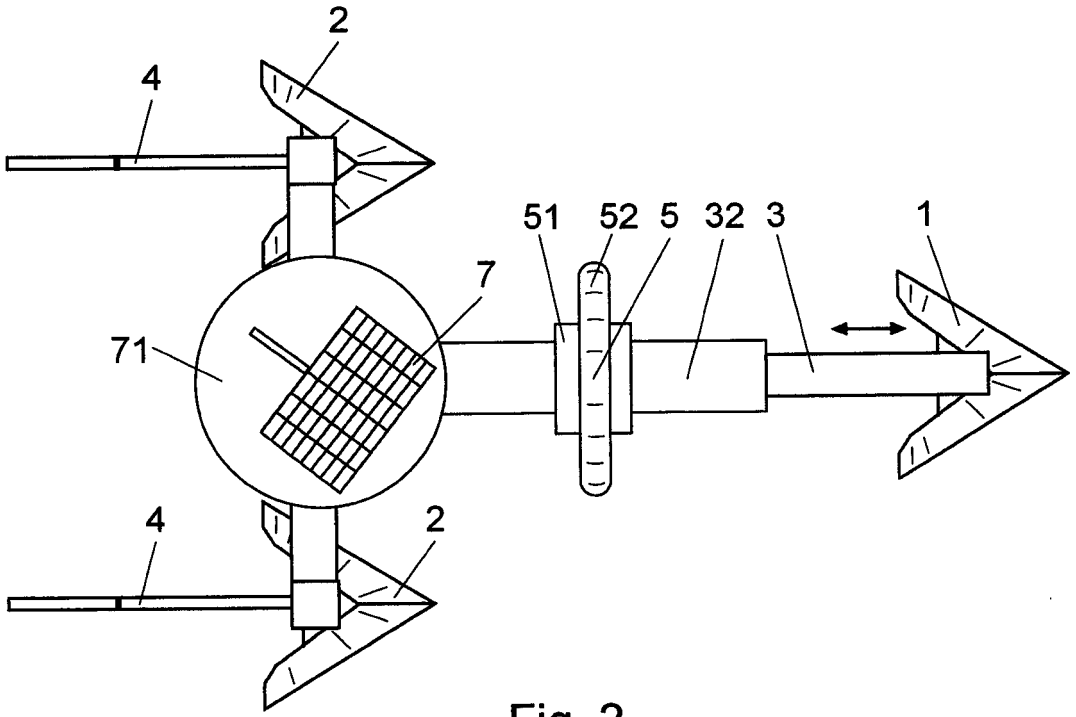

Fig. 2

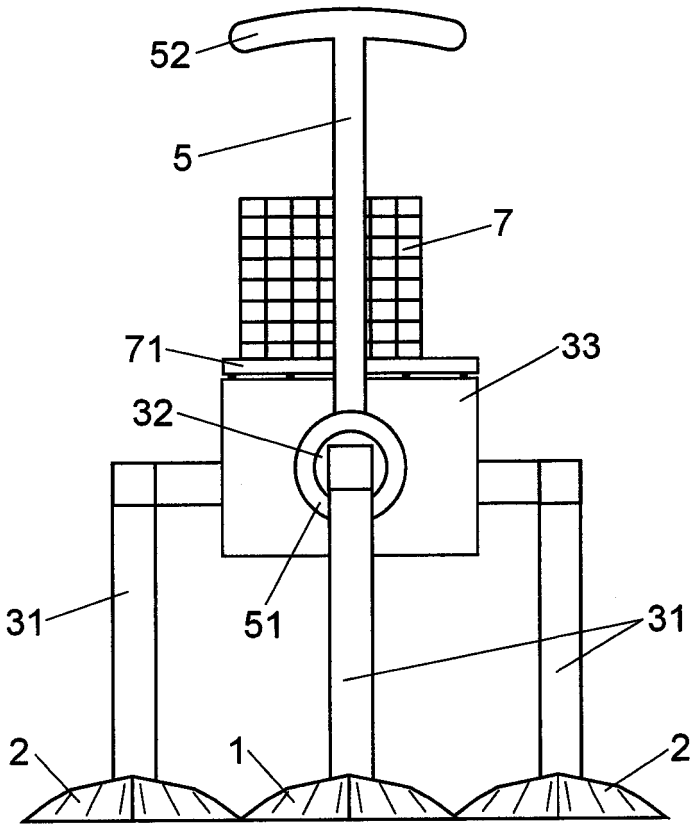

Fig. 3

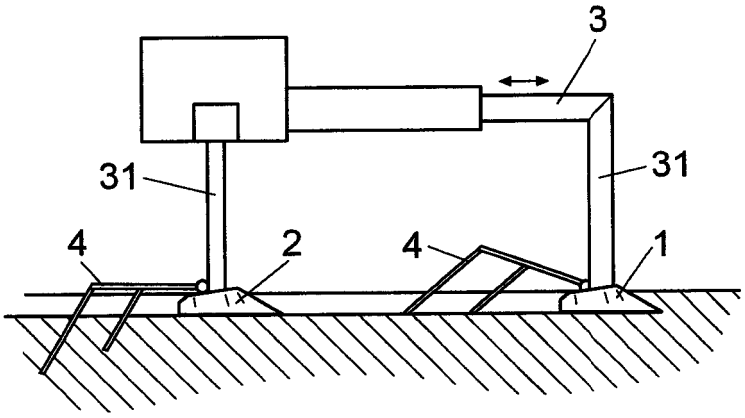

Fig. 4

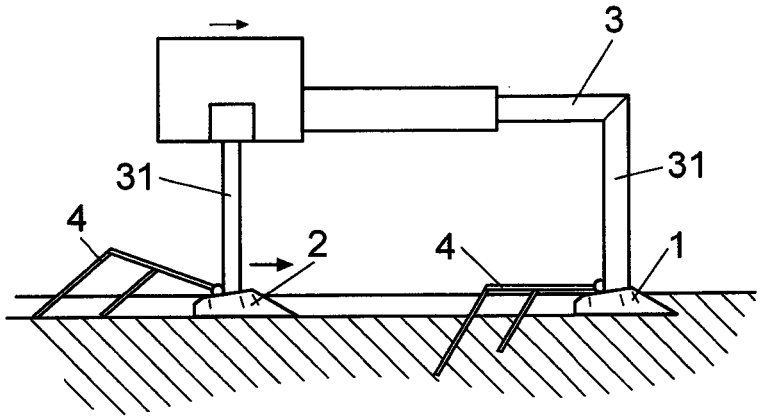

Fig. 5

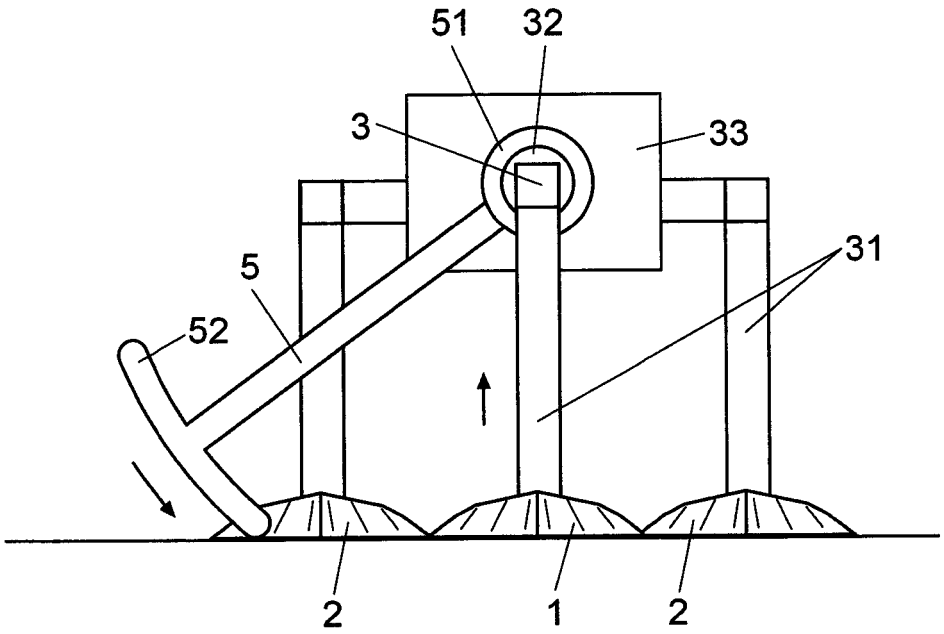

Fig. 6

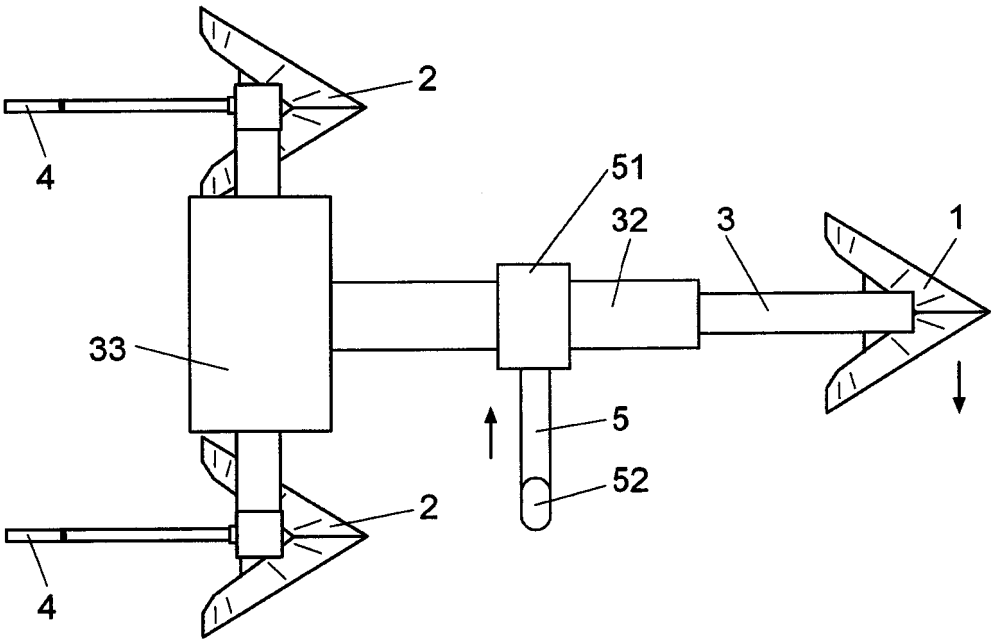

Fig. 7

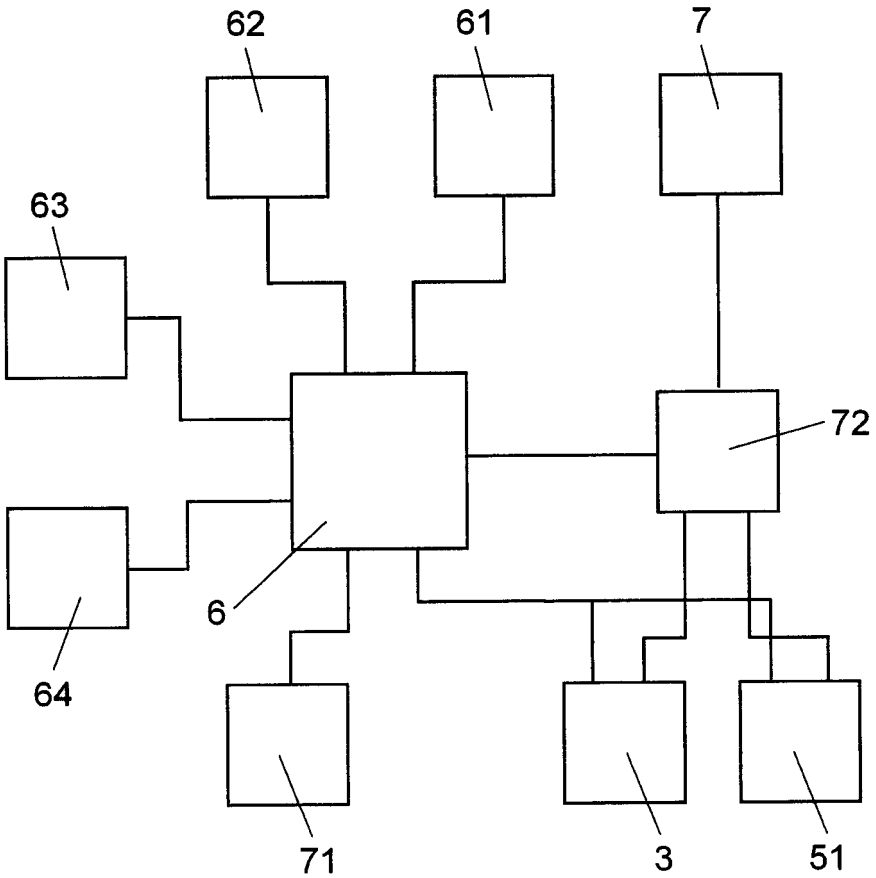

Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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