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(54) Title: ACCUMULATOR-ASSISTED DEVICE FOR TRACTORS

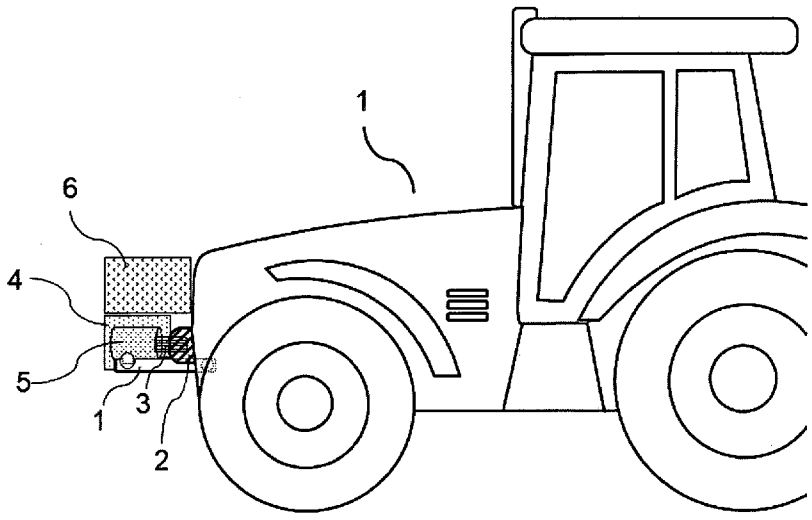

FIG. 1

(57) Abstract: A device to be placed on the tractor allows the supply of rotary energy or electric energy to the tractor or also to attachments and mounted implements.

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Accumulator-assisted device for tractors

Background of the Invention

Tractors for agricultural use are usually designed for low speed and high tractive power.

In the course of the spread of purely electric drives for passenger cars, it is naturally obvious to realize this also for agricultural vehicles and implements, especially since photovoltaic solar generators are also available in many cases for favorable charging in the agricultural sector.

In the field of passenger cars, the combination with internal combustion engines as hybrid drives is declining because the need for a reserve is hardly necessary with increasing battery performance.

However, the situation is different in agronomic applications: Here, high power is occasionally required when towing implements, but often only comparatively short distances are driven and the distance to the charging point is therefore short in each case.

It therefore makes sense to leave the power of the diesel engine in full, but to supplement it with an electric drive for a large number of applications requiring medium power.

Task of the Invention/Problem to be Solved

The task of the invention is therefore to develop a type of tractor that meets these requirements.

Solution

An inventive step to this end is to arrange an additional battery pack in such a way that it can be changed easily and quickly. This is possible at all implement attachment points on the tractor, especially at the front and rear power lift with which it can be picked up and, if necessary, also put down.

The further inventive step is then to also arrange an electric motor there and to couple its shaft to the power take-off shaft. The power take-off shaft is normally only used for power output, but it can be used reversibly. This simplifies the design considerably.

Another inventive step is to install the electric motor either together with the battery as a

single unit or in a dissolved design. In this case, the battery and electric motor are mounted separately, e.g. the battery in the front linkage and the motor in the rear linkage.

The diesel engine of the tractor runs constantly during its operation, first to generate the power if more of it is needed than the electric motor delivers, second to operate all auxiliary drives (compressed air, alternator, hydraulics etc). The tractor is supported by the electric motor and thus becomes a hybrid vehicle.

When the battery is empty, the tractor runs normally with the internal combustion engine, and there is no need to rely solely on the electric drive at any time.

Furthermore, attachments and mounted implements can be supplied with electric power or rotary power via a power take-off shaft.

CONTROL OF THE ELECTRIC DRIVE

The electric motor is controlled directly by the tractor via a connection to the vehicle control system.

Furthermore, it is also possible to charge additional batteries in case of favorable electricity prices or high production output of the own energy production and to use them alternately on the tractor.

PRIOR ART

US7828099B2 and others describe a purely electrically driven tractor.

DE102018218078A1 exemplarily discloses a hybrid drive system for a work vehicle comprising an engine and an electric motor. The drive system also includes a transmission configured to transmit mechanical power between the engine and the electric motor.

US20120321934A1 is about an energy storage system comprising at least one energy storage module suitable for supplying electrical energy to a hybrid vehicle.

KR101565780B1 discloses a battery system of a hybrid tractor and a hybrid tractor comprising the system.

None of the previously known systems and none of the previously disclosed devices are suitable for retrofitting an existing tractor with an electric drive or for supplying attachments with electric power or rotary power.

CLOSER DESCRIPTION ALONG TO THE DRAWING

Fig. 1 shows a tractor (1) with a motor block (4) attached to the three-point front attachment (2) and connected to the power take-off shaft (3), as well as the electric motor (5) and battery (6) arranged thereon.

CLAIMS

1. Accumulator-assisted device for tractors, wherein an additional accumulator is connected to the on-board power supply and an electric motor is connected to the power take-off shaft of the tractor.

2. Acumulator-assisted device for tractors according to claim 1, wherein the electric motor delivers rotational power to the power take-off shaft of the tractor.

3. Battery-assisted device for tractors according to claim 1 and 2, wherein the electric motor has its own power take-off shaft.

4. Battery-assisted device for tractors according to claim 3, wherein the electric motor delivers rotary power to implements or other external consumers via its own power take-off shaft.

5. Accumulator-assisted device for tractors according to claim 1, wherein the accumulator and the electric motor are arranged adjacent to each other or separately from each other and removably on the implement mounting spaces.

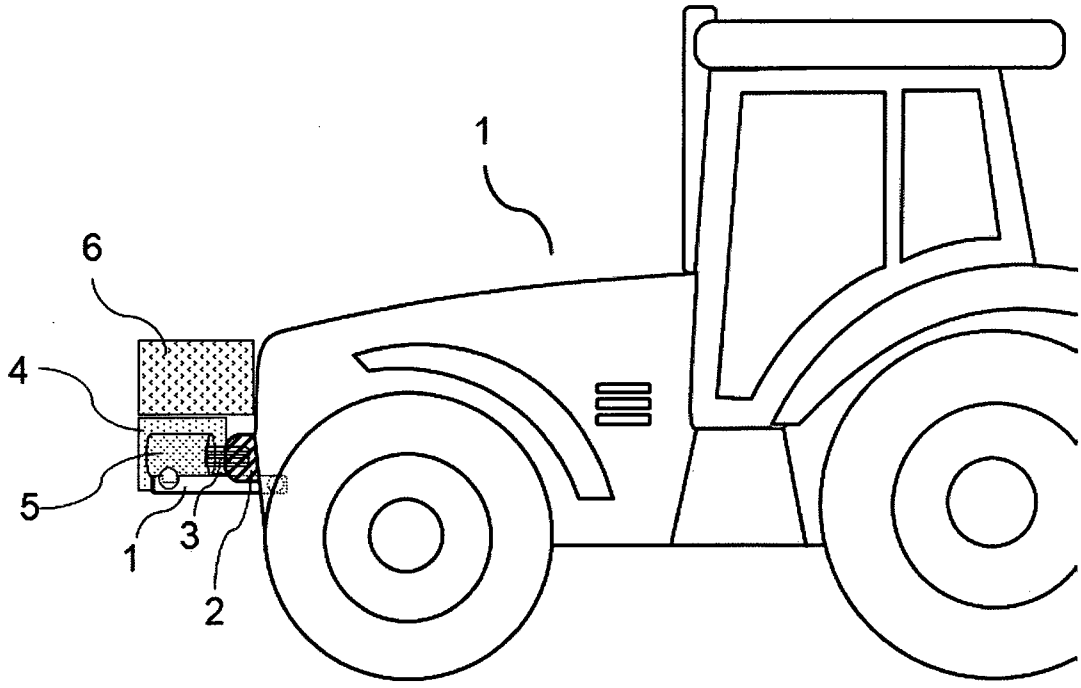

FIG. 1

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. B60K6/48 B60K6/485 B60W20/16
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60K B60W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 3 771 581 A1 (CNH IND ITALIA SPA [IT]) 3 February 2021 (2021-02-03) abstract; claims 1-13; figures 1,2	1-5
X	US 2009/018716 A1 (AMBROSIO JOSEPH MARIO [US]) 15 January 2009 (2009-01-15) abstract; figures 1-8 paragraph [0019]; claims 1-24	1-5
A	US 2006/052215 A1 (BEATY KEVIN D [US] ET AL) 9 March 2006 (2006-03-09) the whole document	1-5

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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