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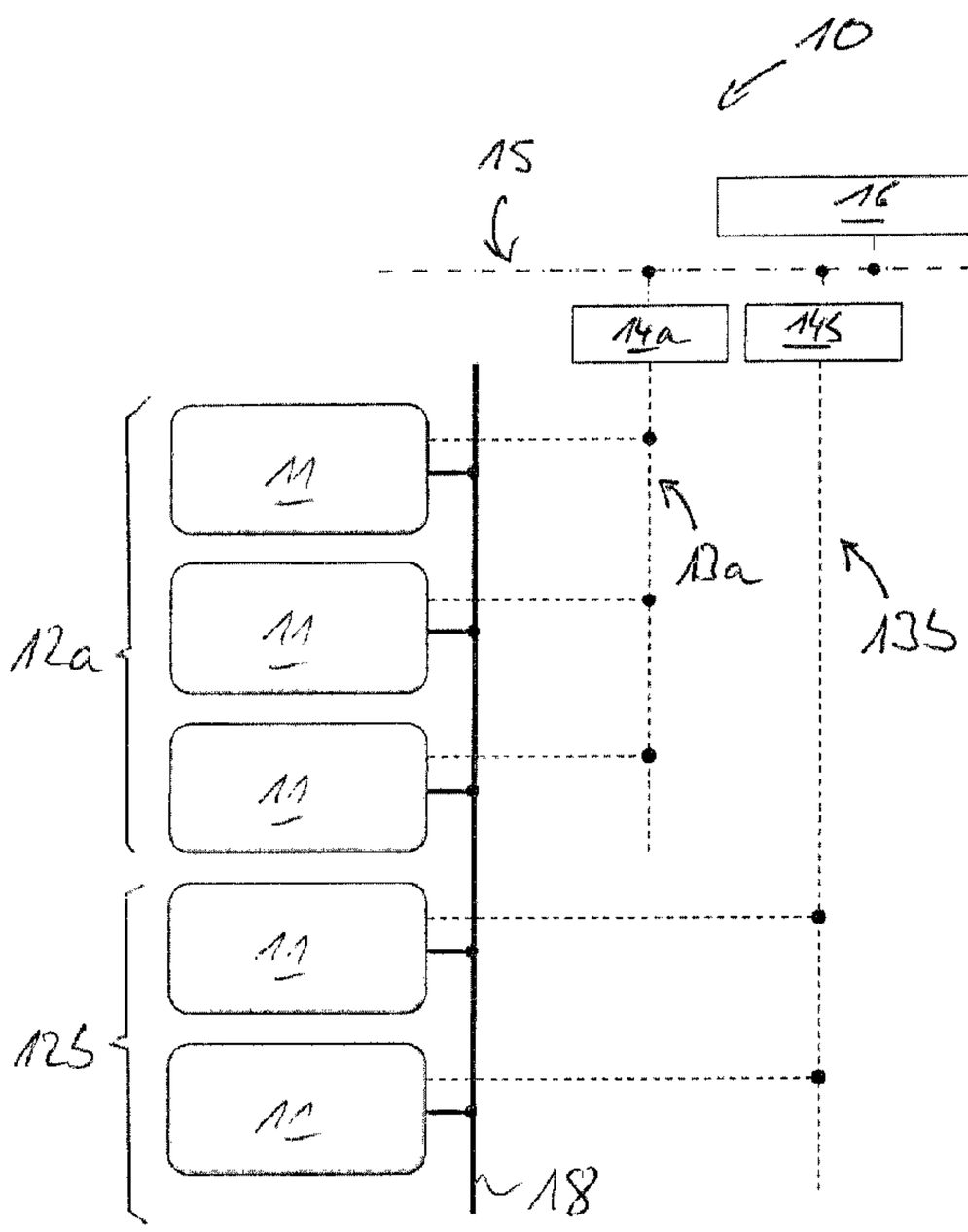
(54) Title: SHIP OR POWER PLANT VOLTAGE SUPPLY SYSTEM



(57) Abrégé/Abstract:
A ship voltage supply system for supplying an electric consumer of a ship with an electric target voltage and an electric target energy, with a plurality of automotive traction battery modules, wherein each automotive traction battery module has an electric actual voltage and an electric actual energy, wherein the automotive traction battery modules are interconnected dependent on the electric target voltage, the electric actual voltage, the electric target energy and the electric actual energy in series connections to form a plurality of traction battery module subgroups and/or in a parallel connection to form at least one traction battery module group.

ABSTRACT

A ship voltage supply system for supplying an electric consumer of a ship with an electric target voltage and an electric target energy, with a plurality of automotive traction battery modules, wherein each automotive traction battery module has an electric actual voltage and an electric actual energy, wherein the automotive traction battery modules are interconnected dependent on the electric target voltage, the electric actual voltage, the electric target energy and the electric actual energy in series connections to form a plurality of traction battery module subgroups and/or in a parallel connection to form at least one traction battery module group.

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SHIP OR POWER PLANT VOLTAGE SUPPLY SYSTEM

TECHNOLOGICAL FIELD

The invention relates to a ship voltage supply system or power plant voltage supply system.

BACKGROUND

Electric drives for example for hybridising the drive system play an ever more prominent role also on ships. For operating electric consumers of a ship such as for example for operating electric machines which serve for driving the ship, electric ship voltage supply systems are needed in order to supply the electric machine or the electric consumer with an adequate electric voltage or adequate electric energy. There is a need for a ship voltage supply system which with little expenditure and accordingly with low costs can provide an electric consumer of a ship with a desired electric target voltage and a desired electric target energy. Comparable requirements also exist in stationary applications in power plants. Starting out from this, the invention is based on the object of creating a new type of ship or power plant voltage supply system.

SUMMARY

This object is solved through a ship voltage supply system that comprises a plurality of automotive traction battery modules, wherein each automotive traction battery module has an electric actual voltage and an electric actual energy. Dependent on the electric target voltage, the electric actual voltage, the electric target energy and the electric actual energy the plurality of automotive traction battery modules are interconnected in series connections to

form a plurality of traction battery module sub-groups and/or in a parallel connection to form at least one traction battery module group.

With the present invention it is proposed to utilise automotive traction battery modules in a ship voltage supply system, which automotive traction battery modules are known from automotive applications in the motor vehicle sector. However, since such automotive traction battery modules deviate with respect to their electric actual voltage and/or electric actual energy from the target voltage and/or the target energy of the electric consumer of the ship, the invention proposes a defined interconnection of the automotive traction battery modules. The invention makes it possible with little expenditure using automotive traction battery modules to provide a ship voltage supply system which supplies an electric consumer of the ship, for example an electric machine serving to drive the ship, with a desired electric target voltage and electric target energy.

In particular when the electric actual voltage of the automotive traction battery modules corresponds to the electric target voltage of the electric consumer, a plurality of automotive traction battery modules are connected in parallel to form at least one traction battery module group. In particular when the electric actual voltage of the automotive traction battery modules is smaller than the electric target voltage of the electric consumer, a plurality of automotive traction battery modules are connected in series to form a traction battery module subgroup and a plurality of traction battery module subgroups connected in parallel to form at least one traction battery module group. Such an electrical interconnection of the automotive traction battery modules is preferred in

order to supply the electric consumer of the ship with the electric target voltage and electric target energy.

Preferentially, the automotive traction battery modules are activatable via an automotive CAN bus system. By way of this, an activation of the automotive traction battery modules can take place with little effort and use of automotive CAN bus systems. Because of this, a simple and cost-effective ship voltage supply system can be provided.

According to a further development, the ship voltage supply system comprises a plurality of traction battery module groups which are electrically connected in parallel, wherein the number of the automotive traction battery modules for each traction battery module group is dependent on the control signal capacity of the automotive CAN bus system, wherein the automotive traction battery modules of each traction battery module group in each case are connected to a group-individual automotive CAN bus system, wherein the number of the traction battery module groups is dependent on the electric target energy of the electric consumer and wherein the group individual automotive CAN bus systems are connected to a higher-level control device. This further development is particularly preferred in order to provide a ship voltage supply system using automotive traction battery modules and automotive CAN bus system, which provides an electric consumer of the ship with the desired electric target voltage and electric target energy.

The power plant voltage supply system according to the invention is further defined herein.

Preferred further developments of the invention are obtained from the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the invention are explained in more detail by way of the drawings without being restricted to this. There it shows:

Fig. 1 a first ship voltage supply system according to the invention and

Fig. 2 a second ship voltage supply system according to the invention.

DETAILED DESCRIPTION

The invention relates to a ship voltage supply system 10 for supplying an electric consumer of a ship with an electric target voltage and an electric target energy.

The invention also relates to a power plant voltage supply system for supplying an electric consumer of a power plant with an electric target voltage and an electric target energy. In the following, the invention is described making reference to ship voltage supply systems. However, the invention also applies to power plant voltage supply systems.

The ship voltage supply system 10 comprises a plurality of automotive traction battery modules 11, wherein each automotive traction battery module 11 has or provides an electric actual voltage and an electric actual energy.

The automotive traction battery modules 11 are interconnected dependent on the electric target voltage, the electric actual voltage, the electric target energy and the electric actual energy to form a

plurality of traction battery module subgroups in series connections and/or to form at least one traction battery module group in a parallel connection.

Fig. 1 shows a first exemplary embodiment of a ship voltage supply system 10 according to the invention with a plurality of automotive traction battery modules 11, wherein in Fig. 1 five such automotive traction battery modules 11 are exemplarily shown. All automotive traction battery modules 11 are interconnected in the sense of parallel connections to form at least one traction battery module group, namely in Fig. 1 two traction battery module groups 12a, 12b, wherein the traction battery module group 12a in Fig. 1 comprises three automotive traction battery modules 11 and the traction battery module group 12b two automotive traction battery modules 11.

In Fig. 1, it is not only the automotive traction battery modules 11 of the respective traction battery module group 12a, 12b that are each connected parallel to one another, but the traction battery module groups 12a, 12b are also connected parallel to one another so that all automotive traction battery modules 11 of the traction battery module groups 12a, 12b are connected in the sense of a parallel connection to a common voltage supply line 18, via which the at least one electric consumer of the ship, in particular an electric machine serving as drive source, can be supplied with the desired target voltage and the desired target energy.

In Fig. 1, the actual voltage of the automotive traction battery modules 11 corresponds to the electric target voltage of the electric consumer, the number of the automotive traction battery modules 11

interconnected in parallel depends on the desired electric target energy.

Activation of the automotive traction battery modules 11 is effected via automotive CAN bus systems. Such automotive CAN bus systems have a limited control signal capacity. For this reason, the automotive traction battery modules 11 of each traction battery module group 12a, 12b are each activated via a group-individual automotive CAN bus system 13a, 13b, namely the automotive traction battery modules 11 of the traction battery module group 12a via the automotive CAN bus system 13a and the automotive traction battery modules 11 of the traction battery module group 12b via the automotive CAN bus system 13b. Thus controllers 14a, 14b coordinate the transmission of the control signals via the respective automotive CAN bus system 13a, 13b, wherein the automotive CAN bus systems 13a, 13b or the bus controllers 14a, 14b are connected to a higher-level bus system 15 in order to exchange data with a higher-level control device via this higher-level bus system 15.

A further ship voltage supply system 10 according to the invention is shown by Fig. 2. In the case of the ship voltage supply system 10 of Fig. 2, a total of 12 automotive traction battery modules 11 are present, wherein in each case four of the automotive traction battery modules 11 are interconnected to form a traction battery module group 12a, 12b, 12c. Within each traction battery module group 12a, 12b and 12c, two of the four automotive traction battery modules 11 are each interconnected in the sense of a series connection to form traction battery module subgroups 17a, 17b and 17c, wherein the traction battery module subgroups 17a, 17b and 17c are interconnected in the

sense of a parallel connection to form the respective traction battery module group 12a, 12b and 12c.

Accordingly, the electric actual voltage of the automotive traction battery modules 11 is smaller in Fig. 2 than the electric target voltage of the electric consumer of the ship, wherein the number of the automotive traction battery modules 11a which are interconnected in series and interconnected to form a traction battery module subgroup 17a, 17b and 17c is dependent on the ratio of the actual voltage to the target voltage.

The number of the traction battery module groups 12a, 12b, 12c is dependent on the ratio of the actual energy to the needed target energy. The traction battery module groups 12a, 12b, 12c which are connected in parallel are connected to a common voltage supply line 18.

A group-individual automotive CAN bus system 13a, 13b and 13c again interacts with each traction battery module group 12a, 12b, 12c, wherein in this respect bus controllers 14a, 14b, 14c are coupled to a higher-level bus system 15 in order to communicate with the higher-level control device 16. The number of the automotive traction battery modules 11 of each traction battery module group 12a, 12b, 12c again depends on the control signal capacity of the automotive CAN bus system.

Using known and available automotive traction battery modules 11 and known and available automotive CAN bus systems 13, 15, the invention allows building-up an electric ship voltage supply system 10 in order to supply at least one electric consumer of a ship with a desired electric target voltage and a desired electric target energy, so that the ship voltage supply system

10 can be build-up cost-effectively and reliably using assemblies known per se. The electric actual energy of known automotive traction battery modules 11 is between 10 kWh and 100 kWh, in particular in the order of magnitude of 20 kWh. The electric target energy of the electric consumer of the ship is typically greater than 1,000 kWh, typically of the order of magnitude of a plurality of MWh.

With the parallel arrangements of the automotive traction battery modules 11 (see Fig. 1) and with the parallel arrangements of automotive traction battery modules 11 connected in series or with the parallel arrangements of traction battery module subgroups 17 (see Fig. 2), a very high redundancy materialises. Should a defect occur in an automotive traction battery module 11 and the same has to be switched off for protection as a consequence, the electric voltage supply can still be maintained. With a correspondingly large number of parallel or automotive traction battery modules 11 or parallel traction battery module subgroups 17, a power or energy deficit is low. Such a defect case is detected via the automotive CAN bus system. The failure of automotive traction battery modules 11 is correspondingly signalled to a higher-level guidance system.

REFERENCE LIST

10 Ship voltage supply system
11 Automotive traction battery module
12a Traction battery module group
12b Traction battery module group
12c Traction battery module group
13a Automotive CAN bus system
13b Automotive CAN bus system
13c Automotive CAN bus system
14a Bus controller
14b Bus controller
14c Bus controller
15 Bus system
16 Control device
17a Traction battery module subgroup
17b Traction battery module subgroups
17c Traction battery module subgroups
18 Voltage supply line

CLAIMS

1. A ship voltage supply system for supplying an electric consumer of a ship with an electric target voltage and an electric target energy,

with a plurality of automotive traction battery modules, wherein each automotive traction battery module has an electric actual voltage and an electric actual energy;

wherein the automotive traction battery modules are interconnected dependent on the electric target voltage, the electric actual voltage, the electric target energy and the electric actual energy in series connections to form a plurality of traction battery module subgroups and/or in a parallel connection to form at least one traction battery module group.

2. The ship voltage supply system according to claim 1, wherein when the electric actual voltage of the automotive traction battery modules corresponds to the electric target voltage of the electric consumer, a plurality of automotive traction battery modules are connected in parallel to form at least one traction battery module group.

3. The ship voltage supply system according to claim 1 or 2, wherein when the electric actual voltage of the automotive traction battery modules is smaller than the electric target voltage of the electric consumer, a plurality of automotive traction battery modules are connected in series to form a traction battery module subgroup and a plurality of traction battery module subgroups are

connected in parallel to form at least one traction battery module group.

4. The ship voltage supply system according to any one of claims 1 to 3, wherein the automotive traction battery modules are activatable via an automotive CAN bus system.

5. The ship voltage supply system according to claim 4, wherein the number of the automotive traction battery modules of each traction battery module group is dependent on the control signal capacity of the automotive CAN bus system.

6. The ship voltage supply system according to claim 4 or 5, wherein the same comprises a plurality of traction battery module groups which are electrically connected in parallel,

wherein the number of the automotive traction battery modules of each traction battery module group is dependent on the control signal capacity of the automotive CAN bus system,

wherein the automotive traction battery modules of each traction battery module group are each connected to a group-individual automotive CAN bus system,

wherein the number of the traction battery module groups is dependent on the target energy of the electric consumer,

wherein the group-individual automotive CAN bus systems are connected to a higher-level control device.

7. The ship voltage supply system to any one of claims 1 to 6, wherein the actual energy of each automotive traction battery module amounts to between 10 to 100 kWh, and in that the target energy of the electrical consumer is greater than 1,000 kWh.

8. A power plant voltage supply system for supplying an electric consumer of a power plant with an electric target voltage and an electric target energy,

with a plurality of automotive traction battery modules, wherein each automotive traction battery module has an electric actual voltage and an electric actual energy;

wherein the automotive traction battery modules are interconnected dependent on the electric target voltage, the electric actual voltage, the electric target energy and the electric actual energy in series connections to form a plurality of traction battery module subgroups and/or in a parallel connection to form at least one traction battery module group.

9. The power plant voltage supply system according to claim 8, characterized by features according to any one of claims 2 to 7.

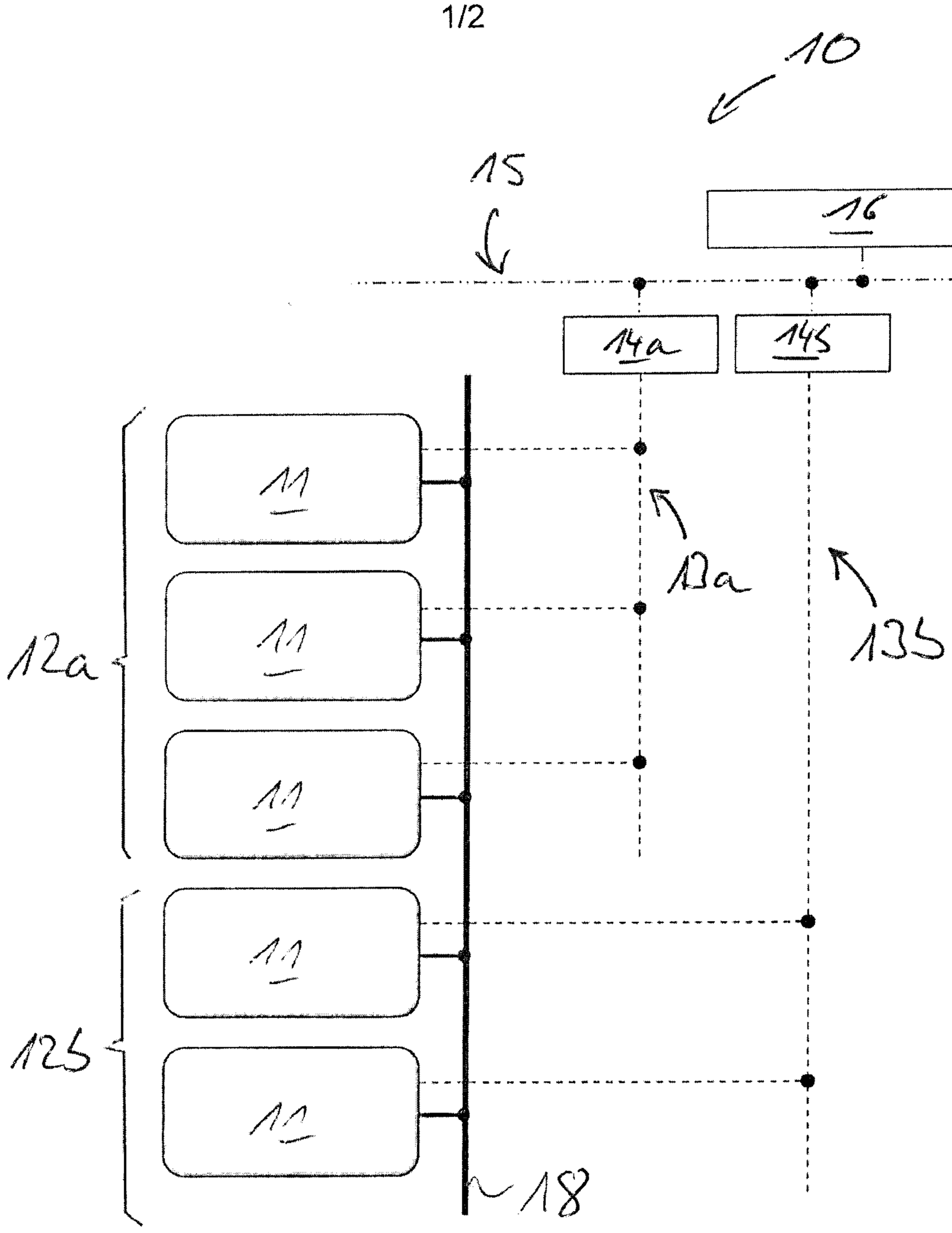

Fig. 1

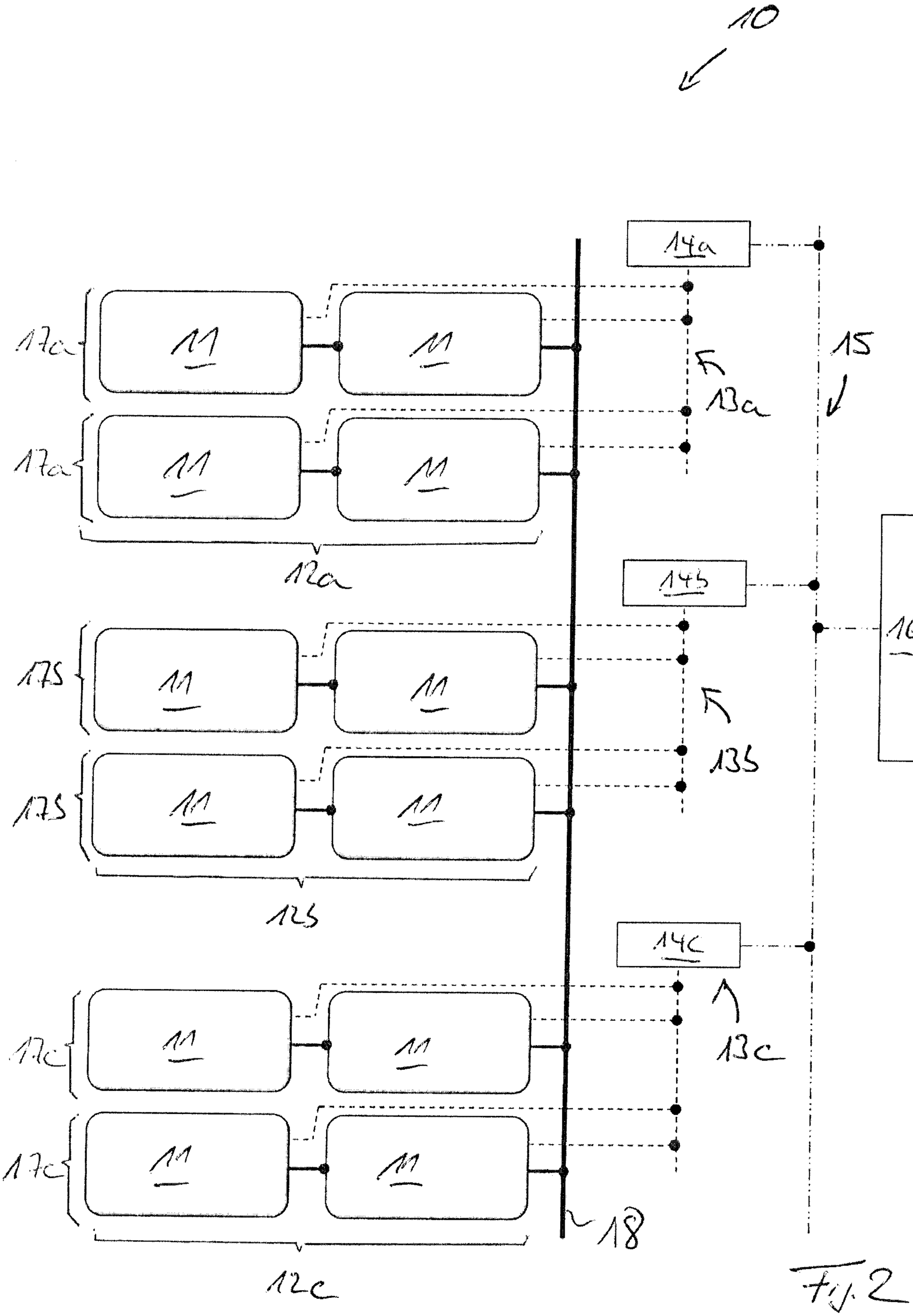
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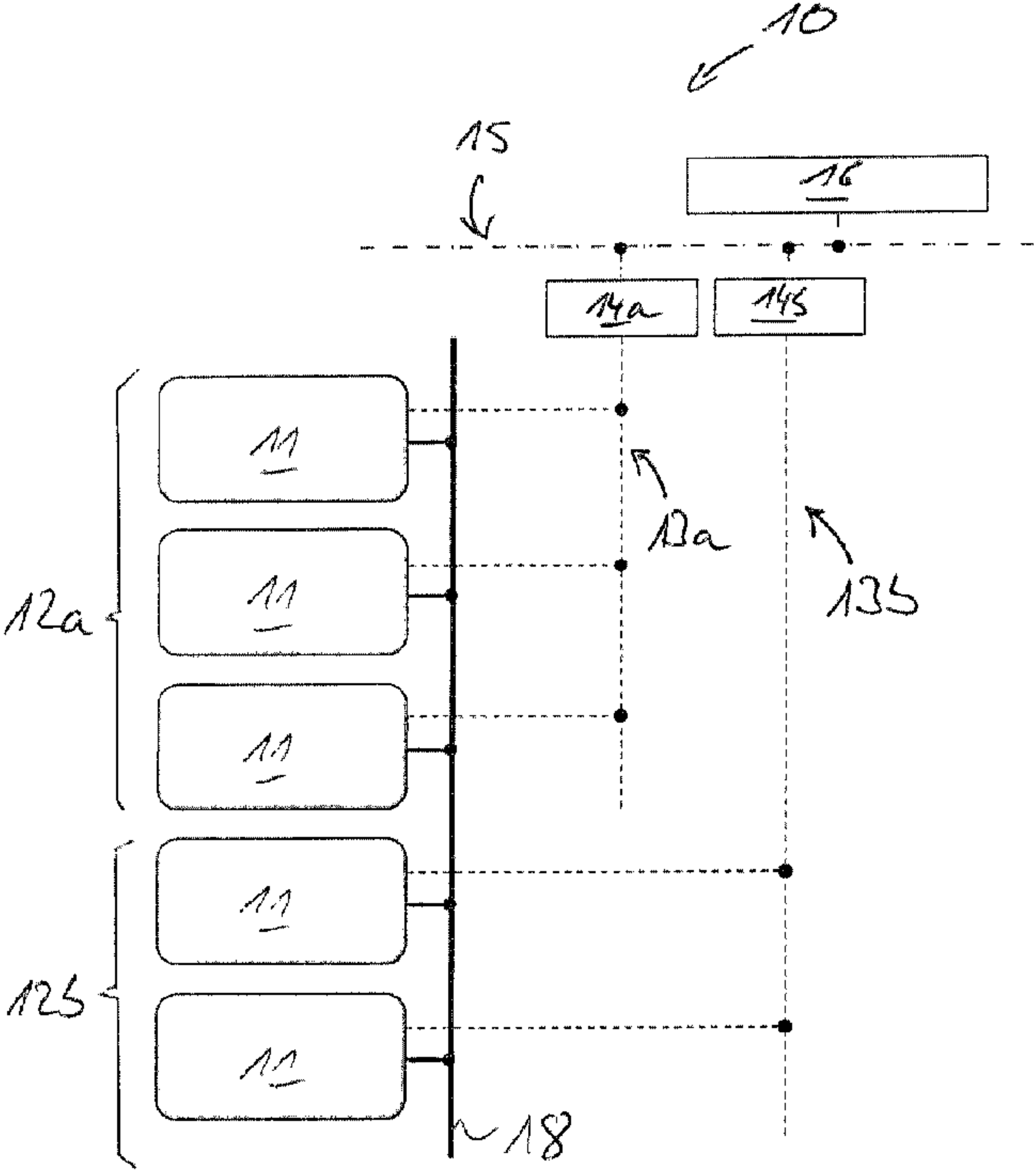
Fig. 2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