

5 **System consisting of a stacking aid and a plurality of AGM batteries**

The invention relates to a system consisting of a stacking aid and a plurality of AGM batteries arranged in the stacking aid. The invention also relates to a stacking aid for holding AGM batteries.

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AGM batteries in general and systems consisting of a stacking aid on the one hand and a plurality of AGM batteries on the other, in particular, are known per se in prior art. Printed proof is therefore not required at this point. For this reason, reference is only made to DE 20 2019 105 570 U1 as an example
15 which comprises a battery cabinet for holding AGM batteries in particular.

AGM batteries are rechargeable batteries which comprise electrode plates arranged in a battery housing. The housing is rectangular in cross section and comprises first side walls extending parallel to each other, on the one hand, and
20 second side walls extending parallel to each other, on the other hand. In this case, the electrode plates accommodated by the housing are aligned parallel to the first walls of the housing. The second side walls extend transversely to the electrode plates.

25 A nonwoven serving as a separator is arranged between two adjacent electrode plates. Further, the housing holds an electrolyte which surrounds the electrode plates and, in the case of AGM batteries, is provided in the bound state by the nonwovens disposed between the electrode plates. Thus, the nonwovens not only serve as separators, but also for binding the electrolyte.

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The electrolyte, which is present in the bound state in the case of AGM batteries, advantageously enables AGM batteries to be stored also horizontally, i.e., on one of the side walls of the housing, without the risk of electrolyte escaping from the housing.

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5 To ensure the long service life of AGM batteries, it is essential that there is
always surface contact between the individual electrode plates and the
interposed webs doped with electrolyte. To ensure this, plate packs consisting
of the electrode plates and the interposed webs are inserted in the housing of
the AMG battery in a compressed state. However, when used as intended, the
10 housing may become dented or bulged as a result of the inner pressure building
up in the housing, which will lead to that compressed arrangement of the
electrode plates and webs can no longer be maintained despite the previously
compressed plate packs. This has the negative effect that the contact between
the electrode plates and the webs decreases, whereby the service life of the
15 AGM battery is significantly reduced. The pressure inside the housing of an
AGM battery may increase, especially during a charging cycle, which leads to a
repeated contact reduction between the electrode plates and the webs, which
again reduces the service life. Accordingly, the load condition due to the
compressed webs is therefore the main cause of the bulging of the housing.

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To address this problem, it has already been proposed that AGM batteries are
stored horizontally in racks, in which case the AGM batteries are aligned
relative to the rack in such a way that the electrode plates extend in parallel to
the shelves. In this case, when used as intended, the AGM batteries are
25 virtually clamped between two shelves, as already proposed by the initially
mentioned DE 20 2019 105 570 U1, in order to prevent undesired bulging of
battery housings.

Comparable systems are further known from US 6,641,951 B1 and EP 0 922
30 308 B1. These systems also use stacking aids for holding AGM batteries which
enclose the batteries held by them, and support elements in the form of
intermediate and/or insertion shelves are provided which are connected to
laterally arranged flanges in a force-transmitting manner. When used as
intended, the AGM batteries are thus clamped at least between a bottom
35 element and an intermediate and/or fitted shelf on the one hand and an
intermediate and/or fitted shelf and a cover element on the other hand, in

5 which manner the bottom element and the cover element and the at least on
intermediate and/or fitting shelf counteract unwanted bulging of the housing of
an AGM battery. In this case, when a force acts on the bottom element, the
intermediate and/or insertion shelf and/or the cover element as a result of
counteracting bulging of the housing of an AGM battery, force is dissipated via
10 the lateral flanges of the stacking aid which communicate with the at least one
intermediate and/or fitting shelf in a force-transmitting manner.

In addition, the above-mentioned EP 0 922 308 B1 proposes a modular design
of the stacking aid, in which individual modules serving to hold AGM batteries in
15 each case are provided. The individual modules are coupled to each other in a
force-transmitting manner, and pressure elements are which act on adjacent
modules are provided in addition.

Another modular design of a stacking aid is known from EP 2 396 733. This
20 design also uses pressure elements positioned between modules arranged one
above the other in the height direction. A special advantage of the design
according to EP 2 396 733 A1 is that this modularity enables adjustments to
made in line with requirements of the individual case.

25 Although the existing systems and stacking aids have proven themselves in
everyday use, there is still a need for improvement. For example, modular
systems have the inherent disadvantage that a large number of different
components and individual parts are provided, which both makes production
more expensive and makes handling more difficult, especially during assembly.
30 In addition, all previously known systems and stacking aids have the
disadvantage that they are designed to be very robust by means of a
corresponding use of material, in particular to ensure that a corresponding force
can be transferred via the lateral flanges. The high amount of material used in
the design makes the previously known stacking aids comparatively expensive
35 to manufacture. In addition, the material-intensive design of the stacking aids
makes both production and assembly on site more difficult.

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The invention is based on the **problem** of providing a system or stacking aid of the type described above, which, due to its design, enables simplified handling during assembly while at the same time improving economic efficiency.

10 For the **solution** of this problem, the invention proposes among others a system consisting of a stacking aid and a plurality of AGM batteries arranged in the stacking aid, wherein an AGM battery has a housing comprising first side walls and has electrode plates arranged in the housing, wherein the first side walls and the electrode plates are aligned so as to extend in parallel, wherein
15 the stacking aid has a U-shaped main body which a support element and two flanges aligned orthogonally thereto, wherein the flanges receive the support element between them, which support element is arranged at one end on one flange and at the other end on the other flange, wherein the support element receives a plurality of AGM batteries arranged one above the other in rows,
20 wherein both the support element and the first side walls of the housings of the AGM batteries are aligned so as to extend horizontally, and wherein the stacking aid is formed so as to be free of further support elements which are arranged on the flanges and receive AGM batteries.

25 Further, for the **solution** of the above-mentioned problem there is proposed a stacking aid for holding AGM batteries, comprising a U-shaped main body having a support element and two flanges aligned orthogonally thereto, wherein the support element is designed to received a plurality AGM batteries arranged one above the other in rows, wherein the flanges receive the support element
30 between them, which support element is arranged at one end on the one flange and at the other end on the other flange, and wherein the stacking aid is designed so as to be free of additional support units arranged on the flanges and receiving AGM batteries.

35 The special feature of both the system according to the invention and the stacking aid according to the invention is to be seen in the simple and less

5 material- and component-intensive design. This simplifies both production and assembly and also makes production cheaper. As a result, simplified handling is made possible while at the same time improving economic efficiency.

10 The stacking aid according to the invention, when used as intended, receives a plurality of AGM batteries which are arranged one above the other in rows. In this case, the AGM batteries are supported solely by a support element which is arranged at the very bottom in the height direction and hence receives the AGM batteries arranged one above the other in rows. When used as intended, vertically aligned flanges are arranged laterally of the support element, which, 15 on the one hand, serve to protect the stacked AGM batteries from falling out and, on the other hand, ensure that the AGM batteries stacked in the intended use are protected against unintentional mechanical impact from the outside. In contrast to prior art, no further support elements in the form of intermediate and/or insertion shelves are provided, which serve to hold AGM batteries and 20 are arranged on the flanges in a force-transmitting manner. In this respect, the flanges of the stacking aid according to the invention do not assume a load-bearing function, but serve only as lateral protection for the AGM batteries held by the stacking aid in the sense explained above.

25 This embodiment according to the invention provides two particular advantages in a synergistic manner. Firstly, in contrast to prior art, it is possible to make the lateral flanges less stable and therefore less material-intensive. This is because the flange according to the embodiment of the invention does not assume any load-bearing function, but only a lateral protective function. This results in 30 simplified assembly and more cost-effective manufacture. On the other hand, it is also advantageous that the embodiment according to the invention has a very simple overall structure and ultimately only three structural components, namely two flanges and a supporting element arranged between them. This results in a significantly reduced number of components compared to prior art, which also 35 reduces manufacturing costs and simplifies assembly.

5 The embodiment according to the invention makes use of the finding that the AGM batteries accommodated by the stacking aid, when used as intended, due to their own weight, ensure that unintentional bulging of individual battery housings is reliably prevented. On the system side, the invention therefore also provides that both the support element and the first side walls of the housings of
10 the AGM batteries are aligned horizontally, with the first side walls and the electrode plates running parallel to one another. When used as intended, the AGM batteries are therefore arranged one above the other in the direction of bulging, whereby any bulging is prevented by the fact that the rows of AGM batteries stacked on top of each other are supported against each other due to
15 gravity. The support element holding the AGM batteries serves as an abutment on which the AGM batteries rest. Since, according to the invention, no intermediate and/or insertion shelves, i.e., no further supporting elements, are provided, no force is transferred to the laterally formed flanges, so that, in contrast to prior art, these do not have a supporting and/or bearing function.

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In this respect, the flanges provided according to the invention solely and exclusively have the function of protecting the stacked AGM batteries, namely against undesired mechanical influences from outside, on the one hand, and of preventing the AGM batteries from falling out of the stacking aid or tilting
25 sideways, especially in the event of vibration or shock, on the other hand.

According to a further feature of the invention it is provided that the support element comprises two tubes that are rectangular in cross section and are aligned to as to extend in parallel and are spaced from each other in the
30 transverse direction of the tube, i.e. in a direction transverse to the tube longitudinal direction. These two rectangular tubes virtually serve as support beams where stacked AGM batteries rest on when used as intended. In contrast to support elements formed over an area, the use of such support beams is more resource-saving, especially less material-intensive. Also, the
35 rectangular tubes are particularly advantageous in absorbing bending and torsional loads occurring under the intended load. The rectangular shape

5 additionally ensures easy stacking of AGM batteries which have a housing which is also rectangular in cross section.

According to a further feature of the invention it is provided that the U-shaped main body is composed of two L-shaped base bodies, one base body including
10 a section of the support element and a flange formed orthogonally thereto, said section of the support element being arranged at one end on the flange.

According to this particularly preferred proposal of the invention it is provided that the U-shaped main body is composed of two base bodies, each of the base
15 bodies being L-shaped. In this case, the base bodies are preferably designed identically with each other, so that it is sufficient to connect two base bodies to each other as intended, in order to form a U-shaped main body, without having to differentiate between base bodies in terms of their design.

20 An L-shaped base body comprises a flange on one side and a section of the support element on the other side. In this case it is preferred if the two sections of the support element of two L-shaped base bodies are equally long in the longitudinal direction of the support element, hence the two sections of the base body correspond to one half of a support element. In the assembled state, a U-
25 shaped main body is formed in the manner as previously described, i.e., a main body with a support element on one side and with flanged arranged thereon on the other side.

The section of a support element of an L-shaped base body is arranged at one
30 end on a flange. At the other end, the section of the support element is preferably arranged on a connecting piece. In the final assembled state of a U-shaped main body, the two connecting pieces of the support element sections abut each other, which fact enables a simple connection of the two support element sections, e.g. by screws. In the assembly as intended, the L-shaped
35 base bodies which belong to a U-shaped main body must be aligned first, namely in such a way that the connecting pieces provided by the respective

5 support element sections abut each other. Thereafter, the two L-shaped base bodies have to be coupled to each other by screwing the mutually abutting connecting pieces together. This results in a U-shaped main body in terms of the invention.

10 According to a further feature of the invention it is provided that the U-shaped main body comprises an extension element formed in a manner corresponding to the support element, wherein the two sections of the support element receive the extension element between them, which is arranged at one end on one section and at the other end on the other section of the support element.

15 According to this preferred embodiment of the invention, one extension element is provided. This serves for an optional extension of a U-shaped main body in the longitudinal direction of the support element. In this respect, a modular design of the U-shaped main body from two L-shaped base bodies, on the one

20 hand, and an extension element optionally to be arranged between two L-shaped base bodies, on the other hand, is achieved. This design is particularly advantageous inasmuch as it enables a constructive adjustment of a U-shaped main body to the number of AGM batteries to be accommodated by the stacking aid. Of course, not only one extension element, but optionally several extension

25 elements can be used, so that the size of the stacking aid can be adapted almost at will to the number of AMG batteries to be accommodated. According to the invention, this size adjustment in the longitudinal direction of the support elements is only possible because the flanges of the stacking aid do not have a support function. Because differently from the known prior art, no additional

30 support elements, for example in the form of intermediate and/or insertion shelves, are arranged on the flanges, which would prevent an extension of the stacking aid in the longitudinal direction of the support element, which is only possible with the invention, in order to avoid unwanted sagging.

35 An extension element is designed to correspond to a support element and therefore also provides a connecting piece per support element for connection

5 to a support element. For assembly, the connecting pieces facing each other must therefore be coupled together, for example by screwing, to connect a supporting element section and an extension element.

10 In the simplest case, an extension element has two rectangular tubes corresponding to the design of a support element. These are each connected to a connecting piece at one end and at the other end. In this way, any number of extension elements can be easily inserted between two L-shaped base bodies to form a U-shaped main body.

15 According to a further feature of the invention, a stiffening element is provided which connects the two flanges to each other or one flange to the support element. Such a connecting element ensures in particular that a flange does not twist unintentionally relative to a support element, in particular about an axis of rotation extending transversely to the longitudinal direction of the support
20 element. The stiffening element therefore does not serve to create a load-bearing capacity in the direction of gravity, i.e. in the vertical installation direction for the AGM batteries. Rather, the stiffening elements serve to protect the flanges against twisting and tilting, and this in relation to the support element.

25 According to a further feature of the invention, it is provided that one flange has an extension pointing in the direction of the other flange, which serves as a stop for a positioning aid.

30 For an accurate and precisely positioned alignment of the AGM batteries held by the stacking aid, a stop is provided for each flange, which is preferably designed as an appendix. When used as intended, this appendix serves either as a stop for one AGM battery or as a positioning aid, which in turn can serve as a simultaneous stop for a plurality of AGM batteries.

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5 In this context, the invention further proposes that a positioning aid is arranged
between two successive rows of AGM batteries in the height direction. Such a
positioning aid serves in particular to precisely align a row of batteries at the top
in the height direction with respect to the row of batteries below it. If a
positioning aid is arranged between all rows of batteries, all of the AGM
10 batteries can be precisely and safely aligned over the entire stacking aid.

Preferably, the positioning aid is a plate which is equipped with an appendix
which serves as a stop. In this case, the appendix serves as a stop for all of the
AGM batteries which when used as intended are arranged above the plate
15 which serves as a positioning aid. The positioning aid itself is held in a precise
and secure position at one end and at the other end by means of the respective
flange, which also ensures that the AGM batteries are aligned in a precise and
secure position when the positioning aid is interposed.

20 When used as intended, the positioning aid does not hold the AGM batteries
arranged above it in the height direction in the direction of gravity in the sense
of an abutment, but only serves to ensure the desired alignment and positioning
of the AGM batteries held by the stacking aid in the manner described above.

25 According to a further feature of the invention, it is provided that the stacking aid
has two U-shaped main bodies which are arranged one above the other in the
height direction, the end sections of the flanges of one main body opposite the
supporting element facing the end sections of the flanges of the other main
body opposite the supporting element, so that a circumferentially closed frame
30 element is formed.

According to this particularly preferred embodiment, a stacking aid has two U-
shaped main bodies of the type described above. In the final assembled state,
the main bodies face each other with their open sides, so that the main bodies
35 arranged one above the other in the height direction form a closed frame. When

5 used as intended, this frame surrounds the batteries held by the stacking aid as a whole.

A particular advantage of this design is that two identically shaped U-shaped main bodies are used. These are coupled together in a simple manner as
10 described above to form a frame element, whereby the result of this construction is a stacking aid which has a first support element as a base and a second support element as a quasi lid. These two support elements are coupled to each other at one end and at the other end via a common flange. In this case, the lower support element in the height direction in the intended
15 installation case serves as an actual load-bearing component that supports the AGM batteries held by the stacking aid. However, the upper support element in the vertical direction does not assume a load-bearing function in this sense. Rather, it serves to protect the AGM batteries held by the stacking aid from unwanted external influence from above, in particular from unwanted
20 mechanical influence. This support element also serves to protect the lateral flanges from twisting and tilting. As the two U-shaped base bodies are identical, simplified assembly at the installation site is guaranteed. Both U-shaped main bodies can each consist of two L-shaped base bodies. In this case, the stacking aid has a total of four L-shaped base bodies, wherein two of these base bodies
25 are first assembled to form a U-shaped main body and then two main bodies are assembled to form a frame element. The individual main bodies are preferably connected by screwing, which also facilitates disassembly in the event of dismantling.

30 According to a further feature of the invention, it is provided that the two U-shaped main bodies are arranged so as to be adjustable in height relative to one another. This adjustable arrangement advantageously allows height adjustment for the purpose of tolerance compensation. Such tolerance compensation may be necessary, for example, to allow for tolerance-related
35 differences in the size of the stacked battery housings. For the purpose of relative adjustability in the height direction, it is provided in this context in

5 accordance with a further feature of the invention that the flanges of the main
bodies arranged one above the other have accessible channels for receiving
connecting means via the respective end faces facing one another. Such
connecting means can, for example, be rods, tubes and/or similar elements, so
that telescoping is possible in the manner of a tube-in-tube system. The
10 resulting height adjustment of the two U-shaped main bodies arranged one
above the other is advantageous for two reasons. On the one hand, it enables
adaptation to the resulting height of the AGM batteries stacked on top of each
other. This ensures precise alignment of the stacking aid depending on any
tolerance-related height differences. On the other hand, the relative movability
15 in the height direction of the two U-shaped main bodies ensures that the weight
of the upper U-shaped main body in the height direction acts on the uppermost
row of AGM batteries due to gravity. Unintentional bulging of the housing of
these batteries is thus prevented, even though no other row of batteries is
arranged above this uppermost row of batteries. In contrast to the prior art, no
20 force is introduced into the side flanges via the uppermost support element.
Instead, the entire weight of the AGM batteries stacked on top of each other as
well as the weight of the upper U-shaped main body in the height direction rest
on the lower support element in the height direction of the respective main
body, following the weight force.

25 According to a further feature of the invention, it is provided that the end faces
of the flanges on the support element side and/or the support elements have
connection fittings on their flat sides facing away from the flanges, in particular
for the detachable arrangement of spacers. Such connection fittings can be
30 used in particular to equip the lower support element in the height direction of
the stacking aid with spacers serving as support feet. The end faces of the
lateral flanges facing the floor at the installation site can also be equipped
accordingly. This ensures that the stacking aid is arranged at a distance from
the floor at the installation site, which is particularly advantageous for
35 transportation reasons, as the distance from the floor at the installation site

5 makes it possible to position lifting forks below the lower support element if necessary.

According to a further feature of the invention, it is provided that the sections of a support element are screwed to the associated flange. This also simplifies
10 assembly and disassembly as described above.

According to a further feature of the invention, it is provided that a support element and/or the flanges are designed to be movable. In this context, it is particularly preferable to equip the lowermost support element arranged at the
15 bottom in the final assembled state of a system or a stacking aid, i.e. the support element forming contact with the floor at the installation site and/or the associated flanges, with a device on the floor side, so that movement of the support element and/or the flanges is permitted. This makes it possible to move the entire stacking aid or the entire system, which allows maneuvering in an
20 advantageous manner.

According to one possible embodiment, castors, wheels and/or the like are provided, via which the support element and/or the flanges are supported for displacement on the floor at the installation site. According to another
25 embodiment, a kind of track guide can be provided as an alternative. In this case, rails or grooves can be provided on the floor side into which the support element and/or the flanges engage with corresponding guide elements. This enables a rail-supported movement of the support element and/or the flanges and thus also of the stacking aid or the system.

30 According to an alternative embodiment, a base element can be provided which receives a support element and/or the flanges and which itself can be moved, preferably in a rail-guided manner. According to this embodiment, a stacking aid is not as such, but is movable with the interposition of a base element.

35 Accordingly, in this case, a movable base element is provided, which accommodates a stacking aid that cannot be moved itself or a system that

5 cannot be moved itself. The movability of the stacking aid or system is therefore a result of the movable design of the base element.

According to a further feature of the invention, it is preferable to detachably connect the support element and/or the flanges to the base element, for
10 example by screwing, in order to ensure that a stacking aid or a system is positioned securely and accurately on a base element. This enables simple assembly and disassembly.

To form a mobile system, according to a further feature of the invention, it is
15 provided to accommodate a stacking aid equipped with batteries in a container, preferably a container with standard dimensions. The container can be moved, in particular transported, in a manner known per se using aids provided for this purpose, so that changing locations for the system or stacking aid according to the invention are possible. In order to optimize the use of the storage space
20 provided by a container, one or more stacking aids or systems accommodated by the container are movably arranged within the container. This makes it possible to move stacking aids that hold batteries, particularly for maintenance purposes, so that an accessible maintenance aisle can be optionally formed between two adjacent stacking aids or systems. Other adjacent stacking aids
25 are arranged directly next to each other, wherein a maintenance aisle can also be optionally formed between these by moving a stacking aid accordingly, depending on the position of the at least one movable stacking aid. The storage space or installation space provided by a container can thus be utilized in an optimized manner. At the same time, all of the batteries are freely accessible
30 from the user's side, particularly in the event of maintenance and/or replacement.

Further features and advantages of the invention become apparent from the following description with reference to the drawings in which it is shown by

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- 5 Fig.1 a schematic perspective view of a stacking aid according to the invention;
- Fig. 2 a schematic perspective view of a U-shaped main body;
- 10 Fig. 3 a schematic perspective view of a system according to the invention with a partially loaded stacking aid;
- Fig. 4 a schematic perspective view of a system according to the invention with a fully loaded stacking aid;
- 15 Fig. 5 a schematic perspective view of a first U-shaped main body according to a second embodiment;
- Fig. 6 a schematic perspective view of a second U-shaped main body according to the second embodiment;
- 20 Fig. 7 an L-shaped base body according to the second embodiment;
- Fig. 8 a schematic perspective view of a stacking aid according to the invention in a second embodiment;
- 25 Fig. 9 a schematic perspective view of a system according to the invention comprising a partially loaded stacking aid according to the second embodiment;
- 30 Fig. 10 a schematic perspective view of a system according to the invention comprising a fully loaded stacking aid according to the second embodiment;
- 35 Fig. 11 a schematic perspective view of an extension element;

- 5 Fig. 12 a schematic perspective view of a positioning aid;
- Fig. 13 a schematic perspective view of a stacking aid according to a third
 embodiment;
- 10 Fig. 14 a schematic perspective view of a system according to the invention
 comprising a partially loaded stacking aid according to the third
 embodiment;
- Fig. 15 a schematic perspective view of a system according to the invention
15 comprising a partially loaded stacking aid according to the third
 embodiment; and
- Fig. 16 a schematic perspective view of a container equipped with a system
 according to the invention.

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Figure 1 shows a perspective view of a stacking aid 2 according to the invention which when used as intended serves to receive a plurality of AGM batteries 3, as illustrated in Figures 3 and 4, each of which showing a system 1 according to the invention.

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The stacking aid 2 according to Figure 1 has two U-shaped main bodies 6 arranged one above the other in the height direction 16, one of which is shown in a schematic perspective view in Fig. 2 in the sole position.

- 30 As the illustration in Figure 2 shows, a U-shaped main body 6 comprises a support element 7 which is disposed between two flanges 8 and 9. The support element 7 is arranged at its one end on the flange 8 and at its other end on the flange 9. In the final assembled state of the support element 7 and the flanges 8 and 9 a main body 6 with a U-shaped configuration is formed.

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5 In the illustrated embodiment, the support element 7 comprises two tubes 11 which are rectangular in cross section. These two tubes 11 are arranged spaced from each other in a direction transverse to the tube longitudinal direction 12, thus forming a gap space between them.

10 To simplify assembly, the tubes 11 of the support element 7 are each screwed to the ends of the associated flanges 8 and 9. Alternatively, a material-locking connection by welding in particular can also be provided, especially in the case of pre-assembly by the manufacturer. To form the stacking aid 2 shown in Figure 1, only two main bodies 6 need to be arranged on top of each other in

15 the height direction 16 at the installation site, as shown in Figure 2.

Further, a stiffening element 13 is provided to prevent additional stabilization of the flanges 8 and 9 against unintentional rotation to the left or right in relation to the support element 7 with respect to the drawing plane, for example as shown

20 in Figure 2. In the embodiment shown, this is designed as a simple flat material that couples the two flanges 8 and 9 together.

As can be seen by a combined view of Figures 1 and 2, the support element 7 is equipped with connection fittings 15 on its flat side facing away from the

25 respective associated flanges 8 and 9 in its height direction. These connection fittings 15 serve in particular for an exchangeable arrangement of spacers 14 serving as feet. In this case, in the assembled state of the stacking aid 2, only the lower support element 7 in the height direction 16 is equipped with corresponding spacers 14, as shown in particular in the illustration according to

30 Figure 1. The connection fittings 15 of the upper support element 7 in the height direction 16 remain unused.

The end faces of the flanges 8 and 9 also have corresponding connection fittings 15, wherein in the final assembled state, the end faces of the flanges 8

35 and 9 facing the floor at the installation site are equipped with corresponding spacers 14, as can be seen in Figure 1.

As can be seen in a combined view of Figures 3 and 4, the stacking aid 2, when used as intended, receives a plurality of AGM batteries arranged in rows 10 on top of each other in the height direction 16. In this case, each of the AGM batteries has a housing 4 with first side walls 5. Electrode plates are arranged among others in the housing 4 of each AGM battery, wherein the first side walls are aligned so as to extend in parallel. When stacked as intended, as illustrated in Figures 3 and 4, the AGM batteries are stacked horizontally, wherein the first side walls 5 of the respective housings 4 and also the support elements 7 supporting the AGM batteries are aligned horizontally. This alignment ensures that, on the one hand, the preload of the AGM separators does not cause the housing to bulge in the vertical direction 16 and, on the other hand, that there is no possible housing bulging in the vertical direction 16 even when an AGM battery is charged as intended.

The design according to the invention successfully counteracts such unwanted bulging of the housing by the AGM batteries received by the stacking aid 2 are arranged one on top of the other in the height direction 16, so that due to its own weight alone of each AGM battery 3 a compression following gravity takes place in such a way that any unwanted bulging of the housing is reliably counteracted. In this case, the invention provides that the stacking aid 2 does not have and additional support elements 7, receives the AGM batteries and is coupled to the flanges 8 or 9 in a force-transmitting manner. All of the AGM batteries therefore rest solely on the lower support element 7 in the height direction 16, following the force of gravity, as can be seen from a combined view of Figures 3 and 4 in particular. In this respect, the flanges 8 and 9 do not assume any load-bearing function and only serve to secure the batteries 3 held by the stacking aid 2 against unintentional lateral falling out, for example as a result of a vibration or against unintentional mechanical force from the outside.

A second embodiment of the stacking aid 2 according to the invention or of the system 1 according to the invention is shown in Figures 5 to 10. In this case, it

5 is provided that a U-shaped main body 6 is composed of two L-shaped base bodies 19. Such a base body 19 is shown in Figure 7.

A base body 19 provides a flange 8 or 9 as well as a section 17 or 18 of a support element 7. In the final assembled state of two L-shaped base bodies 19
10 a U-shaped main body 6 is formed, as illustrated in Figures 5 and 6.

The sections 17 or 18 of a support element 7 are arranged at one end on the associated flange 8 or 9 and carry a connecting piece 20 at the other end. In the embodiment shown, this connecting piece is formed as a flat material and
15 enables screwing for the connection of two L-shaped base bodies 19, as this can be seen in particular in the illustrations according to Figures 5 and 6.

According to the second embodiment, a triangular-shaped stiffening plate 13 is used to prevent the flanges 8 and 9 from twisting and/or tilting, which stiffening
20 plate couples a support element section 17 or 18 to the associated flange 8 or 9, as can be seen from a combined view of Figures 5 to 7.

Connection means 29 are used to arrange two U-shaped main bodies 6, as can be seen in Figure 5. According to this embodiment, the connection means 29
25 are designed as square tubes. In the final assembled state, they engage in channels 31 of the main bodies 6, which are accessible via the respective end face 30. In the final assembled state, it is thus possible to telescope two main bodies 6 arranged one above the other in the direction 16, which in particular enables tolerance compensation.

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The design of the U-shaped main bodies 6 comprising two L-shaped base bodies 19 additionally has the advantage that the U-shaped main bodies 6 can be extended in the longitudinal direction of the support elements 7. An extension element 20 is provided for this purpose, as illustrated in Figure 11.

35 This extension element 20 is designed in a manner corresponding to a support element 7 and comprises two tubes 11 which are rectangular in cross section

5 and which are each connected at one side and the other to a connecting piece 22. A connection piece 22 is formed for example as a flat material, as shown in Figure 11. For the connection of the tubes 11 by means of the connecting pieces 22, a welding connection can be provided. Alternatively, a screw connection is also possible.

10 For extending the main body 6 in the longitudinal direction of a support element 7, an extension element is to be arranged between two L-shaped base bodies 19, wherein the body-side connecting pieces 20 have to be coupled to the extension-side connecting pieces 22 by screwing, for example. Of course,
15 instead of only one extension element 20, also several extension elements 20 can be arranged between two L-shaped base bodies 19.

For a positionally correct and secure arrangement of the AGM batteries 3 in the stacking aid 2, the flanges 8 and 9 each provide appendices 28 serving as
20 stops, as illustrated for example in Figure 13. A positioning aid 23, as shown in Figure 12, is in contact with these extensions when used as intended. With reference to the drawing plane according to Figure 13, the positioning aid 23 abuts on the left-hand side against the extension 28 provided by the flange 8 on the one hand and on the other hand against the extension 28 provided by the
25 flange 9 on the other hand.

As can be seen from the illustration in Figure 12, the positioning aid 23 is designed in the form of a plate 24. At its rear edge, with reference to the plane of the drawing according to Figure 12, this plate has an extension 27 serving as
30 a stop. In the final assembled state, the AGM batteries 3 held by a positioning aid 23 come to abut against this extension 27, as can be seen from the illustration according to Figure 14, for example.

The positioning aid 23 also has spacers 26 for spacing the AGM batteries 3
35 held by a positioning aid 23. In addition, the positioning aid 23 is equipped with

5 slots 25, which allows air to circulate between adjacent AGM batteries 3 for cooling purposes when used as intended.

Wall mountings 21 can also be provided for wall mounting of the stacking aid 2 according to the invention, as can be seen for example in the illustration
10 according to Figure 9.

Figures 13 to 15 show a third embodiment. According to this embodiment, the stacking aid 2 is designed as a double-row stacking aid 2, i.e., it is used to hold two rows of AGM batteries 3 in the depth direction of the stacking aid 2, as can
15 be seen in particular from a combined view of Figures 14 and 15.

To accommodate a double row 10 of AGM batteries 3 according to this embodiment, it is provided that a support element 7 has not two but three tubes 11 of rectangular cross-section, as can be seen in particular from the illustration
20 in Figure 13.

Figure 16 shows a particularly preferred embodiment. A container 32 is then provided, preferably a container 32 with standard dimensions, for example a conventional overseas container. This provides a storage space 42 in a manner
25 known per se, which is accessible in a manner known per se via a loading opening provided for this purpose. This loading opening can be closed and locked by means of a door, wherein a door with two door wings 33 and 34 is shown in the embodiment shown.

30 In the embodiment shown, the storage space 42 accommodates four stacking aids 2 designed according to the invention, each of which is equipped with a plurality of AGM batteries 3. Consequently, four rows of eight AGM batteries 3 are provided, namely rows 35, 36, 37 and 38.

5 In the embodiment shown, the stacking aids 2 are arranged on base elements 39 or 40. Alternatively, the stacking aids 2 can also be accommodated in the container 32 without base elements 39 or 40.

10 In the embodiment shown, the two base elements 39 of the battery rows 35 and 38 are arranged in a fixed position in the container 32. However, the base element 40 supporting the two stacking aids 2 of the rows 36 and 37 is arranged to be movable in the container 32, namely movable to the left and right with reference to the drawing plane shown in Figure 16.

15 As can be seen from the position of the base element 40 shown in Figure 16, the base element 40 is moved to the right with respect to the drawing plane according to Figure 16, so that the two stacking aids 2 of the rows 37 and 38 are directly adjacent to one another. In this position of the base element 40, a gap 43 is formed between the two stacking aids 2 of rows 35 and 36. This gap
20 43 serves as a maintenance aisle that can be used by the user, so that access to the AGM batteries 3 of rows 35 and 36 is permitted. As soon as the base element 40 is moved to the left with reference to the drawing plane according to Figure 16, the gap space 43 closes and a gap space opens between the stacking aids 2 of the rows 37 and 38. In this position of the base element 40,
25 maintenance of the AGM batteries 3 of the stacking aids 2 of the rows 37 and 38 is then permitted.

The movable design of the base element 40 enables optimized use of the storage space 42 provided by the container 32, and this with simultaneous
30 accessibility of individual AGM batteries 3, in particular for maintenance and/or repair purposes.

According to an alternative embodiment, it is of course also possible to design not only the base element 40, but also the base elements 39 supporting the two
35 stacking aids 2 of the rows 35 and 38 to be movable.

5 In the embodiment shown, the base element 40 is designed to be rail-guided and movable. For this purpose, the base of the container 32 has grooves 41 in which correspondingly designed rollers, sliding blocks and/or other moving devices of the base element 40 engage. Instead of grooves 41, rail bodies can also be provided, on which the base element 40 is arranged to be movable.

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As an alternative to the embodiment shown, it is also possible that the support elements 7 of the stacking aids 2, which are arranged in the vertical direction towards the bottom, are each designed to be movable themselves. In this case, base elements 39 or 40 can be advantageously dispensed with. In this case, 15 each support element 7 arranged towards the bottom in the vertical direction has rollers, wheels, sliding blocks and/or similar moving devices, which interact with rails and/or grooves on the container side in the final assembled state.

The container 32 itself can be transported and moved using aids known per se, 20 thus creating an overall mobile device. This enables a simplified change of location, so that the total battery capacity provided can be moved from location to location in a simplified manner.

5 Reference signs

1	system	23	positioning aid
2	stacking aid	24	plate
3	AGM battery	25	slot
4	housing	26	spacer
5	first side wall	27	appendix
6	main body	28	appendix
7	support element	29	connection means
8	flange	30	end face
9	flange	31	end face
10	row	32	container
11	tube	33	door wing
12	longitudinal direction of tube	34	door wing
13	stiffening element	35	row
14	spacer	36	row
15	connection fitting	27	row
16	height direction	38	row
17	section	39	base element
18	section	40	base element
19	base body	41	groove
20	connecting piece	42	storage space
21	wall mounting	43	gap space
22	extension element		

What is claimed is:

1. System consisting of a stacking aid (2) and a plurality of AGM batteries (3)
10 arranged in the stacking aid (2), wherein an AGM battery (3) has a housing (4)
comprising first side walls (5) and has electrode plates arranged in the housing
(4), wherein the first side walls (5) and the electrode plates are aligned so as to
extend in parallel, wherein the stacking aid (2) has a U-shaped main body (6)
which as a support element (7) and two flanges (8, 9) aligned orthogonally
15 thereto, wherein the flanges (8, 9) receive the support element (7) between them,
which support element is arranged at one end on one flange (8) and at the other
end on the other flange (9), wherein the support element (7) receives a plurality
of AGM batteries (3) arranged one above the other in rows (10), wherein both the
support element (7) and the first side walls (5) of the housings (4) of the AGM
20 batteries (3) are aligned so as to extend horizontally, and wherein the stacking
aid (2) is formed so as to be free of further support elements (7) which are
arranged on the flanges (8, 9) and receive AGM batteries (3).
2. Stacking aid for receiving AGM batteries (3), the stacking aid comprising a U-
25 shaped main body (6) which has a support element (7) and two flanges (8, 9)
aligned orthogonally thereto, wherein the support element (7) is configured to
receive a plurality of rows (10) of AGM batteries (3) arranged one above the
other, wherein the flanges (8, 9) receive the support element (7) between them,
which support element is arranged at one end on one flange (8) and at the other
30 end on the other flange (9), and wherein the stacking aid (2) is formed so as to
be free of further support elements (7) which are arranged on the flanges (8, 9)
and receive AGM batteries (3).
3. System according to claim 1 or stacking aid according to claim 2, characterized in
35 that the support element (7) comprises two tubes (11) rectangular in cross
section which are aligned so as to extend in parallel and are arranged spaced
from each other in a direction transverse to the pipe longitudinal direction (12).

- 5 4. System or stacking aid according to any one of the preceding claims,
characterized in that the U-shaped main body (6) is composed of the L-shaped
base bodies (19), wherein the base body (19) includes a section (17, 19) of the
support element (7) and a flange (8, 9) aligned orthogonally thereto, wherein the
10 section (17, 18) of the support element (7) is arranged at one end on the flange
(8, 9).
- 15 5. System or stacking aid according to claim 4, characterized in that the section (17,
18) of the support element (7) is arranged at the other end on a connecting piece
(20).
- 20 6. System or stacking aid according to claim 4 or 5, characterized in that the U-
shaped main body (6) has an extension element (20) formed in a manner
corresponding to the support element (7), wherein the two sections (17, 18) of
the support element (7) receive the extension element (20) between them, which
extension element is arranged at one end on one section (17) and at the other
end on the other section (18) of the support element (7).
- 25 7. System or stacking aid according to any one of the preceding claims,
characterized in that a stiffening element (13) is provided which connects the two
flanges (8, 9) to each other or one flange (8, 9) to the support element (7).
- 30 8. System or stacking aid according to any one of the preceding claims,
characterized in that one flange (8, 9) has an appendix (28) pointing in the
direction of the other flange (8, 9), which appendix serves as a stop for a
positioning aid (23).
- 35 9. System or stacking aid according to any one of the preceding claims,
characterized in that a positioning aid (23) is arranged between two rows (10) of
AGM batteries (3) succeeding each other in the height direction (16).
10. System or stacking aid according to claim 9, characterized in that the positioning
aid (23) is a plate (24) equipped with an appendix (27) serving as a stop.

- 5 11. System or stacking aid according to any one of the preceding claims,
characterized in that the stacking aid (2) has two U-shaped main bodies (6)
which are arranged one above the other in the height direction (16), wherein the
end sections of the flanges (8, 9) of one main body (6) opposite the support
element (7) face the end sections of the flanges (8, 9) of the other main body (6)
10 opposite the support element (7), so that a circumferentially closed frame
element is formed.
12. System or stacking aid according to any one of the preceding claims,
characterized in that the two U-shaped main bodies (6) are arranged adjustable
15 to each other in the height direction (16).
13. System or stacking aid according to claim 12, characterized in that the flanges (8,
9) of the main bodies (6) arranged one above the other have channels (31) for
receiving connecting means (29) which are accessible via the respective mutually
20 facing end faces (30).
14. System or stacking aid according to any one of the preceding claims,
characterized in that end faces of the flanges (8, 9) on the supporting element
side and/or the supporting elements (7) have connection fittings (15) on their flat
25 side facing away from the flanges (8, 9) for the detachable arrangement of
spacers (14).
15. System or stacking aid according to any one of the preceding claims,
characterized in that a support element (7) and/or the flanges (8, 9) are designed
30 to be movable.
16. System or stacking aid according to any one of the preceding claims,
characterized by a base element (40) which is designed to be movable and which
receives a support element (7) and/or the flanges (8, 9).
35
17. System or stacking aid according to claim 16, characterized in that the support
element (7) and/or the flanges (8, 9) are detachably connected to the base
element (40).

- 5 18. System or stacking aid according to any one of the preceding claims 15 to 17, characterized in that the support element (7), the flanges (8, 9) and/or the base element (40) are movable in a rail-guided manner.