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(54) Title: BATTERY HOLDER

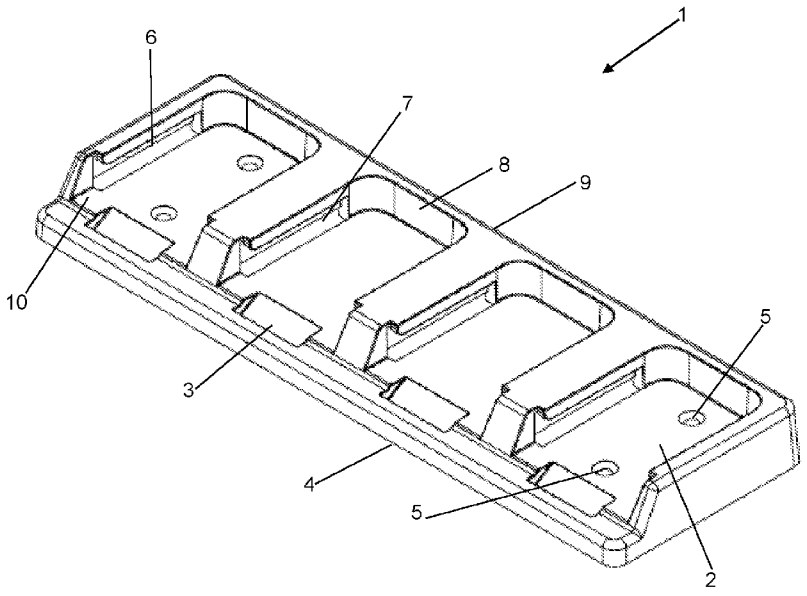

FIGURE 1

(57) Abstract: The present invention relates to a battery holder including at least one compartment for receiving a battery, the compartment including a first side wall, second side wall, rear wall, base and a locking portion to secure the battery.

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BATTERY HOLDER

FIELD OF THE INVENTION

The present invention relates to a hand-held power tool battery holder.

BACKGROUND TO THE INVENTION

There is an ever increasing prevalence of battery powered hand tools, such as for example drills, grinders and sanders. Initially battery powered tools lacked power and were only suitable for small home handyman jobs. However, such tools are no longer so limited, and provide sufficient power to meet the needs of professionals.

Battery powered hand tools would now be the favoured option for tradespeople. The use of battery powered devices on work sites provides greater flexibility and efficiencies for the tradesperson. No longer is it necessary to work with long power cords that both require a power source and present a safety hazard.

While the power of battery powered hand tools is sufficient to meet the needs of the professional tradesperson, the battery life is not unlimited. There is a limited time that the tool can be operated before the battery needs recharging.

As a result the tradesperson will normally have multiple batteries suitable for use on the same tool. In fact, the same battery could be suitable for a number of tools. Tool manufacturers recognised that a tradesperson would often need multiple different tools but could only use one tool at a time. The manufacturers therefore designed their various tools with interchangeable batteries. In this way, a tradesperson could first use a circular saw for example, and then when the tradesperson was finished with the circular saw and needed a drill, the battery could be removed from the circular saw and attached to the drill.

Initially this offered some flexibility. But it also encouraged tradespeople to keep multiple battery packs. On site when one battery pack became exhausted the tradesperson would simply swap the battery pack for another that was fully charged. In some cases the exhausted battery pack would be recharged on site. In other cases the tradesperson would recharge the battery overnight.

The difficulty or limitation with owning multiple battery packs is the need to store them. It is not practical to store a large number of batteries on individual tools, as a tradesperson may only use a small number of tools in a given period, while still needing to rotate through a large number of batteries. Likewise, storing batteries in a battery charger is not convenient as some battery chargers typically only charge or hold one battery at a time and charging stations designed for multiple batteries can be expensive, bulky and difficult to transport.

In some cases, the result is multiple batteries are simply left on work benches or in tool bags. This increases the risk of damage to the battery pack, which could reduce the performance and/or life of the battery.

An alternative is needed that enables the tradesperson to have sufficient battery power without the same risk of damage or loss of batteries that currently exists.

SUMMARY OF THE INVENTION

In a broad form, there is provided a battery holder that holds at least one power tool battery.

In a first aspect, there is provided a battery holder including at least one compartment for receiving a battery, said compartment including a first side wall, second side wall, rear wall, base and a locking portion to secure said battery,

Preferably, at least one of the first side wall or the second side wall includes a lip to engage the battery. This lip can also assist with sliding the battery into position.

The locking portion may be located opposite the rear wall in the base of the compartment. Alternatively, the locking portion may be located in at least one of the first side wall or the second side wall. In this case the lip of the side wall(s) may also comprise the locking portion.

The location of the locking portion reflects the brand of battery that is to be housed.

In alternative terms the at least one compartment is a female component moulded to complement a male component of the battery to be stored.

BRIEF DESCRIPTION OF THE DRAWINGS

An illustrative embodiment of the present invention will now be described with reference to the accompanying figures. Further features and advantages of the invention will also become apparent from the accompanying description.

Figure 1 shows a battery holder in accordance with one embodiment of the present invention.

Figure 2 shows alternate views of the battery holder of Fig 1.

Figure 3 shows alternative embodiments of a battery holder.

Figure 4 shows example embodiments.

DETAILED DESCRIPTION

The following description is presented to enable any person skilled in the art to make and use the invention, and is provided in the context of a particular application and its requirements. Various modifications to the disclosed embodiments will be readily apparent to those skilled in the art, and the general principles defined herein may be applied to other embodiments and applications without departing from the spirit and scope of the present invention. Thus, the present invention is not intended to be limited to the embodiments shown, but is to be accorded the widest scope consistent with the principles and features disclosed herein.

The present invention provides a battery holder that is able to hold multiple battery packs at one time. Ideally, the holder will be configured to suit a particular brand of battery pack so as to best ensure safe storage of the battery packs.

Referring to Fig 1, there is shown an example of one such battery holder. The holder of Fig 1 has been designed to specifically accommodate Makita branded battery packs. It can be seen that the holder of Fig 1 is suitable for storing four battery packs. It will be appreciated that alternative embodiments may store less or more battery packs as required. For example, an alternative embodiment may store six battery packs.

The battery holder 1 includes a plurality of battery compartments 2. Each battery compartment 2 includes a recess to receive a battery. Preferably the recess is designed to accommodate a particular branded battery.

Each compartment 2, includes two enclosed side walls 7, and a rear wall 8. Preferably the height of the side walls 7 and rear walls 8, is around 14 mm (for a Makita model) to guide the battery into place. An open side 10 is provided for the battery to enter the holder 1. To further assist guidance of the battery into position, and to also assist in retaining the battery in position, a lip 6 may be included along a portion of a, or each, side wall 7. Conveniently, the open side 10 of each compartment 2 will be on the front edge 4 of the holder 1.

Each compartment 2 should include a locking portion 3 or mechanism. This locking portion 3 should be compatible with the particular battery to be stored. For example, compartments configured to receive Makita branded batteries ideally have a recessed locking portion 35mm by 14mm by 5mm. Again for Makita branded batteries the locking portion is located along or about the open side 10 of the compartment 2.

In the preferred arrangement, the holder 1 is around 318mm in length, with a spacing of around 24mm between side walls 7 of adjacent compartments 2. The height of the holder 1 may be around 104mm. This provides sufficient space for each compartment 2 to be housed, without excessive need of material needed to create a larger body. It will be appreciated however, that some applications may include extra space between the rear wall 8 of each compartment 2 and the top edge 9 of the holder 1. This may be the case if for example a brand name or other information is desired to be included on the face of the holder 1.

The length of preferred arrangements of the holder is between 318mm and 331.5mm. The height ranges between 22.5 to 27 mm, and the width between 90mm to 104 mm.

In the case of a compartment suitable for a Makita branded battery, the preferred dimension would be around 56 mm by 71 mm by 14 mm.

The preferred embodiment also includes screw holes 5, to facilitate mounting of the holder 1. Preferably, the screw holes 5 are countersunk so as to allow a screw head to sit flush, or below, the surface of the holder 1, and thereby reduce the risk of damage to a battery during insertion into the holder. For example, the screw hole may be:

- Countersink width for the head diameter 10mm
- Countersink depth for the head height 2.5mm

- Hole width for the screw diameter 5.5mm

The reverse side (not shown) of the holder 1 may include ribbing designed to provide strength and successful injection moulding without distortion.

With reference to Fig 4a, one arrangement suitable for Makita branded batteries can be seen, in which the preferred dimensions are:

A. locking mechanism size 15mm x 34mm x 5.5mm with a 20 degree angle
B. Rear Screw Mounting holes Size 5.5mm Counter sunk section 10mm fits screws gauge 8 and 10. distance from back 23mm
C. Front screw mounting holes size 5.5mm counter sunk section 10mm fits screws gauge 8 and 10. Distance from front 34mm
D. Side wall height 27mm length 104mm with a 61 degree angle
E. Front lower section Length 14mm Height 8mm
F. Distance between compartments 24mm
G. Battery locking section Width 56mm Length 81mm height 15mm
H. Overall length 318mm
I. Internal Radius 8.125
J. external Radius 5.260

In an alternative arrangement, with reference to Fig 4b, a holder suitable for a Bosch branded battery can be seen, in which the preferred dimensions are:

K. locking mechanism Size 23.5mm x 13mm x 4mm
L. Rear Screw Mounting holes Size 5.5mm Counter sunk section 10mm fits screws gauge 8 and 10. distance from back 24mm
M. Front screw mounting holes size 5.5mm Counter sunk section 10mm fits screws gauge 8 and 10. Distance from front 46mm
N. Side wall height 22.5mm length 100mm
O. Front lower section Length 320mm Height 10mm
P. Distance between batteries 28mm
Q. Battery locking section Width 52mm Length 68mm height 10mm
R. Over all length 320mm

More specifically, for a Bosch branded battery, the dimensions of a battery holder capable of holding four batteries could be:

Length	320mm
Width	100mm
Height	22.5mm
Distance between holes (Vertically)	30mm
Distance between holes (horizontally)	237.7mm
Space between batteries	28mm
Thickness of top walls	2mm
Thickness of support ribs	1.5mm
Size of holes	5.5mm
Size of counter sunk section of holes	10mm
Screw sizes that fit holes	8 and 10 gauge
Color	Blue
Height with 3.0AH battery inserted	67mm
Distance from rear hole to the back	24mm
Distance of front hole to the front	46mm
Distance from outside battery to the outside of the holder	15mm
Height of support ribs	14mm
Number of screws Holes	4
Width of locking section	13mm
Length of locking section	23.5mm
Depth of locking section	4mm
Height of front lower section	10mm
With of front lower section to bottom of tapered angle	15mm
Width of battery locking section	52mm
Length of battery locking section	68mm

The battery holders can be made as a single unit through injection moulding. This provides a single piece without moving or removable parts. A single part has the advantage that components will not be lost over time. Further, the lack of

moving parts should improve the life of the product by reducing the risk of breakage. That is, moving parts can be more susceptible to breakage.

In some arrangements, moving parts may be included. For example, an extra locking mechanism may be included to further restrain the batter pack in position. This may be desired if the holder is mounted on a moving vehicle that traverses very rough terrain. However, it is expected that in most cases the locking portion will be sufficient.

Currently the Applicants prefer to make the holders from ABS (Acrylonitrile Butadiene Styrene) plastic. This is because it is light in weight whilst being strong and heat resistant. Alternative material could include polypropylene, nylon, polycarbonate and polystyrene or glass-filled varieties.

The Applicants believe that a linear arrangement – as seen in Fig 1 – is preferred. This will provide a line of batteries that could be mounted in various locations. An alternative arrangement however could be to arrange the batteries in a grid pattern, for example two by two. This would form a substantially square holder as opposed to the substantially rectangular holder of Fig 1. In some cases the grid arrangement may be preferred due to the location the holder will be kept.

It is expected that in most applications the holder will be configured such that each of the batteries is aligned the same way. In the case of Fig 1, the locking mechanism is located along the front edge. However, other embodiments may have the battery compartments aligned in opposite directions. This may be suitable for example if the holder is to be mounted in the middle of a workbench that is accessed from both sides.

Most, if not all, power tool batteries are different in size, shape and connection mechanism. To accommodate this, respective embodiments of the present invention should be configured to accommodate each of the various manufacturer's battery (for example Makita, Milwaukee, Dewalt, Bosch and AEG)

The battery holder 1 of the present invention is designed to enable a tradesperson to store a plurality of batteries from the same manufacturer at the same time. Some embodiments may elect to store batteries from different manufacturers. This may for example be suitable in a teaching or training environment in which students may bring their own batteries. However, it is

expected that in the majority of cases it will be desired that the holder be suitable for a single brand/design of battery.

Each battery holder is designed to leverage the batteries' locking mechanism, meaning that they can be mounted in any direction and the batteries should not fall out.

The battery holder could be mounted to any flat surface such as trade trailers, vans, sheds, garages, tool shops, farms and trade schools. The holder could be mounted by any suitable means, such as for example, with screws. Alternatively, in some arrangements adhesive pads (or simply adhesive) could be used to join the holder to a surface.

The battery holder of the present invention provides for the easy storage of multiple batteries. The holder improves organisation and saves time, and protects valuable assets from loss or damage.

Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, the appearance of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment.

Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more combinations. It will be appreciated that persons skilled in the art could implement the present invention in different ways to the one described above, and variations may be produced without departing from its spirit and scope.

Any discussion of documents, devices, acts or knowledge in this specification is included to explain the context of the invention. It should not be taken as an admission that any of the material forms part of the prior art base or the common general knowledge in the relevant art, in any country, on or before the filing date of the patent application to which the present specification pertains.

CLAIMS:

1. A battery holder including at least one compartment for receiving a battery, said compartment including a first side wall, second side wall, rear wall, base and a locking portion to secure said battery,

2. A holder as claimed in claim 1, wherein at least one of said first side wall or said second side wall includes a lip to engage said battery

3. A holder as claimed in claim 2, wherein said locking portion is located opposite said rear wall in said base of said compartment.

4. A holder as claimed in claim 2, wherein said locking portion is located in at least one of said first side wall or said second side wall.

5. A holder as claimed in any preceding claim wherein said at least one compartment is a female component moulded to complement a male component of said battery.

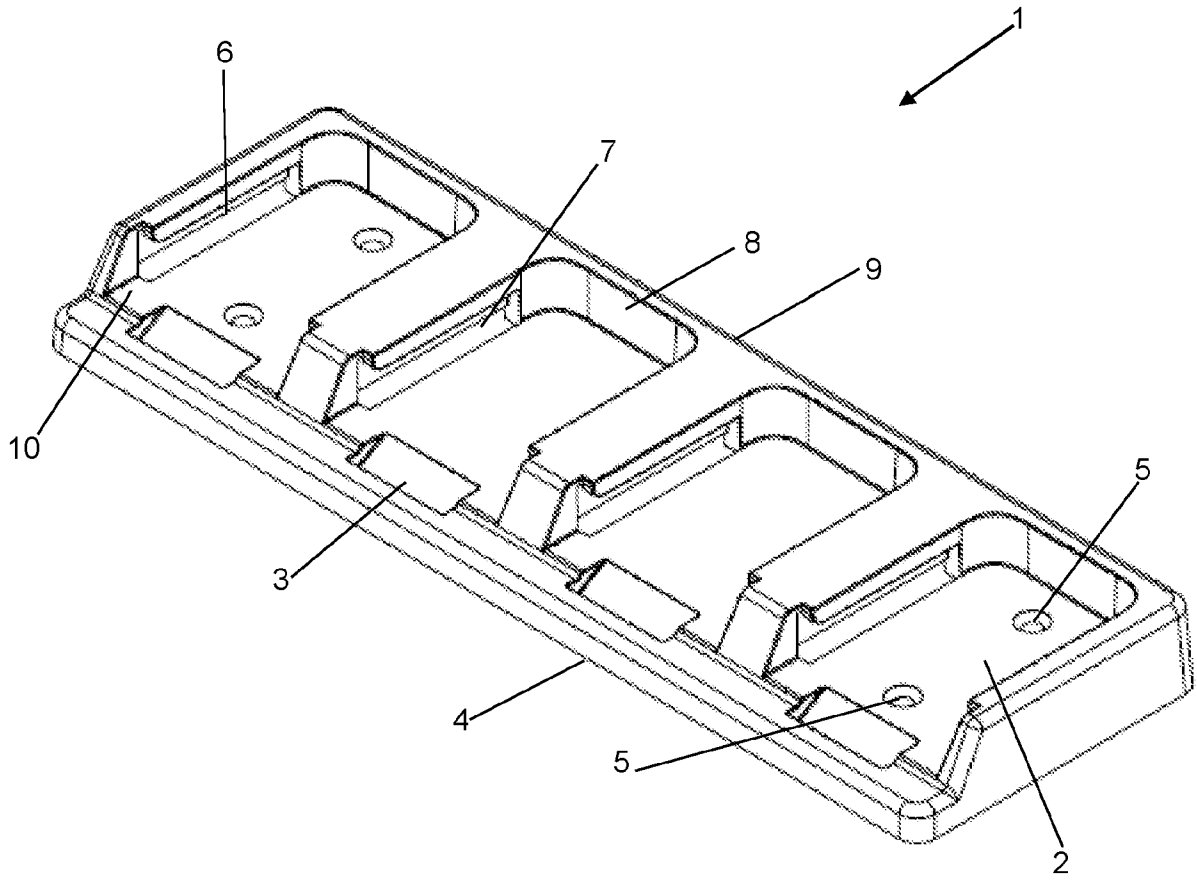

FIGURE 1

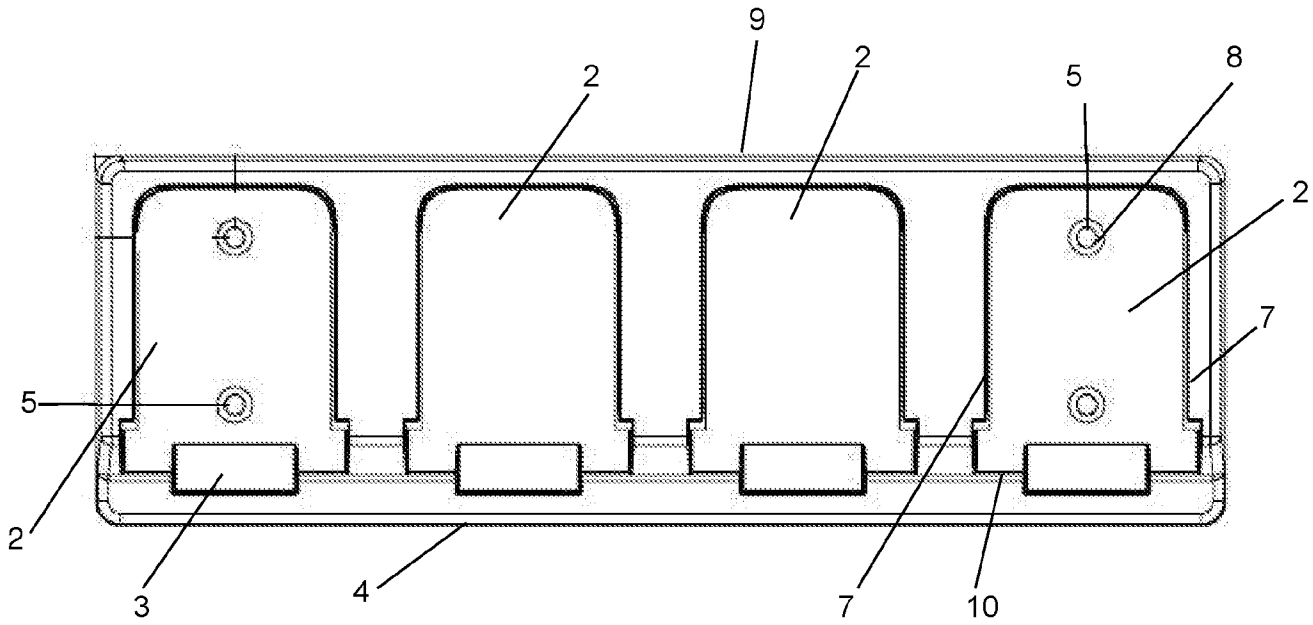

FIGURE 2a

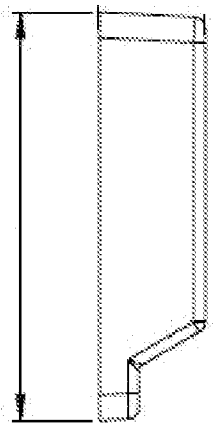

FIGURE 2b

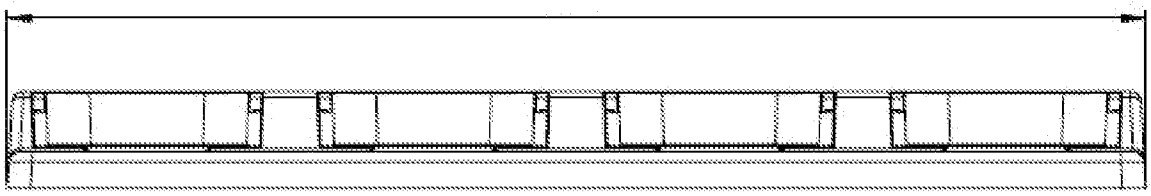

FIGURE 2c

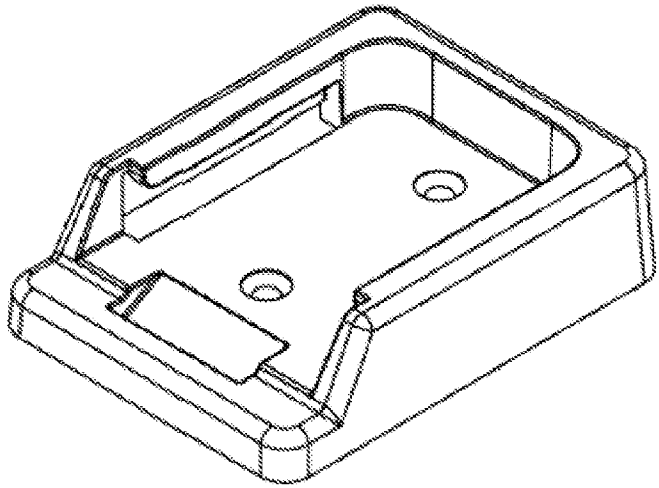

FIGURE 3a

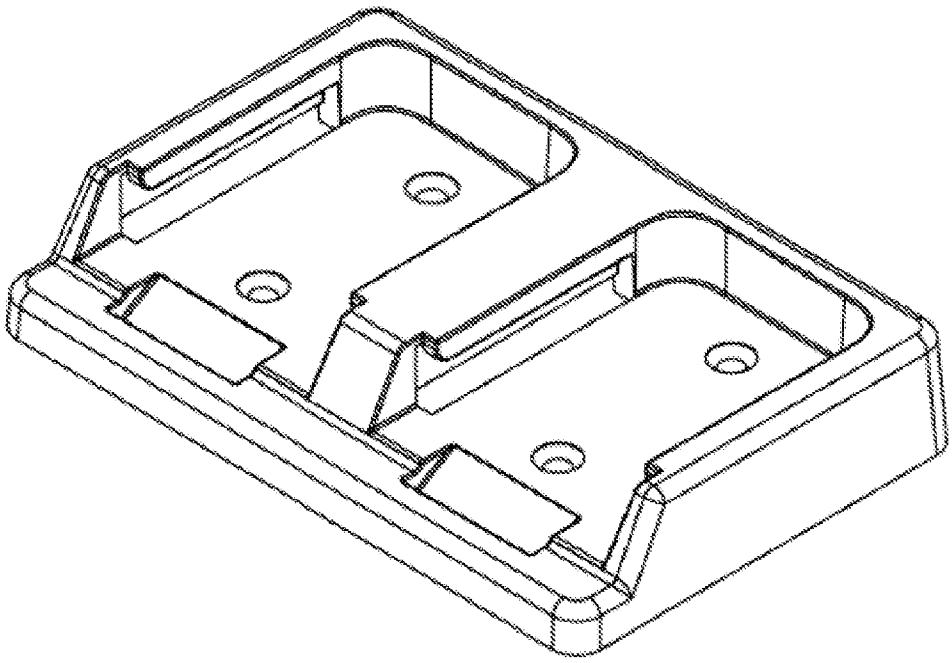

FIGURE 3b

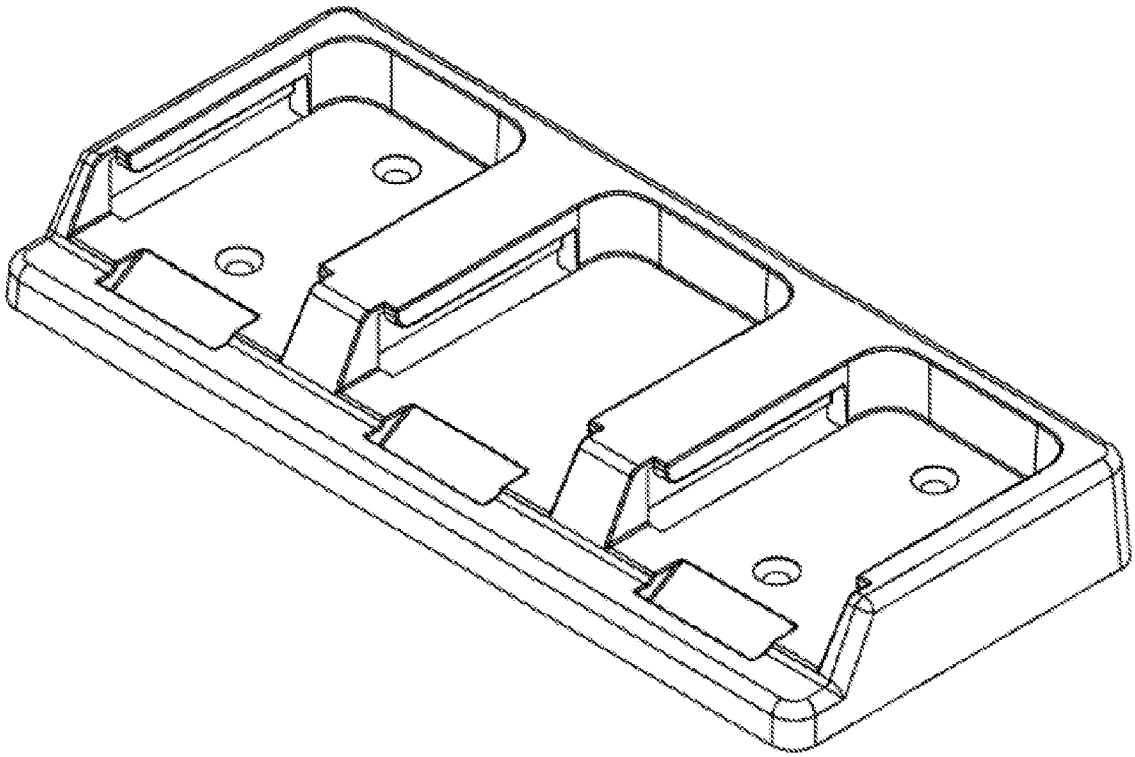

FIGURE 3c

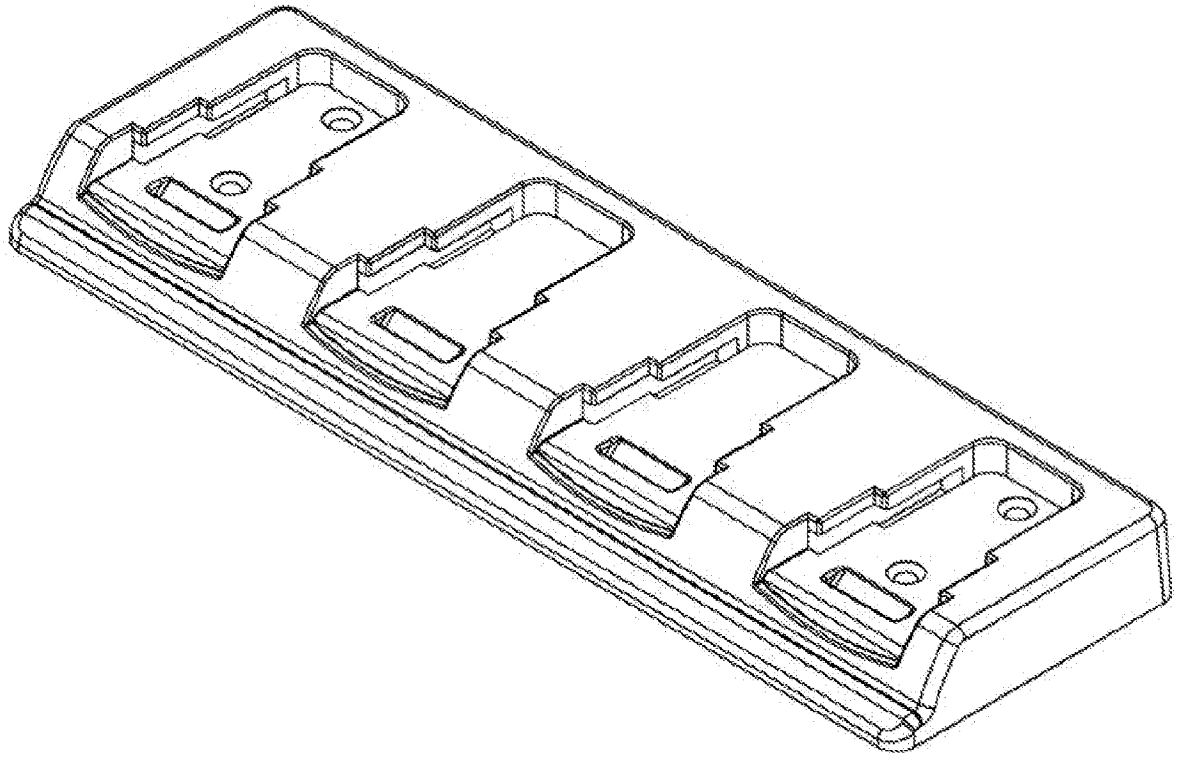

FIGURE 3d

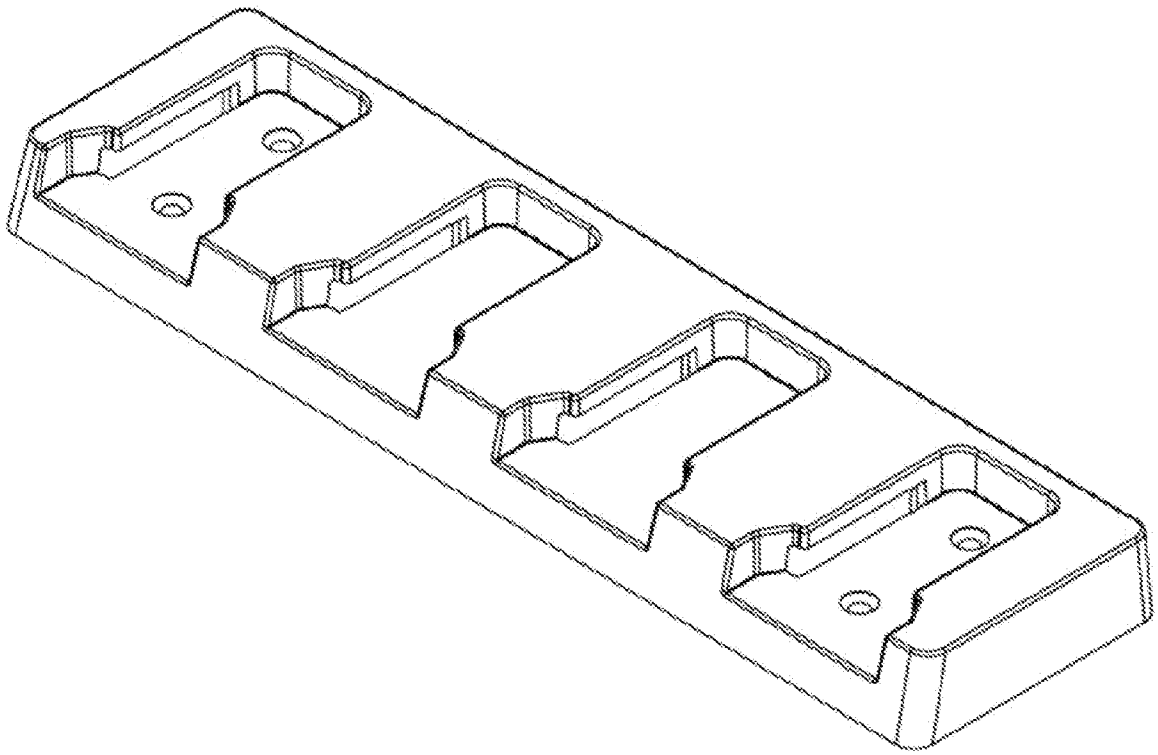

FIGURE 3e

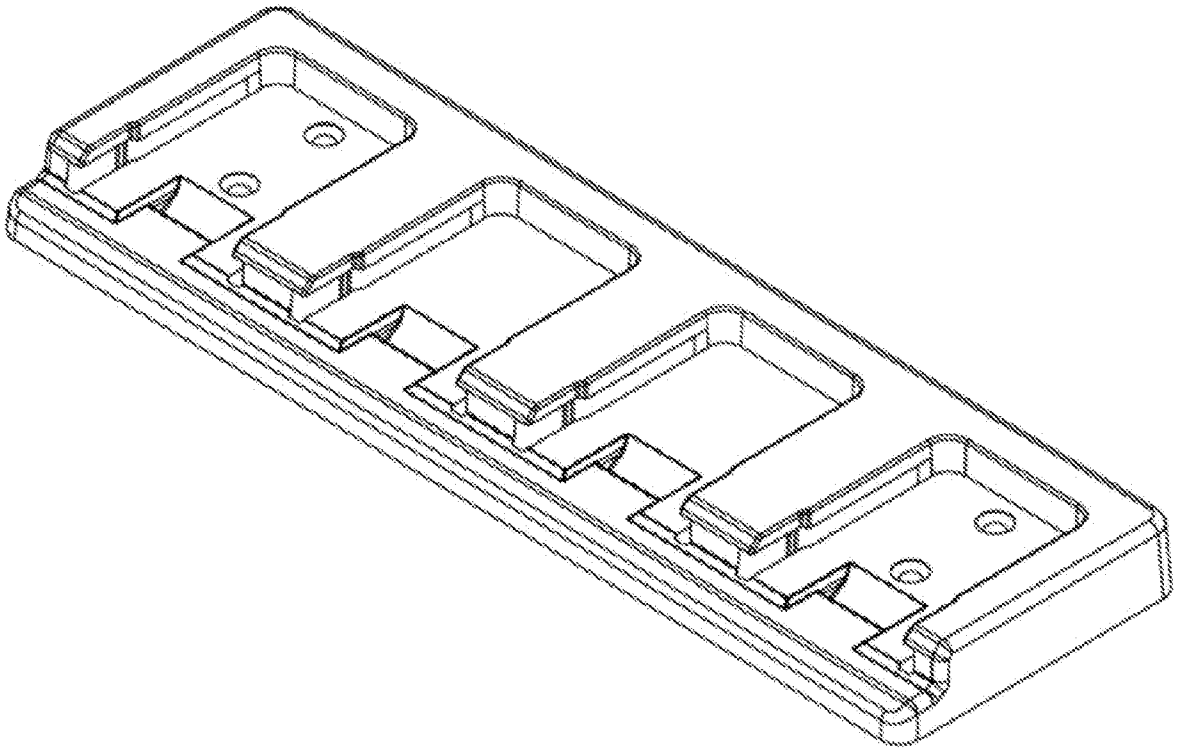

FIGURE 3f

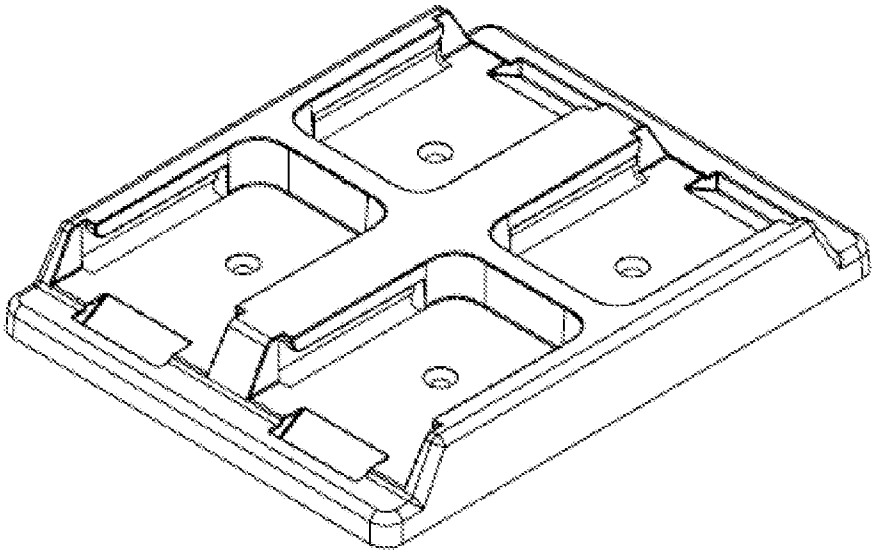

FIGURE 3g

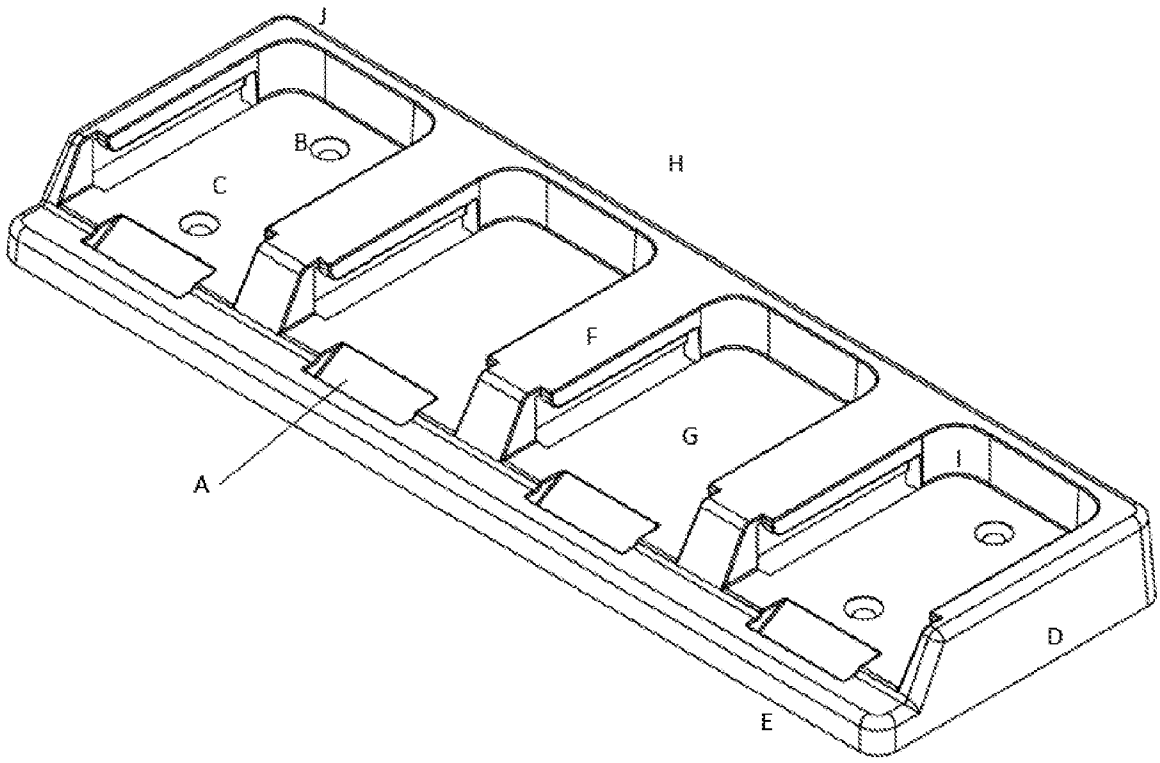

FIGURE 4a

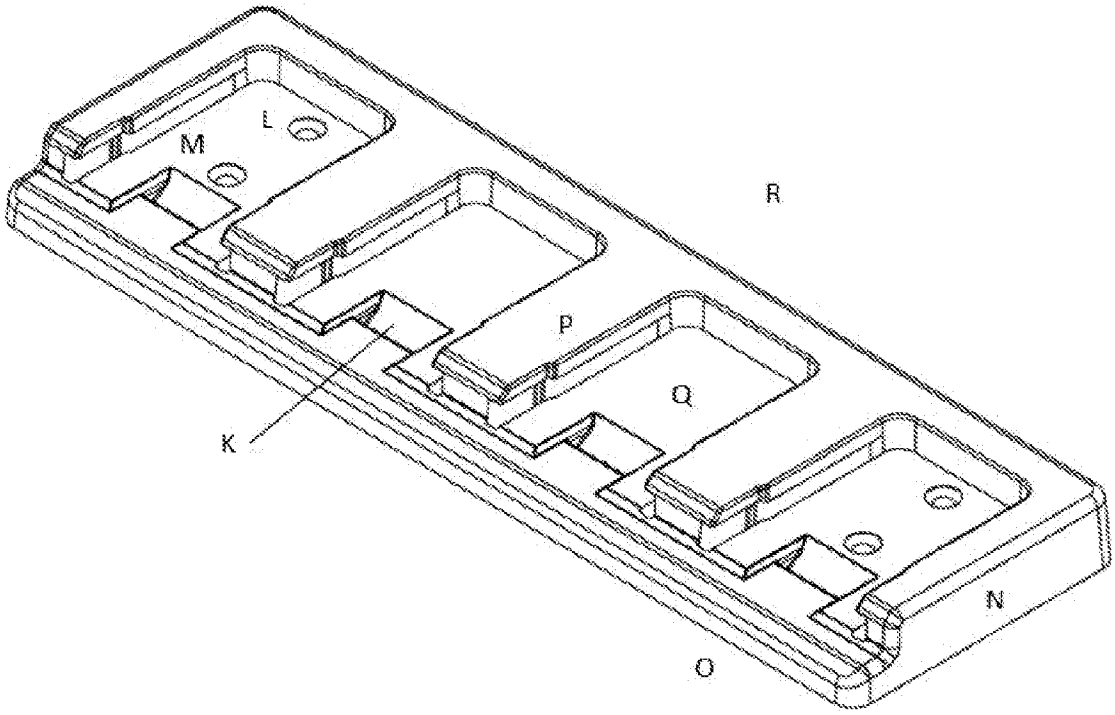

FIGURE 4b

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2019/050887

A. CLASSIFICATION OF SUBJECT MATTER

H01M 2/10 (2006.01) B25F 5/02 (2006.01)

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)

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)

PATENW: /IC/C (H01M2/1022, H01M2/1077, H01M/LOW, H01M2220/30, B25F5/029, B25B21/LOW) & Keywords (lock, secure, power, portable, tool, machine, lip, flange, mould and similar terms).

Google Patents, Espacenet: Keywords (battery holder, power tool, compartment, lock and similar terms).

Applicant(s)/Inventor(s) search conducted on Espacenet, AusPat and all internal databases provided by IP Australia.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C

[X] 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

"D" document cited by the applicant in the international application

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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 November 2019	25 November 2019

Name and mailing address of the ISA/AU	**Authorised officer**
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INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/AU2019/050887**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2017/0070067 A1 (MAKITA CORPORATION) 09 March 2017 abstract; figure 1; para [0073]-[0088]; claims 1-63	1-5
X	JP 2017182914 A (MITSUBISHI MOTORS CORP) 05 October 2017 abstract; English translation of D2 retrieved from Google Patents; figures 1-8	1-5

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2019/050887**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
US 2017/0070067 A1	09 March 2017	US 2017070067 A1	09 Mar 2017
		US 10476284 B2	12 Nov 2019
		US 2015015205 A1	15 Jan 2015
		US 9525293 B2	20 Dec 2016
		US 2014361740 A1	11 Dec 2014
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		WO 2013099228 A2	04 Jul 2013
		WO 2013099229 A2	04 Jul 2013
JP 2017182914 A	05 October 2017	JP 2017182914 A	05 Oct 2017

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.