

DESCRIPTION**HOUSING FOR A DEVICE** ✓

The invention relates to a housing for a device in accordance with the introductory section of claim 1.

Chassis for electronic devices, measuring instruments and other precision equipment are known as such. They house the components of the equipment in question, that are fitted on such a chassis. Depending on the nature of the equipment involved, these components are printed circuit boards, storage disks, ventilators, loudspeakers, cooling units, pumps, gear units etc. The purpose of the chassis is to hold the individual components in a specific fixed position inside the device by mechanical means. Such a chassis generally consists of a frame with a number of partitions in which the components are fitted. The frame itself is attached to an external housing of the device concerned.

The use of parts made from rigid plastic for a chassis has also been disclosed. As is the case with metal chassis, it is complicated and time-consuming to produce such a chassis, because attachment elements such as screws, rivets, tapes and other securing elements are required. Electromagnetic shielding facilities also have to be provided, in which plastic parts are covered with the conductive material and / or in which metal plates or foil are attached to the chassis. Chassis of this kind have too complicated a mechanical structure and it is too expensive to assemble them as well as to fit components.

In order to eliminate these disadvantages, the German utility model 9116755.8 describes a chassis for a device, such as a computer or an electronic measuring instrument, that holds a number of components which form the device - for example printed circuit boards, storage disks, ventilators etc. - and is formed by a support unit made of plastic that is shaped to match the outer shapes of the components, with the components being held in the support unit essentially by positive locking without attachment elements being required and being enclosed by the support unit when they have been fitted in it. The chassis is provided with a support unit that consists of a lower part into which the components can be fitted when the chassis has been assembled and an upper part that fits exactly onto the lower part with the components that have been fitted into it. The upper part and the lower part are hinged to each other along one edge so that the upper part can be swivelled upwards to permit access to the components fitted in the lower part. The support unit has ventilation ducts that are moulded into the plastic, while a ventilator is located in one ventilation duct in such a way that the flow of air produced by the ventilator is directed over components that need to be cooled. The chassis can also be configured in such a way that there are recesses at different levels, with one level being located above the other, so that components can be located above each other. The chassis is made from a plastic that has a density of approximately 60 to 80 grams / litre. It has proved to be very advantageous to choose expanded polypropylene as the plastic for this purpose. Polypropylene is a lightweight material, is easy to mould into different shapes, absorbs impact, is elastic, has inherent resilient properties, is deformable and compliant as well, although it is very dimensionally stable all the same. Polypropylene is also resistant to

temperature fluctuations and chemicals. It can be recycled completely and is therefore very advantageous from the environmental point of view. Similar materials, such as polyurethane and polyethylene as well as similar plastics, can, however, be used for the chassis as well. The above-mentioned chassis does, however, always need a complete housing made of metal or of a metallised plastic of the device housed in each individual case. It has proved to be advantageous here if the chassis is enclosed by a metal housing that is open at its front and back ends, so that the chassis can be inserted into the housing through one of these openings. A front and back shielding plate - produced typically from metal - cover the front and back surfaces of such a chassis.

The object of the invention is to create a housing for a device that consists of a chassis for holding components which is made from recyclable plastic with recesses for components which are held in position essentially by means of positive locking and that is designed to fit into drawers or similar existing elements of laboratory, office, workshop, home or similar furniture, where the chassis is to form an integral and functional unit with the already existing drawer, such as a drawer in a desk.

The main features of the solution proposed by the invention are outlined in the body of claims 1 and 2.

Further variations on the solution to the problem are outlined in claims 3 to 20.

The housing for a device consists of a plastic - particularly foam plastic - chassis for holding the components of the device and a drawer (made of

metal or lined with a metal layer, a metal sheet or metal foil) from a piece of furniture, such as a desk or a cupboard or part of a cupboard, where the (foam) plastic chassis is equipped with elastic projections which act as holding / clamping elements and the gaps between which form variable / controllable air channelling ducts in connection with the metal drawer etc. that have plastic parts which can be inserted, pushed in or moved around to create an easily adapted ventilation system for the components concerned in each individual case. In this way, it is possible, for example, to accommodate computers, measuring instruments, laboratory equipment, multimedia systems or similar devices in the drawer of a desk or a laboratory bench or in a drawer etc. of a different piece of furniture, where the drawer etc. and the plastic chassis form an integral and functional unit for the device - and thus in fact represent the housing for the device, including a ventilation system. By combining an already existing drawer etc. or a module from a piece of furniture with the specially designed plastic chassis, where the module is either made of metal or is provided with a metal layer or is lined with foil, the drawer etc. or the module that can be pulled out of a piece of furniture and pushed back in again for the first time becomes in itself the housing for a device. The special design of the plastic chassis makes sure efficient assembly and excellent functional properties are guaranteed, without the metal housing or metallised plastic housing being required for a device that is otherwise always necessary. The way this is achieved is by the relevant drawer and the plastic chassis fitted into it forming an integral functional unit with a ventilation system with specially designed, controllable ventilation ducts and air inlets and outlets. The use of a connection board specially designed for this application for the external electrical connections also represents a

technical solution which guarantees that the device will function reliably and which is adapted to the novel housing for the device.

Some of the additional advantages of the present invention are as follows:

The number of parts that form the chassis as well as the whole of the housing for a device has been reduced substantially. The requirements on production tolerances are less demanding than in the case of a prior art chassis made from metal or rigid plastic, where parts which are to be assembled have to be manufactured with great precision to make sure it is possible to fit the different parts together exactly. The components can be fitted into the chassis easily and are held in position there securely without additional attachment materials, while the chassis can in turn be inserted very easily into an existing drawer etc. with appropriate openings, because of the presence of the elastic projections.

- The weight level has been reduced considerably by comparison with the previously disclosed designs;
- Very good acoustic insulation, very good electric shielding and very effective cooling of the components (due to the air channelling ducts) are achieved;
- The properties of the chassis material mean that the components are protected against impact. In view of the impact-absorbent features of the chassis, the impact protection requirements on the packaging used for the device during transport are lower. Packaging material and transport volume are also reduced considerably as a result;

- Dismantling goes as smoothly and simply as assembly, which facilitates maintenance work on the device and makes it easy to return the device to the manufacturer if necessary.

It should be emphasised here that the invention is not limited to electronic equipment or precision instruments like computers or measuring instruments; it can instead be used for all kinds of equipment in which a number of different components are provided that have to be kept in a fixed position and need to be accommodated in pieces of furniture of any sort.

Further features of the invention are outlined and shown in the following description and the drawings.

The invention is now explained in greater detail with reference to the embodiments illustrated in the drawings. The reference numbers and terms given in the list of reference numbers at the end of this text are used in the description, the claims and the drawings to denote the same parts.

The invention is now explained in greater detail with reference to the embodiments illustrated in the drawings.

Fig. 1 is an exploded view of the housing for a device;

Fig. 2 is a more detailed view of the housing for a device showing certain parts and components in exploded form;

Fig. 3 shows the housing for a device in the form of a metal drawer for a desk;

Fig. 4 is a front view of a piece of office furniture incorporating a drawer as the housing for a device and

Fig. 5 is a rear view of a piece of furniture incorporating a drawer as the housing for a device.

Fig. 1 is a perspective view of a drawer 12. In this case the drawer 12 is made of metal and is part, for example, of a desk in which, for example, all the electronic equipment for a computer or a measuring instrument is housed. The drawer 12 can be made solely of metal or it can be produced from wood or plastic. It is, however, essential that a drawer 12 produced from such materials is lined with metal foil, with a metal layer or with a thin metal plate to provide electric shielding. This shielding can also be provided by wrapping the parts of the chassis 5 and 17 holding the components in metal foil or metallised plastic film with ventilation openings 4. In the embodiment shown here, the drawer 12 has air inlet / outlet openings 4 in all four walls and in the base. These air inlet / outlet openings 4 can have a wide range of different shapes and sizes depending on the requirements, as can be seen clearly in Fig. 1. The drawer 12 is also provided on its base with locking holes or recesses 7 into which corresponding locking and spacing elements 6 in the lower part 5 of the foam plastic chassis fit. The purposes of these elements are on the one hand to lock and hold the chassis lower part 5 securely in the drawer 12, so that this chassis forms an integral unit together with the drawer 12, and on the other hand to make sure there is a specific gap between the lower

part 5 of the fitted chassis and the base of the drawer 12 in order to create specific ventilation ducts. Projections 1 are also provided on both sides of the lower part 5 of the chassis as an integral part of the plastic chassis. One of the purposes of these projections 1 is to compensate for tolerances when the lower part 5 is fitted in the drawer 12, so that these two parts form integral parts of the housing for a device. Since there are air inlet / outlet openings 4 in the walls on both sides of the drawer 12 and since there is a gap between the projections 1 that act to some extent as clamps, air channelling ducts 3 are formed which can be shaped in the necessary way to direct the air as required. Controllable or controlled air ducts are created by modular foam plastic parts 14 that can be inserted, pushed in or moved around to fill gaps in order to vary the flow of air into the air channelling ducts 3 between the projections 1. This is a very simple way to make it possible for the volume and the speed of cooling air and discharge air for certain components to be determined. The lower part 5 of the chassis shown in Fig. 1 also has integrated supports and clamping elements 13 for drives or similar units that are fitted, such as for example the information storage media that may be required. The drawer 12 is shown in Fig. 1 in such a way that the guide rails 9 on both sides can also be seen clearly. The drawer 12 is normally provided with a front panel 8 as well, that covers the air inlet / outlet opening 4. This front panel 8 has a handle that is shaped in such a way that it, for example, forms an air inlet for this opening 4 underneath it. An opening 11 for plug-in board electrical connections is located at the back of the drawer 12 and will be explained in greater detail in connection with Fig. 2.

Fig. 2 shows the drawer 12 into which the lower part 5 of the chassis has been fitted. This chassis has already been equipped with a printed circuit

board 27 with components, a power supply unit 23 and drives 24 to 26 for a variety of different information storage media. The front plate 8 has now been positively / non-positively locked to the drawer 12. Fig. 2 also shows a front plate 21 that serves to close off the whole of the front of the chassis. This front plate 21 is in turn provided with air inlet / outlet openings 4 and also has openings 31 for inserting information storage media. The connection board 19 for establishing the external electrical connections is also shown at the back of the drawer 12. This board is equipped with standard and / or special plugs and / or spring clips as well as the cable 30 and plug.

Fig. 2 also shows the upper part 17 of the chassis. Like the lower part 5, this upper part 17 is made of plastic. This plastic can, for example, be expanded polypropylene (EPP). This material is known as such and is used, for example, as a packaging material. Production of an EPP chassis in accordance with this invention involves completion of the following steps:

The polypropylene granulate is first of all foamed to form small polypropylene beads using a previously disclosed process. The granulate contains carbon, which makes sure that the finished plastic is electrically conductive enough to avoid electrostatic charging of the chassis. The beads are injected into a mould that has the same shape as the required chassis structure at a pressure level of about 4 bar. The effect of this operation is to reduce the volume. A vacuum is applied in the next operation, so that the volume increases again and the beads take on the shape of the mould. Steam at a temperature of about 180° Celsius is then blown into the mould, which causes the beads to coalesce on their surface

(cross-linking). Then the mould is opened and the foam plastic part is removed for subsequent tempering.

Expanded polypropylene has several advantageous properties which make it a suitable plastic material for the chassis proposed in this invention. It is, for example, extremely dimensionally stable, while remaining compliant as well, so that it absorbs energy. This guarantees that the components assembled in the chassis are given effective impact protection. The deformability or compliance of the plastic can be influenced by varying the density of the material. The density of the polypropylene in one practical embodiment is in the 60 to 80 grams / litre range, which leads not only to good dimensional stability but also to good impact absorption properties. A density range of 20 to 80 grams / litre can also be used for certain applications. The hardness of the plastic and its impact-absorption properties can be adapted to the specific application concerned by changing the density level. The lower the density, the softer the material, which leads to better impact-absorption properties. Another advantage of polypropylene is its temperature stability, which is important when the components housed in the chassis generate a large amount of heat. It has, however, also been discovered that the temperature of the components in the chassis and the housing for a device produced in accordance with the invention is in fact somewhat lower than in a conventional device with the same components that is in uninterrupted operation. The reason for this is that a controlled and better directed flow of air is produced by the air ducts that are created in the chassis and between the chassis and the drawer 12. Another advantage of the polypropylene chassis is that it can be recycled completely, as it does not contain any metal or other materials. Other plastics have, however, also been disclosed that have advantageous

properties of this kind. Polyurethane or polyethylene are two examples of such materials. The term "plastic" that is used here relates to a lightweight, dimensionally stable material with impact-absorbent properties that is preferably a synthetic, formable material. The concept behind the present housing structure for a device can also be implemented with materials that are biological in origin.

If a combustible plastic is used for the chassis, fire protection can be provided by incorporating a carbon dioxide cartridge inside the device. This carbon dioxide cartridge is then linked to a heat sensor which monitors the temperature and makes sure that the carbon dioxide is released when a specific temperature has been exceeded, so that any fire or smouldering can be extinguished.

Like the lower part 5, the upper part 17 of the chassis shown in Fig. 2 has integrated compliant yet dimensionally stable projections 1 to compensate for tolerances and to act as clamps when fitted in a drawer 12. Air channelling ducts 3 are created by the gaps in this case too. A drive 18 for an information storage medium that is not illustrated here can also be seen in Fig. 2. This drive 18 rests, for example, on the supports 13 that act at the same time as clamping elements for drives or other larger components located beneath them. The drive 18 is held in position from above by a specially configured apparatus in the chassis. The drive is held securely from above by a flap 20 with one pivoted axis that is clamped or pressed into an appropriate opening in the upper part 17 of the chassis. This flap 20 is made entirely of plastic - preferably the same plastic as the upper part 17 - and it is provided with an air inlet / outlet opening 4 and a hand recess 22 in addition to the integrated axis.

The whole of the structure is covered from above by a shielding plate 15 or something similar in order to provide electric shielding, this shielding plate 15 again being equipped with air inlet / outlet openings 4. The shielding plate 15 can be secured either by screws or by clips or by gluing or by other means of attachment.

Fig. 3 shows the components and parts illustrated in Figs. 1 and 2 after they have been assembled into an integral unit to form a complete housing for a device in the shape of a drawer. The purpose of the arrows 28 is to indicate the direction of the incoming / outgoing air in each case. Attention should be drawn here to the fact that it is advantageous if only the direction shown through the front panel is chosen if at all possible. It is also advantageous if a free space 32 is created between the front panel of the drawer itself and the front panel of the chassis, as this is necessary for inserting information storage media, for example, and is also suitable for storing such information storage media. The drives can be installed at a slant (up to the angle specified for the drives) to facilitate insertion.

In a special version of such a housing for a device, the drawer 12 is made from a perforated material. The perforations act as air inlets / outlets 4 for air ducts and the flow of air can be controlled by means of foam plastic inserts that are located behind the perforations or are only located in the ventilation ducts to some extent.

Fig. 3 shows very clearly that the housing for a device is formed solely by the drawer itself and the single- or multi-piece plastic chassis fitted in it that has appropriate air channelling and control facilities. The air is

channelled and controlled not only by the openings in the drawer itself but also by the design of the chassis as outlined above, which forms a functional unit together with the drawer.

Fig. 4 shows a side section of a desk in which there are drawers 12. When on the one hand the air flow 28 is channelled through the handle of the drawer and the main air infeed and removal 28 on the other hand takes place at the back - as can be seen in Fig. 5 - it is very advantageous to use the bottom drawer for the proposed application. Fig. 5 gives a clear picture of a furniture module 29 - for example for a desk - that is shown with an open back. This makes it possible to see distinctly the guide rails 9 for the drawer 12 as well as the connection board 19 and the cable 30 with its plug. This figure also makes it clear once again how the air flows / is channelled through the air inlet / outlet openings 4 when the equipment has been assembled. Any furniture that is equipped with drawers (particularly metal drawers) is suitable, whether it is designed for commercial or private use. It should be emphasised here again that the housing for a device illustrated in Figs. 1 to 5 can be equipped with any kind of components, which do not necessarily have to be electric or electromechanical. Optical or only mechanical components can, for example, be housed in the chassis too. The facilities proposed in this invention are not therefore limited in their use to computers or similar data processing equipment; they can be used for a very wide range of different kinds of devices, such as multimedia systems or televisions. These facilities can, for example, also be used, however, for electronic devices or instruments, such as signal transmitters and testing equipment or measuring instruments, for example oscillographs, spectrum analysers, multimeters and technical medical equipment. Another application area is

for equipment used in analytical chemistry. A housing in accordance with this invention can, for example, be used in liquid chromatographs to hold their components like pumps, syringes , valves, control and data processing units and the detector. The ducts for the liquids can be produced in the chassis material during the moulding process, so that no tubes of the kind required in conventional chromatographs are necessary. The housing for a device in accordance with this invention is a very lightweight, impact-absorbent housing that is easy to produce and guarantees simple installation of the individual parts. It is just as easy to dismantle a device in such a housing as it is to assemble it, which is a major advantage when repairs need to be made. It is dismantled simply by taking the upper part of the chassis or the whole of the chassis out of the drawer. Tools are not needed - except possibly for the opening of a chassis closure - and special tools are not required at all.

List of the reference numbers

1	Projections
2	Operating and storage area
3	Air channelling ducts
4	Air inlet and outlet
5	Lower part
6	Locking and spacing elements
7	Holes for locking the foam plastic part
8	Panel for the front of the drawer
9	Guide rail for the drawer
10	Air inlet / outlet space
11	Opening for plug-in boards
12	Drawer
13	Supports and clamping elements
14	Foam plastic parts for controlling the flow of air
15	Shielding plate
16	Screws / clips
17	Upper part
18	Drive
19	Connection board
20	Plastic flap
21	Front plate
22	Hand recess
23	Power supply unit
24, 25, 26	Drives
27	Printed circuit board with components
28	Flow of incoming / outgoing air (drawer)
29	Furniture module
30	Cable with plug
31	Openings for inserting information storage media
32	Handle



CLAIMS

1. Housing for electrical, electronic, precision mechanical, mechanical or other devices for accommodation in commercially used furniture, home furniture or other furniture with drawers,

wherein the drawer (12) made from metal, a metallised material or a material lined with metal forms a functional and integral unit with a plastic chassis for holding components of a device and

wherein air inlet / outlet openings (4), projections (1) and locking and spacing elements (6) on the chassis, the walls and base of the drawer (12) and if necessary an upper shielding plate (15) form air channelling ducts (3) for ventilation purposes.

2. Housing for a device according to the introductory section of claim 1,

wherein the air channelling ducts (3) that are formed by the base, cover and / or side walls of a drawer (12) and by spaces between a fitted plastic chassis which consists of one part or at least two parts (5, 17) and is provided with projections (1) and locking and spacing elements (6), where the base, walls and covers are equipped with air inlet / outlet openings (4) of different sizes and different shapes and

wherein air channelling ducts (3) are designed to be controllable with plastic parts (14) that can be inserted, pushed in, moved around or adjusted.



3. Housing for a device according to claim 2,

wherein the plastic parts (14) provided to vary the flow of air are designed for modular deployment.

4. Housing for a device according to one of claims 1 to 3,

wherein the drawer (12) and perhaps a shielding plate (15) or a metallised shielding element consist of a perforated material and

wherein the air channelling ducts (3) are designed to be controllable by foam plastic inserts.

5. Housing for a device according to one of claims 1 to 4,

wherein supports and clamping elements (13) integrated in the lower part (5) of the chassis are provided for drives (18 and 26) and

wherein a hinged and pivoted elastic plastic flap (20) that is designed to be clampable is provided in the upper part (17) of the chassis to lock and secure the drives underneath it.

6. Housing for a device according to one of claims 1 to 5,

wherein the chassis (for example 5 and 17) that is detachably connected to the drawer (12) is closed off at the front by a front plate (21) with vertical and horizontal openings (31) for inserting information storage media as well as with ventilation openings and



wherein the upper part of the chassis is closed off by a shielding plate (15) with ventilation openings (4).

7. Housing for a device according to one of claims 1 to 5,

wherein the projections (1) provided to compensate for tolerances and to secure and clamp the plastic chassis in the drawer (12) are made from the same material as the chassis, form an integral part of the chassis and are convex, wedge-shaped or double wedge-shaped.

8. Housing for a device according to one of claims 1 to 7,

wherein a connection board (19) for electrical connections is located on the back section of the drawer (12) and

wherein an operating and storage area (2), for example for the data storage media, is provided between the front panel of the drawer (12) and the front plate (21) of the chassis.

9. Housing for a device according to one of claims 1 to 6,

wherein the air inlet and outlet openings (4) for air inflow and outflow are rectangular, square, round, slit-shaped or elliptical.

10. Housing for a device according to one of claims 1 to 8,

wherein it is an integral part of office furniture, particularly desks,



laboratory furniture, home furniture or workshop furniture and is preferably provided as the bottom drawer (12) and

wherein the handle (32) is designed for the purposes of channelling air.

11. Housing for a device according to claim 10,

wherein components of computers, multimedia systems, video and radio equipment, control, measuring and monitoring instruments and / or telecommunications equipment are located in it.

12. Housing for a device according to one of claims 1 to 11,

wherein air channelling ducts (3) are provided between the walls and base of the drawer (12) and the outer walls and lower part of the chassis with integrated projections (1) to secure and clamp the chassis as well as within the chassis.

13. Housing for a device according to one of claims 1 to 12,

wherein the chassis consisting of at least one upper part (17) and one lower part (5) contains integrated supports and clamping elements as well as hinged and pivoted clamping elements (20) to lock and secure components at one, two or more levels.

14. Housing for a device according to claim 13,



wherein the parts (5, 17) of the chassis, the elastic plastic parts (14) for controlling the flow of air and the elastic plastic flap (20) for locking and clamping the drives or larger components are produced from the same plastic by moulding.

15. Housing for a device according to one of claims 1 to 14,

wherein the parts (5, 17) of the chassis are made from plastic with a density of approximately 60 to 80 grams / litre.

16. Housing for a device according to one of claims 1 to 15,

wherein the plastic is expanded polypropylene.

17. Housing for a device according to one of claims 1 to 16,

wherein the plastic is polyurethane or expanded polyethylene.

18. Housing for a device according to one of claims 1 to 16,

wherein the drawer (12) and the plastic chassis form the housing for a device with air channelling facilities and ducts and

wherein the shielding and cover / front panels and plates (8, 15, 21 and / or 30) are held in place by means of snap closures, screws or clips (16) or by means of an essentially positively locked bond.



19. Housing for a device according to one of claims 1 to 18,

wherein the chassis consisting of at least two parts (5, 17) is completely wrapped in metal foil or a metallised or electrically conductive film and

wherein this foil or film has air inlet and outlet openings (4) at the necessary places.

20. Housing for a device according to claim 19,

wherein there is a separate foil of film for each removable part, such as the lower part (5) and the upper part (17).