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(72) Inventor(s):
Wilhelm Neukam

(73) Proprietor(s):
Fujitsu Client Computing Limited
Shinkawasaki Mitsui Bld., West, 1-2,
Kashimada 1-Chome, Saiwai-Ku, Kawasaki-Shi,
Kanagawa 212-0058, Japan

(74) Agent and/or Address for Service:
ip21 Limited
Central Formalities Department, Suite 2,
The Old Dairy, Elm Farm Business Park,
Wymondham, Norwich, Norfolk, NR18 0SW,
United Kingdom

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FIG 1

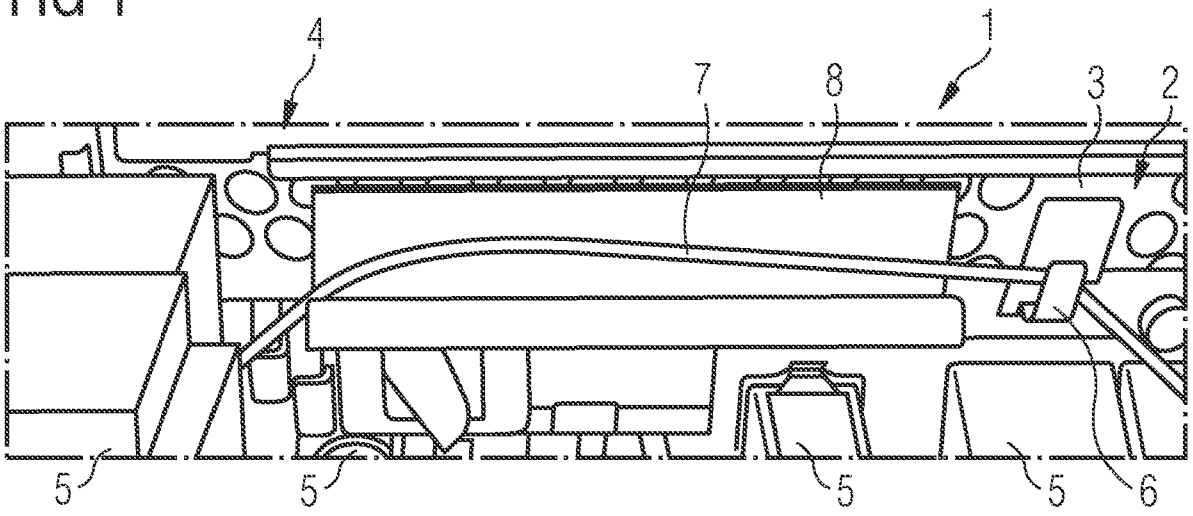


FIG 2

A)

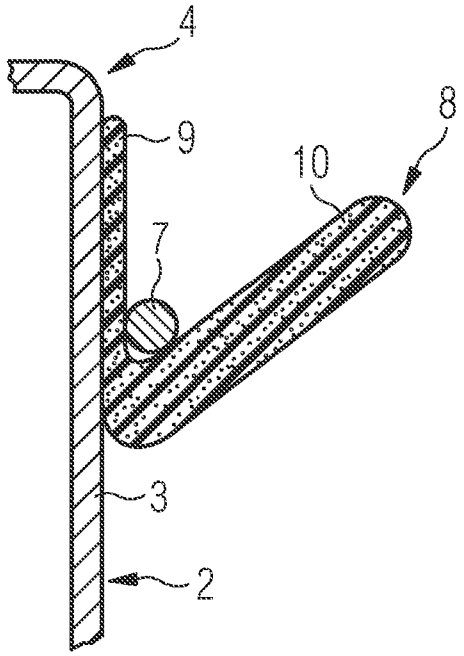


FIG 3

B)

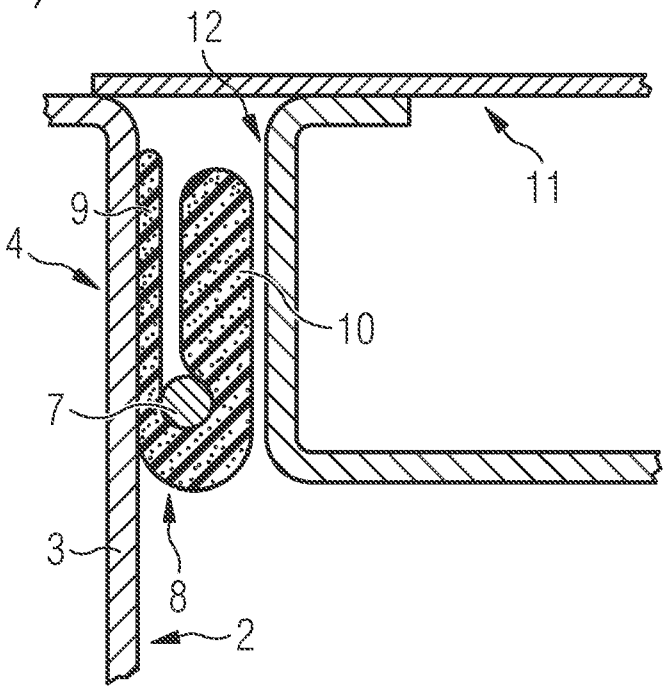


FIG 4

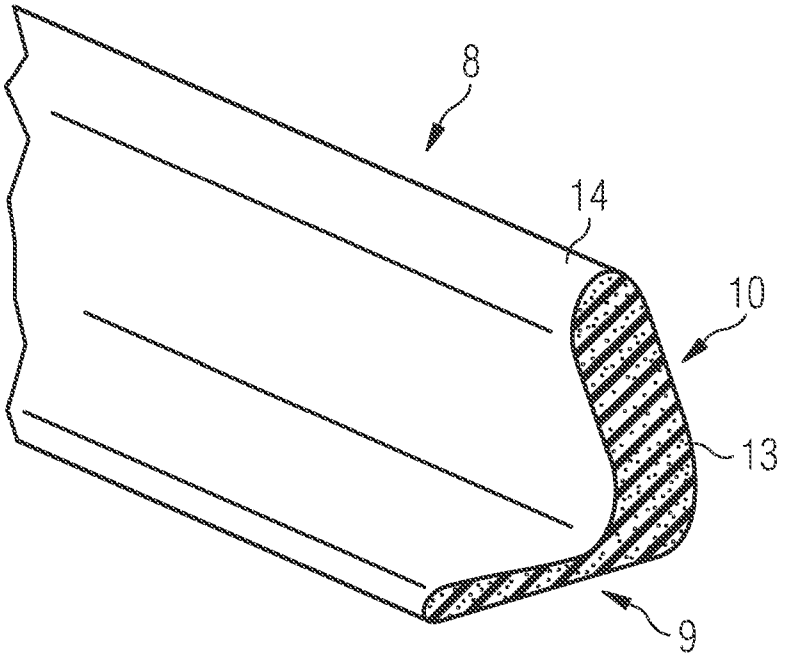


FIG 5

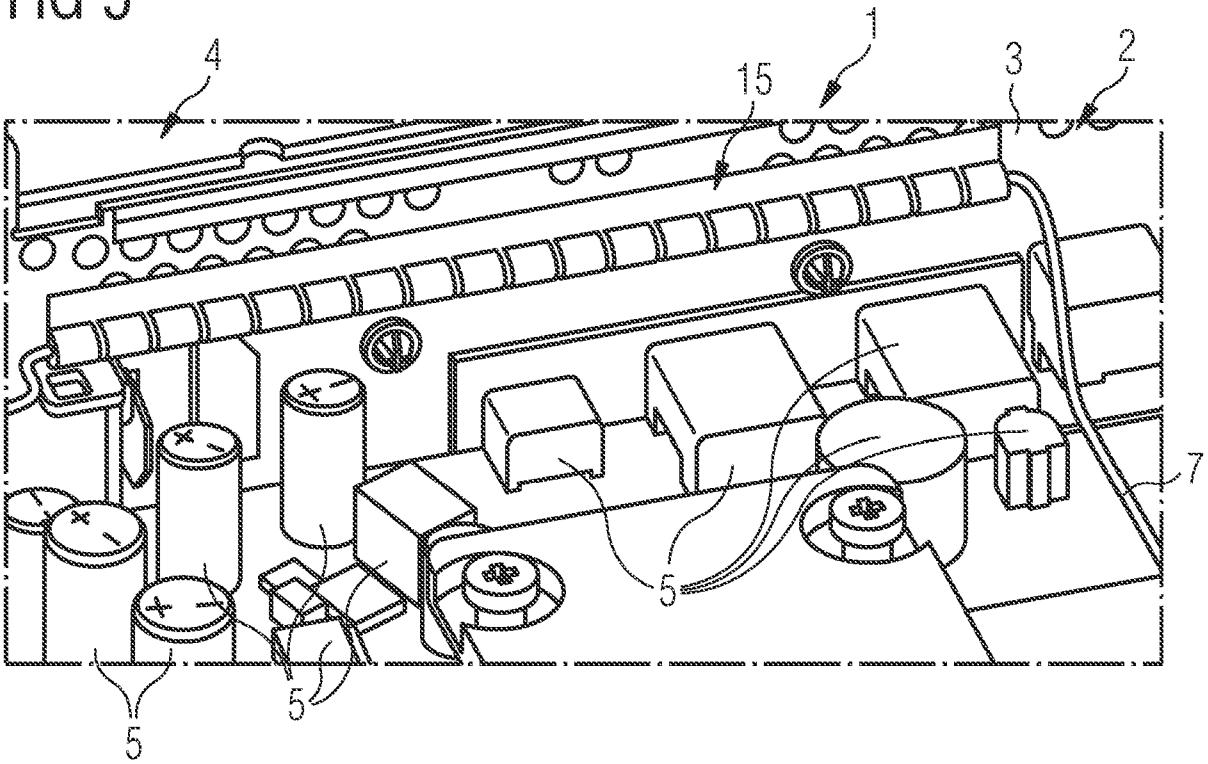
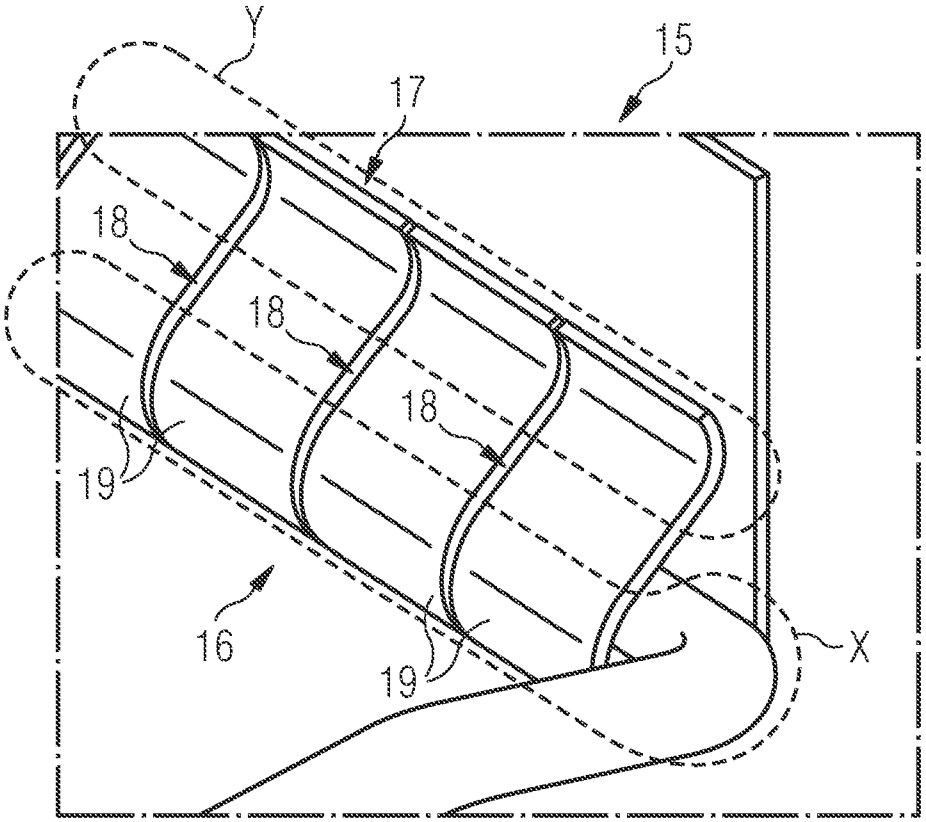


FIG 6



Specification

Computer System

The present invention relates to a computer system comprising a shielding casing and at least one cable.

Computer systems have to be compliant to predetermined specifications for electromagnetic compatibility (EMV). Hereto, shielding cases are used to prevent any discharge of electromagnetic radiation which is generated by the computer system to the environment. However, in such computer systems there are numerous weak points which may impair electromagnetic shielding. As a result, the specifications of the EMV may not be fulfilled. In addition, electromagnetic radiation generated in the shielding casing may be received by components which may cause an impairment of the functionality of the components of the computer system.

From JP 2000-77881 A a computer system having a shielding casing and a shielding apparatus for cables which is arranged inside the casing is known. The shielding apparatus comprises a conductive enclosure which may accommodate signal cables and may be closed by means of a conductive fastening means. However, it may be complicated and time-consuming to insert cables in such a shielding apparatus.

It is an objective of the present invention to specify a computer system comprising an enhanced shielding concept.

According to a first aspect, the objective described above is achieved by a computer system comprising a shielding casing, a movable component and at least one cable. Furthermore, the

computer system comprises a shielding apparatus which is arranged at a first part of the shielding casing which is configured to accommodate the at least one cable in a first state at least partially, and to be compressed during a movement of the movable component in a second state, thus the at least one cable is clamped into the shielding apparatus. Said shielding apparatus comprises or consists of an electrically conductive foam, and comprises a V-shaped or U-shaped profile when viewed in a cross-section.

This way, the shielding apparatus prevents that the cable receives or discharges electromagnetic radiation inadvertently. In addition, by means of the shielding apparatus described here, it is ensured that in an operating state, that is, in case the shielding apparatus is compressed and the at least one cable is clamped into the shielding apparatus, the at least one cable is stored in a secure way. The electrically conductive foam may for example be a conventional foam, for example polyethylene, which is interwoven by electrically conductive materials. Alternatively, it may comprise a conventional foam which is provided with an electrically conductive layer. This kind of electrically conductive foams are also known as gaskets.

An advantage of using an electrically conductive foam for the shielding apparatus is that thus tolerances in the computer system, in particular during compressing the shielding apparatus, are compensated. Further, the electrically conductive foam reduces the risk of damaging the at least one cable, in particular during compressing of the shielding apparatus.

The cross-section plane, in which the shieldingapplication comprises a V- or U-shaped profile, is a plane whose normal vectors extend parallel to a main extension direction of the at least one cable.

It is advantageously here, that in such a shielding apparatus, the at least one cable is arranged in a deepest point of the V- or U-shaped profile of the shielding application in a secure and well protected way. In addition, this ensures an utmost extensive contact of the shielding apparatus with an outer surface of the at least one cable. This guarantees a high degree of shielding of the at least one cable against electromagnetic radiation.

Further advantageous embodiments of the invention are disclosed in the appended claims and in the following description of exemplary embodiments. The exemplary embodiments will be described by means of the following Figures.

In the Figures show:

Figure 1 an interior view of a computer system according to an exemplary embodiment of the invention,

Figure 2 a gasket at the casing wall of the computer system according to an exemplary embodiment of the invention in a first state,

Figure 3 the gasket according to Figure 2 in a second state,

Figure 4 a perspective view of a gasket for a computer system according to an exemplary embodiment of the invention,

Figure 5 an interior view of a computer system according to a further exemplary embodiment of the invention, and

Figure 6 a perspective view of a tunnel-shaped shielding sheet for a computer system according to an exemplary embodiment of the invention.

Figure 1 shows an interior view of the computer system 1 when viewed towards an inner surface of a casing wall 3. The casing wall 3 is part of a shielding casing 4 of the computer system 1, that is the casing wall 3 is electrically conductive. The portion of the computer system 1 shown in Figure 1 shows a variety of electrical components 5 of the computer system 1, wherein the description thereof is omitted here.

The casing wall 3 comprises annular ventilation holes, and a hook 6 which is directed towards an interior of casing 4. The hook 6 is bent from the casing wall 3 to the outside and configured to support a cable 7 which extends inside the casing 4.

In said exemplary embodiment, the cable 7 is an antenna cable which connects a WLAN (Wireless Local Area Network) module, which is not shown here, to a WLAN antenna, which is not shown here. Such WLAN antenna projects to the outside of casing 4 from casing 4 and is configured for sending or receiving data via a WLAN. As the cable 7 is connected to

the antenna which projects to the outside, the electromagnetic waves which are received in the interior of the casing 4 from the cable 7 may be discharged as interfering electromagnetic radiation via the antenna. Such kind of electromagnetic radiation, which is received by the cable 7 in the interior of casing 4, may be generated by other components in the interior of the computer system 1, for example.

At the inner surface 2 of the casing wall 3 a gasket 8 is fixed which is configured to receive the cable 7. In the core thereof, the gasket 8 consists of an electrically non-conductive foam, which is enclosed by a conductive fabric and which is extending along the cable 7 at the casing wall 3. Alternatively, as gasket 8 a gasket made of an electrically conductive foam may be used. In the exemplary embodiment shown here, the gasket 8 extends some centimeters along the casing wall 3. In the present case, this corresponds to an appropriate length of the gasket 8 in order to receive a portion of the cable system as large as possible and at the same time to not interfere with any further components in the casing 4 at the casing wall 3. The gasket 8 comprises a V-shaped profile as seen in the cross-section, and will be described in more detail referring to Figures 2 to 4.

The gasket 8 prevents or reduces reception of electromagnetic interference radiation by the cable 7 inside the casing 4, thus also a discharge of interfering radiation via the antenna is prevented or at least reduced. As the gasket 8 is directly fixed to the electrically conductive casing wall 3, the electromagnetic waves received from the gasket 8 may be discharged to the casing 4. The casing 4 is connected to earth, thus no or neglectable interference radiation may be

discharged by casing 4, and the computer system 1 provides an enhanced shielding concept regarding compatibility.

In the exemplary embodiment shown here, the gasket 8 is fixed to the electrically conductive casing wall 3. As an alternative, the gasket 8 may also be fixed to an electrically conductive chassis or any other suitable electric conductive component of the computer system 1.

Figures 2 and 3 show a part of a casing wall 3 of the casing 4 of a computer system 1 including a gasket 8 and a cable 7 received in the gasket 8 as seen in a cross-section. In Figures 2 and 3, the cross-section plane is chosen in a way that a normal vector of the cross-section plane extends parallel to the main extending direction of the cable 7. The casing wall 3 and the gasket 8 including the cable 7 correspond to the casing wall 3 and the gasket 8 including the cable 7 according to Figure 1, for example.

Figure 2 shows the gasket 8 in a first state A, Figure 3 shows the gasket 8 in a second state B. The first state A corresponds to a mounting state, that is, the state in which the gasket 8 is during mounting to the casing wall 3. Said first state A is also shown in Figure 1. In the first state the gasket 8 having a V-shaped profile is bonded to the first leg 9 of the gasket 8 to the casing wall 3. Hereto, an electrically conductive adhesive is used, thus the gasket 8 is connected to casing wall 3 in an electrically conductive way. Alternatively, the gasket 8 may also be riveted, welded, screwed or fixed in any other way. A second leg 10 of the gasket 8 projects in an angle of about 45° from the first leg 9. By means of this V-shaped opening of the gasket the

cable 7 may be easily inserted into the gasket 8 in a first state A.

Figure 3 shows the gasket 8 in the second state B. The second state B is an operating state in which the gasket 8 is during operation of the computer system 1. In the second state B, the second leg 10 of the gasket 8 is pressed towards the first leg 9 of the gasket 8 by a part of a drive cage 11. The first leg 9 and the second leg 10 are basically parallel to each other.

A transition from the first state A to the second state B is achieved by inserting the drive cage 11 into the casing 4. When during mounting of the drive cage 11, the drive cage 11 is moved towards the casing wall 3, the surface 12 of the drive cage 11 presses the second leg 10 of the gasket 8 towards the first leg 9. In a second state B, the cable 7 is clamped into the gasket 8, thus it is not arranged freely in the casing 4. In the second state B, the perimeter of the shell of the cable 7 is in contact with the inner surface of the gasket 8 to a degree of more than 50%.

In the exemplary embodiment shown here, the surface 12 of the drive cage 11 presses the gasket 8 in a second state. Thus, the cable 7 is clamped into the gasket 8, as soon as the drive cage 11 is inserted into the casing 4, thus the cable is accommodated in a safe way, for example during maintenance work at the computer system 1 which does not require any removing of the drive cage 11, or the cable 7 may not be damaged by such maintenance work inadvertently.

In the illustration shown in Figure 3, a first leg 9 and a second leg 10 do not contact each other. However,

alternatively, it may be possible that in the second state B the gasket 8 is compressed to such a degree that the first leg 9 and the second leg 10 contact each other in the second state B.

Figure 4 shows a perspective illustration of gasket 8 as it is used in the previous Figures, for example. The gasket 8 according to Figure 4 is shown in the first state A which is shown in Figures 1 and 2. The first leg 9 and the second leg 10 of the gasket 8 project from another in an angle of about 45°.

The gasket 8 includes a foam core 13 at the second leg 10 which is enclosed by an electrically conductive fabric 14. The gasket 8 is configured in a way that the foam core 13 is mainly supported in the second leg 10. The first leg 9 with which the gasket 8 may be fixed to a casing wall is nearly exclusively formed by the electrically conductive fabric 14.

This way, a gasket 8 is generated as narrow as possible, wherein a cable received in the gasket 8 is also sufficiently protected against a pressure by the foam core 13 generated by compressing the gasket 8. The electrically conductive fabric 14 shields the cable 7 against electromagnetic radiation.

Figure 5 shows an interior view of the computer system 1 as viewed towards an interface 2 of a casing wall 3 according to a further exemplary embodiment of the invention. As shown in Figure 1, the casing wall 3 is here also part of a shielding casing 4 of the computer system 1, that is, the casing wall 3 is electrically conductive. The section of the computer system 1 shown in Figure 5 shows a variety of electrical

components 5 of the computer system 1, the description thereof is omitted here.

Inside the casing 4 a cable 7 extends. In said exemplary embodiment, as in the exemplary embodiments according to Figure 1, the cable 7 is an antenna cable which connects the WLAN module, which is not shown here, to a WLAN antenna, which is not shown here.

At the inner surface 2 of the casing wall 3 a tunnel-shaped shielding sheet 15 is fixed which is configured to receive the cable 7. The tunnel-shaped shielding sheet 15 is formed of an electrically conductive spring sheet-metal which extends along the main extending direction of the cable 7 at the housing wall 3 in a tunnel shape. Alternatively, the shielding sheet 15 may also be made from a copper beryllium sheet or any other suitable electrically conductive sheet-metal or comprise such.

In the exemplary embodiment shown here, the shielding sheet 15 extends some centimeters along the casing wall 3. In the present case this equals an appropriate length of the shielding sheet 15 in order to receive a portion of the cable 7 as large as possible and also to not interfere with any further components in the casing 4 or at the casing wall 3. The shielding sheet 15 will be described in detail referring to Figure 6.

As in the gasket 8 according to Figure 1, the shielding sheet 15 prevents or reduces reception of electromagnetic interference radiation by the cable 7 inside the casing 4, thus also a discharge of interfering radiation via the antenna is prevented or at least reduced. As the shielding

sheet 15 is directly fixed to the electrically conductive casing wall 3, electromagnetic waves received from the shielding sheet 15 may be discharged to the casing 4. The casing 4 is connected to earth, thus no or neglectable interference radiation may be discharged by the casing 4, and the computer system 1 provides an enhanced shielding concept regarding electromagnetic compatibility. The shielding sheet 15 is riveted, welded, screwed or bonded by means of an electrically conductive adhesive to the casing wall 3, thus a well conducting electrical contact is ensured between the shielding casing 4 and the shielding sheet 15.

In the exemplary embodiment shown here, the gasket 15 is fixed to the electrically conductive casing wall 3. As an alternative, the shielding sheet 15 may also be fixed to an electrically conductive chassis or any other suitable electric conductive component of the computer system 1.

Figure 6 shows a perspective illustration of a tunnel-shaped shielding sheet 15 as it is used in computer system 1 according to Figure 5, for example.

The shielding sheet 15 comprises a plane first leg 9 and a second leg 10 which is bent in a S-shape when viewed in profile. At the first leg 9, the shielding sheet 15 may be fixed to a casing wall. The second leg 10 is bent in a S-shape such that in the first region X, at a deepest point of the shielding sheet 15, wherein the first leg 9 is connected to the second leg 10, a bulge 16 is existing in which a cable 7 is accommodated. The S-shaped bending of the second leg 10 is further configured in a way that in a second region Y of a free end 17 of the second leg 10, the second leg 10 is positioned closer to the first leg 9 as at the position of

bulge 16. This way, the cable 7 is safely accommodated in the shielding sheet 15 and protected against inadvertently releasing from the shielding sheet 15.

In the exemplary embodiment shown here, the second leg 10 of the shielding sheet 15 is further segmented, that is, the second leg 10 of the shielding sheet 15 comprises a plurality of slits 18 perpendicular to the main extending direction of the cable 7. This way, the second leg 10 is formed by a plurality of single fins 19 each having a width of about 0.5 cm to 1 cm. Of course, fins having other widths are also possible. Said segmentation facilitates an introduction of the cable 7 into the shielding sheet 15, as the cable 7 may be compressed during gradual insertion through one or some of the fins 19 into the bulge 16 without having to compress the cable 7 along a complete extension length of the tunnel-shaped shielding sheet 15 at one time.

List of reference signs

1	Computer system
2	Inner surface
3	Casing wall
4	Casing
5	Electric component
6	Hook
7	Cable
8	Gasket
9	First Leg
10	Second Leg
11	Drive cage
12	Drive cage side
13	Foam core
14	Electrically conductive fabric
15	Tunnel-shaped shielding sheet
16	Bulge
17	Free end
18	Slot
19	Fin

A	First state
B	Second state
X	First region
Y	Second region

Amended Claims

1. A computer system (1) comprising
- a shielding casing (4),
- a movable component,
- at least one cable (7), and
- a shielding apparatus which is arranged at a first part of the shielding casing (4) configured to accommodate the at least one cable (7) in a first state (A) at least partially, and to be compressed during a movement of the movable component in a second state (B), thus the at least one cable (7) is clamped into the shielding apparatus, wherein the shielding apparatus comprises or consists of an electrically conductive foam, and wherein the shielding apparatus comprises a V-shaped or U-shaped profile when viewed in a cross-section.

2. The computer system (1) according to claim 1, wherein the shielding apparatus and the movable component are arranged in an interior space of the shielding casing (4) in a second state (B), and the at least one cable (7) extends at least partially in the interior space of the shielding casing (4).

3. The computer system (1) according to claim 2, wherein the movable component is part of the drive cage (11).

4. The computer system (1) according to one of claims 2 or 3, wherein the at least one cable (7) extends at least partially outside of the shielding casing (4) or is electrically connected to a component which is arranged outside of the shielding casing (4).

5. The computer system (1) according to claim 4, wherein the at least one cable (7) is at least one antenna cable, which is connected to at least one antenna which is positioned outside of the shielding casing (4).