

CLOSING DEVICE

- 5 The present invention relates to a closing device for closing a housing opening, in particular an electrical door-drive housing.

Such a closing device is known in principle and is used, for example, to close an opening in a housing, in particular a door-drive housing. At the same time, it
10 should still be possible to access components located inside the housing, in particular electronic components. For example, it may be necessary to connect a cable inside the housing, program a controller and/or set a drive priority. For this purpose, the closing device is designed in such a way that it can be opened.

- 15 So that the closing device is nevertheless impermeable to objects such as dust or dirt particles and/or moisture, complex structural measures are often required, making the closing device difficult to operate and/or open.

One object of the invention is therefore to create a closing device that is easy to
20 assemble and that is easy to operate and at the same time has good closing properties.

To achieve the object, a closing device with the features of claim 1 is provided.

The closing device according to the invention comprises a frame, which defines a frame opening and is designed to be inserted into a housing opening to be closed and, in particular without additional aids, to be fastened to the housing, and a cover, which is or can be detachably connected to the frame and by means of which
5 the frame opening can be closed in cooperation with the frame.

The invention is based on the idea that the closing device can be connected to a housing in a simple manner in a tension and pressure-resistant manner, in that the closing device has its own frame, which can be inserted into a housing opening to
10 be closed and firmly anchored there. The frame opening of the frame can then be closed by means of the cover, as a result of which the housing opening is tightly closed as a whole. At the same time, it is possible to detach the cover from the frame again in order to enable access to the interior of the housing, the frame remaining in the housing opening. In other words, the cover is reversibly detachably
15 connected to the frame.

As a result, the housing opening can be closed particularly well by means of the closing device.

20 In principle, each housing opening, for example in the middle, at the end or on the front side, can thus be securely closed in a simple manner without any other components than the frame and the cover.

Advantageous embodiments of the invention are disclosed in the dependent
25 claims, the description and the drawings.

For a particularly simple anchoring of the frame in the housing opening, the frame can have a clip connection, by means of which the frame can be clipped into the housing opening to be closed.

- 5 To implement the clip connection between the frame and the housing opening, the frame can have an elastic projection and a stop, which are designed to receive an edge of the housing opening between them in a form-fitting and/or force-fitting manner at least in section when the frame is in the clipped-in state. As a result, the frame is anchored securely and firmly in the housing opening without additional
- 10 aids. In particular, the frame can be anchored in the housing opening in a tension- and pressure-stable manner without screws or the like, so that no undesired detachment of the frame is possible.

- 15 So that the frame can be clipped particularly easily into the housing opening, the projection of the frame can have an outer surface, which ensures that the edge of the housing opening runs onto the outer surface when clipping the frame into the housing opening.

- 20 When clipping the frame into the housing opening, the outer surface of the projection runs onto the edge delimiting the housing opening, the elastic projection then being deflected in the direction of the centre of the frame opening. The frame can thus be clipped into the housing opening with little effort.

- 25 If the frame is completely clipped into the housing opening, the elastic projection springs back into its starting position and the frame is firmly anchored in the housing opening. When the frame is clipped in, the projection engages behind an edge of the housing opening, so that the frame is securely anchored in the housing opening by means of the projection and the stop.

The projection can alternatively also form a ramp, in particular an elastic ramp, on which the edge of the housing opening runs when it is clipped in.

5 In the closed state of the closing device, the frame opening is preferably closed in a liquid-tight or gas-tight manner by the cover.

10 A seal, in particular a sealing ring, can be provided between the frame and the cover, depending on the desired degree of sealing. The seal can be made of an elastic material such as rubber or silicone, so that in the closed state of the closing device there is no gap or at least no significant gap between the frame and the cover.

15 So that the housing opening is closed as flat as possible in the closed state of the closing device, the cover can define a closure surface that is flush with the frame in the closed state.

20 So that the cover for closing the frame opening can be inserted particularly easily into the frame, the cover can have at least one guide element, which is designed to be guided by a counter-guide element formed on the frame when closing the frame opening. The guide element formed on the cover is preferably designed in the form of a guide web, which can cooperate with a counter-guide element of the frame designed as a guide groove. In principle, however, the guide element can also be a guide groove, and the counter-guide element can be a guide web.

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If the guide element formed on the cover is a guide web, this can extend away from a side of the cover facing away from the closure surface.

5 The frame opening can be closed particularly tightly if the cover has a collar, which is circumferential at least in sections and extends outwards and which is supported on the frame in the closed state of the closing device. In particular, in the closed state of the closing device, the collar can be supported on a counter surface of the frame, which counter surface is designed to be complementary to the collar. Furthermore, to increase the degree of sealing between the collar and the frame, a
10 seal made of an elastic material such as rubber or silicone can be provided. In particular, the seal can be formed on the collar and/or the frame. Alternatively, the collar and/or the frame can be coated with a sealant, for example made of rubber or silicone. In this case, a seal with a higher degree of sealing is used for a gas-tight and/or moisture-tight seal than, for example, for a dust-tight and/or particle-tight seal.
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The frame can preferably have a chamfered section facing the frame opening, on which the collar of the cover is supported, in particular in a form-fitting manner, in the closed state of the device, with a side complementary to the chamfered section.
20 In other words, the frame is designed like a funnel in its chamfered section. The chamfered section forms a counter surface for a collar, which has a corresponding inclined surface. In principle, however, it is also conceivable that the collar of the cover and the frame are designed in a step-like manner.

For particularly easy operability of the closing device, the frame opening can be closed by means of the cover by means of a latching connection. For this purpose, the cover can have a flexible latching means to implement the latching connection between the cover and the frame, which latching means engages behind a projection formed on the frame and protruding into the frame opening in the latched state of the cover. Alternatively, the flexible latching means can also be formed on the frame which, in the latched state of the cover, engages behind a projection formed on the cover.

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So that the latching connection between the cover and the frame can be detached again, the latching means can have an engagement means, in particular for a tool, by means of which, preferably exclusively, the latching connection between the cover and the frame can be detached. The corresponding standard specifications, for example DIN-EN 60529, can be met by exclusively using a tool for detachment.

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The latching means and the engagement means are preferably arranged recessed in the cover and the cover has an access opening for the engagement means for detaching the latching connection, through which the latching connection can be detached with the aid of the engagement means.

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According to an advantageous embodiment, the cover can have a cover section and a base section, the latching means being formed between the cover section and the base section. In principle, the latching means can be formed on the cover section and/or on the base section. However, it is advantageous in terms of production technology if at least the cover section and the base section are separate components. Since the cover section and the base section are separate components, they can be produced by injection moulding with simpler injection moulds than when the cover section and the base section are formed in one piece.

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The cover can be implemented in a particularly simple and inexpensive manner in that the cover section and the base section are clipped to one another in order to form the cover. Advantageously, the cover section, the base section and the latching means are separate components.

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If the latching means is a separate component from the cover section and the base section, the latching means can be designed in the form of a locking ring, which is received between the cover section and the base section of the cover.

- 10 The locking ring is preferably a slotted ring, which is also known as a snap ring. Such a slotted ring has two ends, which each surround the slot of the slotted ring, and which can be compressed in the direction of the slot against a spring force, thus reducing the circumference of the ring.
- 15 Pressing the ring together clips the cover into the frame opening and detaches the latching connection. To detach the latching connection, the ring can have engagement means for a tool at its ends facing the slot. For example, the engagement means can be designed in the form of holes formed in the respective ends, so that the ring can be compressed by means of snap ring pliers. Alternatively,
- 20 extensions can also project from the ends of the ring surrounding the slot, so that the ring can be pressed together by hand.

- As already mentioned, the circumference of the slotted ring is reduced when the ends surrounding the slot are compressed. In this case, the circumference of the
- 25 ring is reduced such that the ring no longer engages behind a counter support of the latching connection formed on the frame and the cover can be removed from the frame, whereby access to the interior of the housing is possible.

The invention also relates to a housing, in particular a door-drive housing, with a housing opening and a closing device.

Although the invention is described in connection with a door-drive housing, the
5 invention can also be used in connection with other types of housing.

In the following, the invention will be described in a purely exemplary manner on
the basis of a possible embodiment with reference to the accompanying drawings.
In the figures:

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Fig. 1 shows an exploded view of a closing device with a cover and a frame, and a perspective view of a housing with a housing opening to be closed;

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Fig. 2 shows a perspective view of the housing from Fig. 1 with an inserted frame of the closing device from Fig. 1 in an opened state of the closing device;

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Fig. 3 shows a perspective view of the housing from Fig. 2, with the closing device closed;

Fig. 4 shows a lateral sectional view of Fig. 3, and

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Fig. 5 shows an exploded view of the cover of the closing device from Fig. 1.

Figs. 1 to 4 show different views of a closing device for closing a housing opening 10 of a housing 12, which in the exemplary embodiment shown is an electrical door-drive housing. The housing opening 10 is required to allow access to the interior of the housing 12, for example in order to establish a connection 14 of a cable 16 in the interior of the housing 12.

The closing device comprises a frame 18 and a cover 20, which is shown in detail in Fig. 5 and the structure of which is explained in more detail below.

- 10 The frame 18 defines a frame opening 22 and is designed to be inserted into the housing opening 10 to be closed. In this case, the frame 18 can be particularly simply clipped into the frame opening 22 into the housing opening 10 to be closed without additional aids by means of a clip connection. For this purpose, the frame 18 has elastic projections 24 and stops 26 on its outer circumference, which are
- 15 designed to receive an edge 28 of the housing opening 10 between them in a form-fitting and/or force-fitting manner when the frame 18 is in the clipped-in state (Fig. 4). The projections 24 and the stops 26 are arranged on an outer side of the frame 18 facing the edge 28 of the housing opening 10.
- 20 In the exemplary embodiment shown, the frame 18 specifically comprises four projections 24 and a stop 26 that completely surrounds the frame 18. In principle, it would be sufficient, for fixed installation of the frame 18 in the housing opening 10, if the stop 26 is interrupted, since only the edge 28 of the housing opening 10 must be received between the stop 26 and the respective projections 24. However, the
- 25 sealing effect can be significantly increased if the stop 26 is designed to be completely circumferential, i.e. continuous.

Each of the projections 24 can be designed to be elastic, so that the frame 18 can easily be clipped into the housing opening 10 to be closed. In addition, each of the projections 24 has an outer surface 30, along which the edge 28 of the housing opening 10 runs when clipping in the frame 18.

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The frame opening 22 can be closed in cooperation with the cover 20. In the exemplary embodiment shown, the frame opening 22 can be closed by means of the cover 20 by means of a latching connection between the frame 18 and the cover 20. For this purpose, the cover 20 has a flexible latching means 32 which, when the housing opening 10 is in the closed state or when the cover 20 is in a latched state, engages behind a projection 34 formed on the frame 18 and protruding into the frame opening 22 (Fig. 4). In the present exemplary embodiment, two opposing projections 34 are provided on the frame 18.

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Referring now to Figs. 4 and 5, the structure of the cover 20 will be explained in more detail. The cover 20 comprises a cover section 36 which, in the closed state of the closing device, faces away from the housing opening 10 and thus forms part of an outer side of the housing 12. Furthermore, the cover 20 comprises a base section 38 which projects into the housing opening 10 in the closed state of the closing device.

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The cover section 36 and the base section 38 are clipped together to form the cover 20. For this purpose, the base section 38 has four clip hooks 40 which are each arranged in corner regions of the base section 38. In the clipped state of the cover 20, the clip hooks 40 each engage behind a clip counter support 42 provided
 5 on the cover section 36. Conversely, the clip hooks 40 can also be formed on the cover section 36 and corresponding clip counter supports 42 on the base section 38. Furthermore, the number of clip hooks 40 and clip counter supports 42 can differ from four, i.e. more or less than four clip hooks 40 and clip counter supports 42 can be provided. Furthermore, it is not absolutely necessary for the clip hooks
 10 40 and clip counter supports 42 to be arranged in corner regions. Rather, it is also possible to arrange the clip hooks 40 and clip counter supports 42 in between, in particular in the middle between the corner regions.

The latching means 32 is formed between the cover section 36 and the base section 38. In the present exemplary embodiment, the latching means 32 is designed
 15 in the form of a locking ring 44, which is received between the cover section 36 and the base section 38.

As can be seen particularly with reference to Fig. 5, the locking ring 44 is a slotted ring with a slot 46, which is surrounded by one end 48 of the slotted ring 4. With
 20 this structure, it is possible to compress the locking ring 44 to some extent, thereby reducing its circumference.

If the cover 20 is clipped into the frame 18, the projections 34 of the frame 18 protruding into the frame opening 22 cause the locking ring 44 to be compressed
 25 against its spring force. The locking ring 44 is immersed in a pocket provided on the cover 20, which is designed between the cover section 36 and the base section 38. Once the cover 20 is clipped into the frame opening 22 so far that the locking ring 44 passes the projections 24 of the frame 18, the locking ring 44 springs
 30 back into its original shape due to its spring force and engages behind the projec-

tions 34. The frame opening 22 is then closed. If the frame 18 is clipped into the housing opening 10 of the housing 12, the housing opening 10 is also closed.

5 So that the frame opening 22 can be opened again, the locking ring 44 has an engagement means 50, which is designed in the form of a hole 52 at the respective ends 48. A pin of snap ring pliers (not shown) can dip into each hole 52, so that the circumference of the locking ring 44 can be reduced by means of the snap ring pliers, whereby the locking ring 44 no longer engages behind the projections 34 of the frame 18 and the latching connection between the frame 18 and the cover 20
10 is detached. The cover 20 can then be removed from the frame 18 in order to gain access to the interior of the housing 12.

To detach the latching connection between the frame 18 and the cover 20 by compressing the locking ring 44 by means of the snap ring pliers, the cover 20 has
15 an access opening 54 for the snap ring pliers. In addition, the locking ring 44 including the engagement means 50 is not accessible from the outside, so that the housing closure can meet the requirements of IP class 42 of DIN EN 60529.

In order to facilitate the clipping of the cover 20 into the frame 18, but also for the
20 correct alignment of the cover 20 with respect to the frame 18, the cover 20 has at least one guide element 56, which is designed to be guided by a counter-guide element 58 formed on the frame 18 when closing the frame opening 22.

In the exemplary embodiment, the guide element 56 is designed in the form of four guide webs 60 on the base section 38 of the cover 20. The guide webs 60 are arranged in corner regions of the base section 38. The counter-guide element 58 is designed in the form of four guide grooves 62, which are arranged on the frame 18 on the side of the frame opening 22.

As can be seen from Fig. 5, the guide webs 60 also extend away from the cover section 36 on a side of the base section 38 facing away from the clip hooks 40. In other words, the guide webs 60 extend in the direction of the frame 18 in the closed state of the closing device.

The closure surface 64 is defined by the cover 20. The frame opening 22 can thus be closed by the closure surface 64 in such a way that the closure surface 64 of the frame 20, and the frame 18 are aligned flush with one another in the closed state of the closing device (Fig. 4).

With reference to Fig. 4, it can be seen in the closed state of the closing device that the frame 18 has a chamfered section 66 facing the frame opening 22, on which a collar 68 formed on the cover 20 is supported in a form-fitting manner with a side 70 complementary to the chamfered section 66. In other words, the frame 18 is designed like a funnel, wherein the cover 20 is pressed or pulled firmly into the frame opening 22 as a result of the latching connection to the frame 18, whereby the frame opening 22 is closed particularly tightly. The funnel-like configuration of the frame 18 also has the effect that the cover 20 is self-centred with respect to the frame 18 and rests precisely on the frame 18.

To increase the tightness between the frame 18 and the cover 20, a sealant can be provided. In particular, a sealing coating, for example made of rubber or silicone, can be provided on the frame 68 of the cover 20 and/or the chamfered section 66 of the frame 18.

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The result is that the frame opening 22 is tightly closed, in particular in a liquid-tight or gas-tight manner, by the cover 20 in the closed state of the closing device (Figs. 3 and 4).

List of reference signs

	10	Housing opening
	12	Housing
5	14	Connection
	16	Cable
	18	Frame
	20	Cover
	22	Frame opening
10	24	Projection
	26	Stop
	28	Edge
	30	Outer surface
	32	Snap-in latching means
15	34	Projection
	36	Cover section
	38	Base Section
	40	Clip hooks
	42	Clip counter supports
20	44	Locking ring
	46	Slot
	48	End
	49	Pocket
	50	Engagement means
25	52	Hole
	54	Access opening
	56	Guide element
	58	Counter-guide element
	60	Guide web
30	62	Guide groove
	64	Closure surface
	66	Chamfered section
	68	Collar
	70	Side

Claims

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1. A closing device for closing a housing opening (10), in particular an electrical door-drive housing, comprising:
a frame (18), which defines a frame opening (22) and is designed to be inserted into the housing opening to be closed and, in particular without additional aids, to be fastened to the housing, and
a cover (20), which is or can be detachably connected to the frame (18), by means of which the frame opening (22) can be closed in cooperation with the frame (18).

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2. The closing device according to claim 1,
characterised in that
the frame (18) can be clipped into the housing opening (10) to be closed by means of a clip connection.

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3. The closing device according to claim 2,
characterised in that,
to bring about the clip connection, the frame (18) has an elastic projection (24) and a stop (26), which are designed to receive an edge (28) of the housing opening (10) between them in a form-fitting and/or force-fitting manner at least in sections when the frame (18) is in the clipped-in state.

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4. The closing device according to claim 3,
characterised in that
the projection (24) has an outer surface (30). which ensures that, when the
frame (18) is clipped into the housing opening (10), the edge (28) of the
5 housing opening (10) runs onto the outer surface (30).

5. The closing device according to at least one of the preceding claims,
characterised in that
the frame opening (22) is closed in a liquid-tight or gas-tight manner by the
10 cover (20) in the closed state of the closing device.

6. The closing device according to at least one of the preceding claims,
characterised in that
the cover (20) defines a closure surface (64) by means of which the frame
15 opening (22) can be closed in such a way that the closure surface (64) and
the frame (18) are aligned flush with one another in the closed state.

7. The closing device according to at least one of the preceding claims,
characterised in that
20 the cover (20) has at least one guide element (56), which is designed to be
guided by a counter-guide element (58) formed on the frame (18) when
closing the frame opening (22).

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8. The closing device according to at least one of the preceding claims,
characterised in that
the cover (20) has a collar (68), which is circumferential at least in sections
and extends outwards and which is supported on the frame (18) in the
closed state of the closing device.
9. The closing device according to claim 8,
characterised in that
the frame (18) has a chamfered section (66) facing the frame opening (22),
on which the collar (68) of the cover (20) is supported, in particular in a
form-fitting manner, in the closed state of the closing device, with a side
(70) complementary to the chamfered section (66).
10. The closing device according to at least one of the preceding claims,
characterised in that
the frame opening (22) can be closed by means of the cover (20) by means
of a latching connection.
11. The closing device according to claim 10,
characterised in that
the cover (20) has a flexible latching means (32) to implement the latching
connection between the cover (20) and the frame (18), which latching
means engages behind a projection (34) formed on the frame (18) and pro-
truding into the frame opening (22) in the latched state of the cover (20).

12. The closing device according to claim 11,
characterised in that
the latching means (32) has an engagement means (50), in particular for a
tool, by means of which, preferably exclusively, the latching connection be-
5 tween the cover (20) and the frame (18) can be detached.
13. The closing device according to claim 12,
characterised in that
the latching means (32) and the engagement means (50) are arranged re-
10 cessed in the cover, and in that the cover (20) has an access opening (54)
for the engagement means (50).
14. The closing device according to at least one of claims 11 to 13,
characterised in that
15 the cover (20) has a cover section (36) and a base section (38), and in that
the latching means (32) is formed between the cover section (36) and the
base section (38).
15. The closing device according to claim 14,
20 characterised in that
the latching means (32) is a locking ring (44) which is received between the
cover section (36) and the base section (38) of the cover (20).
16. The closing device according to claim 14 or 15,
25 characterised in that
the cover section (36) and the base section (38) are clipped together to
form the cover (20).

17. A housing (12), in particular a door-drive housing, having a housing opening (10) and a closing device according to at least one of the preceding claims.