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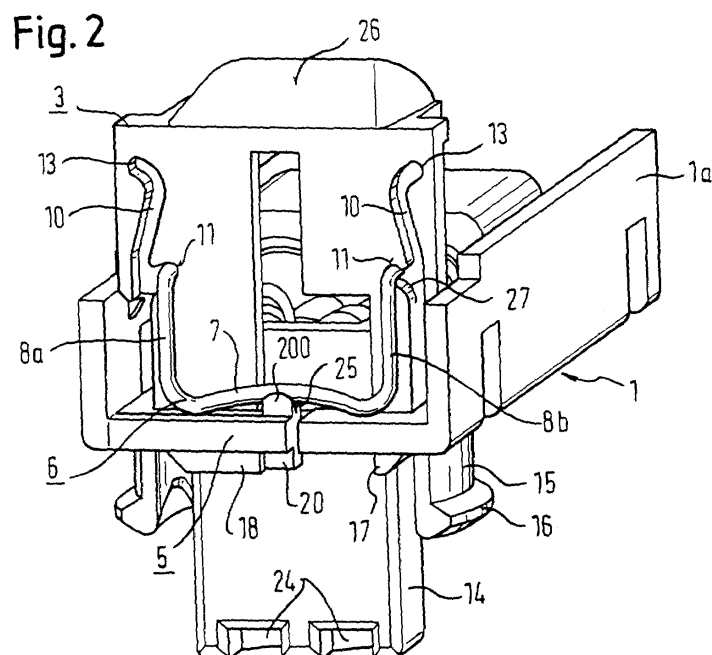
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(54) **Connector plug**

(57) The invention concerns a connector plug comprising a first connector plug shell (1), a second connector plug shell (2) for fitting on the first connector plug (1) and a locking device (3) for the securing of the second connector plug shell on the connector plug shell (1), where the locking device (3) can only be fixed in a first-locked position or end-locked position. The connector plug has a securing device (6), which with the released

plug connector holds the locking device (3) in the front-locked position where with complete insertion of the second connector plug shell (2) a pressure element (5) which is formed onto the connector plug floor (21), actuates the securing device (6). The securing device (6) which, when it is in the first-locked position (11), prevents the introduction of the locking device (3), releases the latter so that the locking device (3) can be locked into the end-locked position.



Description

[0001] The present invention concerns a connector plug comprising a first and a second connector plug shell which has at least two supplementary contacts where the first or the second connector plug shell has a locking device which can be moved from a first release position to a second release position in which both connector shells are locked together, where the first or the second connector plug shell has a securing device which fixes the locking device in the first release position from which it can be released.

[0002] The invention is used in connector plugs in which the loosening of the two connector plug shells from one another is to be prevented.

[0003] The invention is used more particularly in automotive technology, most importantly in airbag retention systems. In the electrical connection of an airbag system, particularly high safety requirements are imposed on the connection. In air bag systems, it is particularly important to ensure that the connector plug is not used incorrectly, or that the connection is not loosened unintentionally. A construction-related requirement placed on connector plugs in airbag systems is a shell of a design which is flat in the direction of insertion, where the cable outlet is usually on the side and the direction of the insertion face is usually at 90° to the connecting cable. This situation is often met on the ignition mechanism of an airbag located on the impact dish of the steering wheel where available space is small.

[0004] In order to increase the functioning security of such connector plugs, a locking device is often used which is introduced into the connector plug whereby loosening of the counter-plug from the connector plug is more securely prevented. The locking device can be a secondary lock.

[0005] A connector plug with a secondary lock and a side cable outlet is known from WO 97/41623, which is inserted into a coupling piece fitted with a shorting bar, which is located in an ignition base with contact pins. For secondary locking of the connector plug into the coupling piece, a shackle is inserted along the connector plug locking arms so that the locking arms can no longer escape from their seating in the ignition base.

[0006] Such a construction has several drawbacks. The secondary lock is not fitted on the connector plug so that it cannot be lost. Furthermore, it is not reliably obvious to the operative, whether the connection between the connector plug and the counter-plug is completely successful.

[0007] It is therefore the object of the present invention to make available a connector plug in which the insertion of the locking device (secondary lock) is only possible with a successful joining of the two connector plug shells.

[0008] According to the invention, this purpose is solved by one of the connector plug shells having a pressure element with a pressure surface acting on the se-

curing device and a bump which touches the other connector shell, where if the connector plug shells are completely joined together, the pressure element acts on a sector of the securing device in such a way that it releases the locking device and the latter can be moved from the first position into the second position.

[0009] Preferably, the pressure element of the connector plug is a spring arm located in one of the connector plug shells

[0010] Furthermore, the first or the second connector plug shell can have a connection area with the pressure surface extending from the connection area in the direction of insertion.

[0011] In a preferred embodiment of the invention, the securing device is a spring element, which has at least one arm with a hook which locks into a recess of the locking device when the locking device is in the first release position. Furthermore, the securing device can be a spring element with a connection sector and two arms, each of which has a hook where both arms project at an angle when the surface of the connection sector is bent whereby the locking device is released.

[0012] The locking device can furthermore have slide-ways, which are formed in a direction opposite the excursion device of the two arms and have an end-recess which receives the hooks.

[0013] In a preferred embodiment of the invention, the locking device is a secondary lock with tongues which lie against the first locking lugs when the connector plug shells are joined and lock the connector plug shells together. One of the connector plug shells can have a contact pin and a recess and the other connector plug shell an insertion face with at least one sleeve contact and a sprung shoulder, which is arranged on a first locking lug which extend parallel to the insertion face. In the connection of the two connector plug shells, the first locking lug is bent vertically to the direction of insertion, until the shoulder reaches into the recess where the locking device has at least one leg which is introduced from a release position parallel to the direction of insertion between the insertion face and the locking lug, whereby the first locking lug is bent into a position in which the leg prevents the first locking lug from bending.

[0014] One of the connector plug shells normally has a lower shell half with a floor and two sidewalls, as well as a connector plug shell cover. In the airbag system application, the insertion face of the connector plug is preferably formed onto the underside of the floor of the connection surface which receives the second connector shell. The cable outlet preferably lies at an angle of 90° to the insertion face at one end of the connector plug shell. Any other angle between the insertion face and the cable outlet is nevertheless possible.

[0015] The pressure element of the connector plug is preferably arranged on the floor, where the locking sector of the securing device lies against the pressure element inside the shell. The two arms of the securing device are preferably bent at right angles and extend

against the direction of insertion. Both free ends of the arms have bent hooks which reach into the slideways which are recessed into the locking device.

[0016] The slideways in the locking device preferably have two recesses for each arm, that is to say, locking positions in which both hooks of the arm can be locked either in a front-locked position or an end-locked position.

[0017] The pressure element is preferably cut into the floor of the connector with the fixed end lying against one of the two sidewalls and the free end of the pressure element extending in the direction of the centre of the connector plug. The free end of the pressure element preferably has a bump on the side of the floor facing the other connector plug shell, which acts in concert with the securing device when the other connector plug shell, that is to say, the counter-plug, is fitted from below. When it is introduced over the bump, the counter-plug presses the free end of the pressure element into the interior of the connector plug shell. Since the connection sector of the securing device lies against the pressure element, the free end of the pressure element presses the central part of the connection sector into the interior of the connector plug shell.

[0018] Two arms are formed on the cover of the connector plug shell which project into the interior of the connector plug shell and fix both ends of the connection sector to the floor of the connector plug.

[0019] If, following the insertion of the counter-plug, the pressure element is now pressed into the interior of the connector plug shell, the central part of the connection sector is lifted and the ends of the connection sector are simultaneously fixed.

[0020] In the position of rest, the securing device is so shaped that both the hooks of the spring arm lie in the slideways in the front-locked position. Through the lifting of the free end of the beam and the resulting bending of connection sector, the hooks on the free ends of the arms of the securing device are now forced out of the front-locked position. Only now can the locking device be pressed against the tension of the spring into the end-locked position, when the hooks of the securing device can move freely in the slideways and following the insertion of the counter-plug into the slides, are moved against the direction of insertion and against the spring tension and after traversing a dead point, are led apart from one another and then lock into the end-locked position in an end-recess and actively lead the locking device downwards.

[0021] If both hooks of the securing device are now in the end-locked position, the locking device prevents a loosening of both the connector plug shells. Following the assembling of the connector plug, the securing device is usually in the front-locked position. The locking device can only be actuated if one of the connector plug shells has been correctly inserted into the other connector plug shell (for example the ignition device of an airbag), otherwise the locking device locks in the uninsert-

ed position. An insertion of the locking device is not possible.

[0022] Because of the shape of the slideways which are recessed in the locking device, the latter can only be in a front-locked or an end-locked position (Go-no go principle). The locking device can be actuated by exerting pressure on it from above, after the counter-plug has been inserted. The locking device can therefore be unlocked and made secure by a single movement (one step assembly).

[0023] The invention will be described in greater detail in the following embodiment example which refers to diagrams.

Fig. 1 shows the first connector plug shell and the locking device in the front-locked position;

Fig. 2 shows the securing device in the slideway in the front-locked position ;

Fig. 3 shows the securing device, the connector plug and the locking device after complete insertion of the second connector plug shell (not shown);

Fig. 4 shows the locking device in the end-locked position

Fig. 5 is a diagram of the second connector plug shell

[0024] Next, Fig. 1 to 4 are referred to in which the locking device is shown in various positions.

[0025] Fig. 1 shows a perspective view of the first connector plug shell 1, which has a lower connector plug shell half 1a, with two sidewalls 22,23, a floor 21 and a connector plug shell cover 4. On floor 21 is formed the insertion face 14. The insertion face 14 has on its underside two openings 24, which contain contact sleeves for the reception of contact pins 31 of a second connector plug shell 2 (Fig. 5). On the floor are likewise formed two locking lugs 15, which on being introduced into the second connector plug shell 2, are led into recesses 32. Each locking lug 15 has on its outer side a shoulder 16, which reaches into the recess 32 of the second connector plug shell and prevents any loosening of the connector plug. The locking device 3 is shown here in the front-locked position. The locking device 3 has legs 17,18 which extend over openings in the floor 21 (not shown) of the first connector plug shell 1, between the insertion face 14 and the locking lug 15 in the direction of insertion.

[0026] Two fingers 19a and 19b extend from the connector plug shell cover 4 into the interior of the first connector plug shell 1

[0027] Fig. 1 and 2 show the front half of the shell cut away, in order to be able to show further details. The fingers 19a and 19b, which are not shown, fix a part of

the securing device 6 to the floor of the first connector plug shell. The securing device 6 consists of a connection sector 7 lying substantially horizontally on the floor 21 of the connector plug 1 and two spring arms 8a and 8b. In the floor 21 of the first connector plug shell 1 is also provided a pressure element 5. The pressure element 5 has a free end 5b in the centre of the connector plug shell and a fixed end 5a on one of the sidewalls 22,23. On its free end, the pressure element 5 has a bump 20 and inside a pressure surface 200. Inside the connector plug shell 1, the pressure surface 200 can have a V-shaped slot 25 in which the connection sector 7 comes to lie in the securing device 6. If the second connector plug shell is not introduced, the pressure element 5 lies parallel to the floor 21 of the connector plug shell 1.

[0028] If the connector plug shell 1 is now fitted on the second connector plug shell (not shown), the pressure element 5 is pressed into the interior of the connector plug shell by the surface 20 on the underside of the floor of the connector plug shell 1. The central area of the connection sector 7 is pressed upwards by the pressure surface 200, both ends being fixed to the floor by the arms 19a and 19b which are not shown in Fig. 2. By means of this curvature of the connection sector 7, the spring arms 8a and 8b are swung outwards. The hooks 9a,9b of the spring arms 8a,8b (Fig. 3) are led into slideways 10 and are shown in Fig. 2 in the front-locked position in the recess 11.

[0029] As shown in Fig. 3, the hooks 9a and 9b of the spring arms 8a and 8b are pressed outwards from their recess 11, by the lifting of the pressure element 5 and the simultaneous bending of the connection sector 7. The locking device 3 can now be moved in the direction of insertion, since the hooks 9a,9b no longer prevent the insertion of the locking device 3. By means of pressure on the upper side 26 of the locking device 3, the latter can now be inserted into the first connector plug shell 1. During the insertion of the locking device 3, the hooks 9a and 9b are moved towards one another in the slideways 10 against the tension of the spring, by means of the excursion of the central area of the connection sector 7, until they reach a dead point 12 in the slideways 10. After passing through this dead point 12, the free ends 9a and 9b are led apart from one another and are locked in the end-locked position in an end-recess 13. The locking device 3 is actively moved into the end-locked position by the spring arms.

[0030] As can be seen from Fig. 2 and 3, the locking device 3 is fixed on the connector plug shell 1 in such a way that it cannot be lost. If the hooks 9a of the securing device 6 are in the front-locked position and if the locking device is to be removed upwards from the connector plug shell 1, a shoulder 27 must be overcome. The spring arms 8a and 8b must be pressed apart, for which a certain amount of strength is required. The locking device 3 cannot therefore spontaneously fall out of the connector plug shell 1.

[0031] Fig. 4 shows the locking device in the end-locked position. The legs 17 and 18 slide downwards into the space between the locking lugs 15 and the insertion face 14 slides in the direction of insertion. The legs 17 and 18 have a different shape. Leg 18 also extends on the side of the insertion face 14 facing the observer, whilst leg 17 extends principally on the sides of the insertion face 14. If, for example, a shorting bar is fitted on the insertion face, electrically conducting lamina (not shown) which are linked to one another lie on each of the openings 24, so that both electrical contacts in the openings 24 have the same potential. Through the form of the leg 18, it is possible to lift one side of the shorting bar, so that the two contacts in openings 24 no longer have the same potential

[0032] Fig. 5 shows diagrammatically the second connector plug shell 2 on which the first connector plug shell 1 with the insertion face 14 is inserted. For a clearer representation, the connector plug shell 2 has been rotated in the plane through 90°, so that the recesses 32 into which the locking lugs 15 of the connector plug shell 1 are inserted become more clearly visible. The connector plug shell 2 is substantially cylindrical in shape. On its upper surface, the connector plug shell has a ring-shaped widening 28. When the insertion face 14 is introduced into an opening 29 of the connector plug shell 2, the locking lugs 15 reach into the guides 27. The surface 30 now presses on the bump 20 of the pressure element 5 and presses the latter into the interior of the shell of connector plug 1. The contact pins 31 are introduced into the openings 24. The contact pins 31 are introduced into contact sleeves 310 which are shown dotted in Fig. 3. The locking device 3 can now be fully inserted into the connector plug shell 1, the legs 17 and 18 are completely lowered, so that the shoulders 16 on the locking lugs 15 prevent any loosening of connector plug shell 1 from connector plug shell 2.

[0033] By means of the plug according to the invention which has been described above, a system is provided which is easy to operate. The locking device is only stable in two positions, the front-locked position and the end-locked position, so that the operative can readily recognise whether following the bringing together of the two connector plug shells, the locking device is in the end-locked position or otherwise. If the locking device has not been fully inserted, then it is again pressed out through the spring tension of the securing device, whilst an intermediate position between the front-locked and the end-locked position is not possible. Furthermore, the locking device is fitted on a connector plug shell in such a way that it cannot be lost. Summarising, a connector plug is provided which makes it possible to check, whether both the connector plug shells are correctly fitted together, with the locking device being easily able to be moved between two positions only.

Claims

1. A connector plug comprising a first (1) and a second (2) connector plug shell which have at least two supplementary contacts where the first or the second connector plug shell has a locking device (3) which can be moved from a first release position to a second release position in which both connector plug shells are locked into one another and where the first or the second connector plug shell has a securing device (6) which fixes the locking device in the first release position in such a way that it can be loosened, characterised by the fact that one of the connector plug shells has a pressure element (5) with a pressure surface (200) which acts on the securing device (6) and a bump (20) which touches the other connector plug shell where, when the connector plug shells are completely joined, the pressure element (5) acts on a sector of the securing device (6) in such a way that it releases the locking device (3) and the latter can be moved from the first position to the second position.

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 2. A connector plug according to Claim 1 characterised by the fact that the pressure element (5) is a spring arm fitted on one of the connector plug shells.

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 3. A connector plug according to Claim 1 or 2, characterised by the fact that the first (1) or the second (2) connector plug shell has a connecting surface where the pressure surface (200) extends from the connecting surface in the direction of insertion.

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 4. A connector plug according to one of the Claims from 1 to 3, characterised by the fact that the securing device (6) is a spring element which has at least one spring arm (8a,8b) with a hook (9a,9b) which locks into a recess (11) of the locking device (3) when the locking device (3) is in the first release position.

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 5. A connector plug according to one of the Claims 1 to 4, characterised by the fact that the securing device (6) is a spring element with a connecting sector (7) and two spring arms (8a,8b) each of which has a hook (9a,9b), where the two arms are bent angularly when the connecting sector (7) is bent by the surface (200), releasing the locking device (3)

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 6. A connector plug according to Claim 5, characterised by the fact that the locking device (3) has slide-ways (10) which are angularly bent against the curvature of the two spring arms (8a and 8b) and have an end recess (13) which receives the hook (9a,9b)

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 7. A connector plug according to one of the foregoing Claims, characterised by the fact that the locking device (3) is a secondary locking with tongues (17),
- which, when the two connector plug shells are joined, lie against the first locking lug (15) and lock the connector plug shells together.
8. A connector plug according to one of the Claims from 1 to 6, characterised by the fact that one of the connector plug shells has at least one contact pin (31) and a recess (32) and the other connector plug shell has an insertion face (14) with at least one sleeve contact (310) and a sprung shoulder (16) which extends parallel to the insertion face (14) when the two connector plug shells are joined, the first locking lug (15) bends vertically to the direction of insertion, until the shoulder (16) reaches into the recess (32) where the locking device (3) has at least one leg (17) which starting from one of the release positions is introduced parallel to the insertion direction between the insertion face (14) and the locking lug (15), whereby the first locking lug (15) is locked into a position in which the leg (17) prevents any bending of the first locking lug (15).

Fig. 1

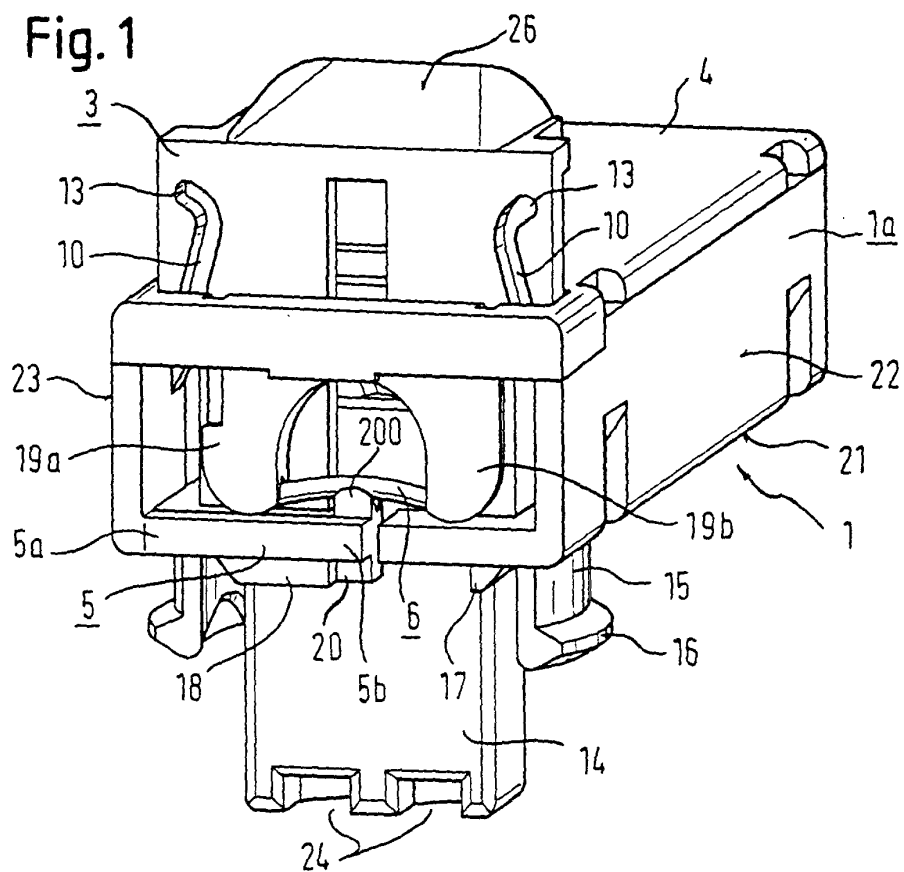


Fig. 2

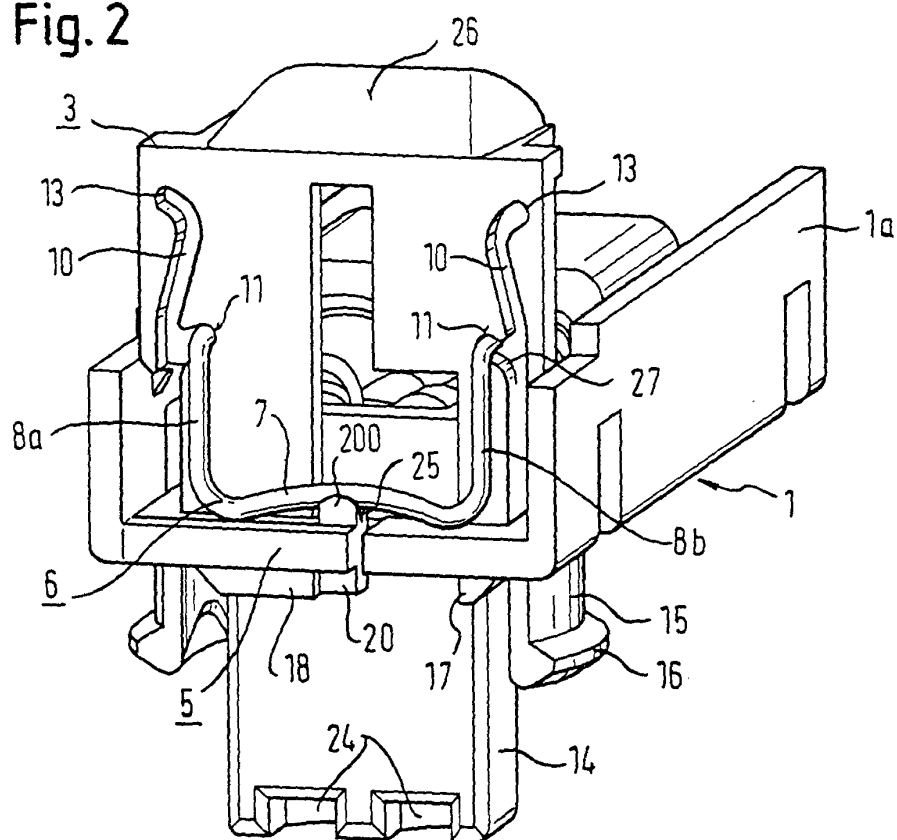


Fig. 5

