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(54) Electrical connection system

(57) The invention relates to a connecting system with at least a first and a second connector element which are insertable, one into the other, comprising an insertion obstruction device, and further comprising an abutting arrangement being connected to said first connector element via a resilient, preferably arm-like connecting member and abutable against the second connector element in at least a portion of the insertion path. Said abutting arrangement thereby forms a part of the insertion obstruction device and is movable in insertion direction in an abutted state in respect of the first connector element wherein the abutted state is deactivatable upon further insertion of the connector elements and said abutting arrangement is movable in the insertion direction in respect of the second connector element.

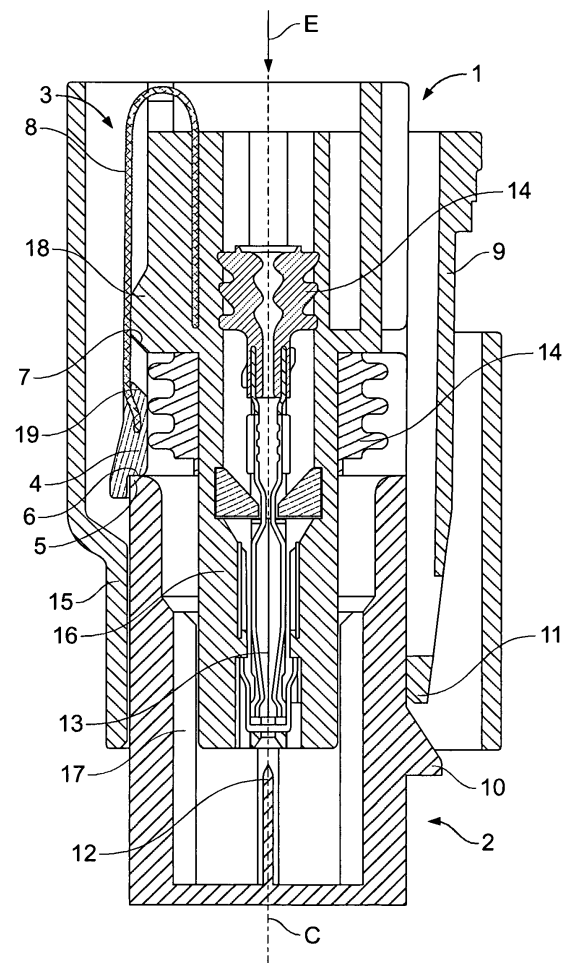


Fig. 1A

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Description

[0001] The invention refers to the field of connection systems with at least one first and one second connector element which are insertable one into the other. In particular, the invention relates to such connection system with at least one first and one second connector element which are insertable one into the other, comprising an insertion obstruction device, and further comprising an abutting arrangement being connected to said first connector element via a resilient, preferably arm-like connecting member and abutable against the second connector element in at least a portion of the insertion path according to the preamble of claim 1.

[0002] Connection systems are used especially e.g. for multipolar electrical connectors and are applied, amongst others, in automotive engineering, mechanical engineering and in electrical machines and devices, where they serve, e.g., as electrical connectors for detachably connecting junctions of cables and are known in a vast variety of embodiments.

[0003] When mounting conventional state of the art connectors, especially multipolar electrical connectors, there is a problem that the connectors usually have a considerable insertion resistance. At the same time, often several pressure points occur over the course of the insertion path with the result that the assembler obtains no precise feedback concerning completed and accurate mounting and therefore, spuriously acts on the assumption of an accurate and complete establishing of the connection even though the connector is not in fact mounted completely and accurately. In this case, a defective mounting will occur which possibly may not be recognized during the production process requiring additional and laborious controlling procedures.

[0004] Furthermore, the progression of force occurring along the insertion path during mounting of the connector can hardly be predefined and adapted to the mounting requirements in an optimal way. Moreover, also an objectionable or unwanted connecting of the connector parts may occur if the insertion resistance is too small. For this reason, the working efficiency is significantly reduced and incorrect mounting cannot reliably be prevented without controlling efforts.

[0005] In order to solve the above-mentioned problems, EP 0 923 167 A1 proposes a connector, comprising a first connector element and a second connector element which can be pushed one into the other and, upon complete insertion of the connector elements, said elements releasibly be locked together. The first connector element comprises an arm-like abutting and locking member being resiliently connected to said first connector element and a spring element, providing an insertion obstruction force, which is directed against insertion direction of the connector elements and capable of pushing apart the connector elements, attached to the second connector element and abutable in a portion of the insertion path against the arm-like abutting and locking

member of the first connector element. Only in case of overriding the insertion obstruction force of the spring element, a complete mounting of the connector elements and engaging of the arm-like abutting and locking member of the first connector element with a locking counterstructure of the second connector element, can be achieved.

[0006] In view of the related art it is, therefore, an object of the present invention to provide a connecting system with an insertion obstruction device according to the preamble of claim 1 providing for such insertion obstruction device a simple and single integral component arrangement which can be either retroactively fitted or simply integrated into line productions of existing connector designs with reasonable adaptation effort and can be exactly adjusted considering progression of mounting force over course of the insertion path and point of deactivation of insertion obstruction device in a wide range to the mounting prerequisites of the connectors and eliminates the above-mentioned disadvantages.

[0007] This object can be solved according to the present invention by a connecting system with at least a first and a second connector element which are insertable, one into the other, comprising an insertion obstruction device, and further comprising an abutting arrangement being connected to said first connector element via a resilient, preferably arm-like connecting member and abutable against the second connector element in at least a portion of the insertion path, wherein said abutting arrangement is part of the insertion obstruction device and movable in insertion direction in an abutted state in respect of the first connector element wherein the abutted state is deactivatable upon further insertion of the connector elements and said abutting arrangement is movable in the insertion direction in respect of the second connector element.

[0008] It is an advantage of the present invention that the insertion forces can be adjusted to the mounting requirements over a wide range of force and precisely preset. At the same time, the insertion forces can largely be maintained independently from mounting temperature, humidity, contamination of the contacting areas, unbalanced insertion force, canting, squeezing or compression of connector housings, mounting caused wear in case of multiple mounting procedures and other factors.

[0009] Moreover, a construction according to the present invention permits the exertion of large insertion obstruction forces and insertion obstruction works without additional constructional expense or causing overstraining of material and construction of the connector elements. Additionally, the connector arrangement is set free of tension after releasing of the insertion obstruction device causing a relaxation of the loaded spring element.

[0010] Furthermore, the insertion obstruction device can be configured to be exchangeable or retrospectively mountable so that it becomes possible to provide connection systems with different mounting characteristics and so to organize a modular system of connectors and

insertion obstruction devices at little production expenses.

[0011] It is also possible to adapt the rising characteristics of the insertion obstruction force preferably to the mounting prerequisites and to the type and construction and the operating conditions of the connectors. It may often be favourable and can easily be achieved to produce by such insertion obstruction device an insertion obstruction force being substantially larger than the frictional forces during mounting of the connector wherein the insertion obstruction force can be provided over a substantial portion of the insertion path by which, in case of incorrect mounting of the connection, the connector parts, for example, can be pushed apart and largely be separated from one another so that, for example, the connector parts automatically become undone. Thus, any incorrect mounting can immediately be recognized.

[0012] Furthermore, the point of deactivation of the insertion obstruction device along the insertion path can be exactly set and preset in compliance with the technical requirements. It may often be beneficial to deactivate the insertion obstruction device prior to occurrence of a maximum of a sum of all other insertion resistances except the ejecting force. In such way, it is, for example, possible to reliably ensure the accurate mounting even in cases of tight connectors, which are difficult to be mounted, featuring several pronounced pressure points, which otherwise would deceive the assembler. Thus, the delusive pressure points can reliably be overridden by the exceeding moment of force, when abruptly deactivating the insertion obstruction device, so that accurate mounting can be secured.

[0013] Upon other terms and conditions it may be preferable to arrange the point of deactivation of the insertion obstruction device at a later point of the insertion path or possibly after locking of the connector elements so that the connector elements in any circumstance become undone unless insertion and locking of the connector elements is thoroughly completed. In doing so, the load peak generated by the insertion obstruction device versus the insertion stroke of the connector elements relative to one another and in relation to the meshing action of for example electrical contacts of contact pins and contacting counter-structures or for example sealing structures can be phased in accordance with the equipment and construction of the connector and with the customers' mating requirements.

[0014] In an advantageous manner, the maximum insertion obstruction force is dimensioned so that this force is significantly larger, preferably substantially at least twice as large as the maximum of the sum of all other insertion resistances except the ejecting force which occurs during mounting of the connector parts along the insertion path. In this way, by appropriately deactivating the insertion obstruction device, a reliable and completed mounting and locking of the connector parts can be ensured. By such specification, a so-called Go-NoGo-principle, that prevents inaccurate assembly as well as in-

complete mounting, can be realized in a simple and efficient manner.

[0015] A further advantage of the connecting system according to the present invention can be that, in case of a force controlled assembly, in which a force for mounting the connector parts is preset and applied, the insertion obstruction device is only deactivated upon exceeding of a predefined minimum mounting force so that only in such case the mounting of the connector part can subsequently be accomplished.

[0016] In a preferred embodiment according to the present invention, the insertion obstruction device may comprise a spring element made of a resilient, preferably metal-like material by which the abutting arrangement is guided and resiliently connected to the first connector element. By this integration of a preferably metal-like spring element, it is possible in an especially favourable manner to provide an insertion obstruction force of a predefined value over a longer partial distance of the insertion path which simultaneously may serve as ejecting force which means that by this ejecting force, incompletely mounted connector elements can substantially be separated from one another so that the connector elements, for example, come undone. In this case, it is possible to verify the accurate mounting of the connector elements without controlling efforts. Furthermore, such construction provides the opportunity not only to resiliently connect the abutting arrangement to the first connector element but also to simultaneously hold in position and guide the abutting arrangement by said spring element and further define a deactivation behaviour of the insertion obstruction device.

[0017] In a further preferred embodiment according to the present invention, the abutting arrangement may comprise a shaped part of a preferably polymeric material being attached to one free end of the spring element. Such abutting arrangement can be formed three-dimensionally in an especially functional, simple, and competitive way and be provided with freely shapable functional portions so that optimal operation of the insertion obstruction device can be achieved at little manufacturing expenses.

[0018] In a further preferred embodiment according to the present invention, said shaped part of the abutting arrangement may comprise at least one, preferably two, specifically formed contacting faces being arranged for interacting with at least one of the connector elements. By such design of section, a manifold and versatile adjustment of the interaction of the abutting arrangement and connector elements can be achieved by which additional degrees of constructional freedom are made accessible so that a precise tuning of the characteristic curve of mounting force over course of the insertion path and point of deactivation of insertion obstruction device in compliance with the mounting prerequisites of the connector design and equipment and the customers' requirements, can be provided.

[0019] In a further preferred embodiment according to

the present invention, the insertion obstruction device and abutting arrangement are producible in a single integral part. By such construction, the insertion obstruction device can easily be configured exchangeable or retrospectively mountable so that it becomes possible to provide connection systems with different mounting characteristics and so to organize a modular system of connectors and insertion obstruction devices with little production expenses. Additionally, it is conceivable to simply integrate such insertion obstruction device into line productions of existing connector designs with reasonable adaptations and to exactly adjust the characteristic curve of mounting force over course of the insertion path and point of deactivation of insertion obstruction device in a wide range to the mounting prerequisites of the connector design and equipment and the customers' requirements. An insertion obstruction device according to this embodiment of the present invention may thus be of a single material exhibiting an abutting arrangement being composed of a specifically formed portion of for example a homogenous polymeric or metal-like spring element or a composite component part of two material components like a metal-like spring element to which a shaped part of for example a polymeric material is e.g. integrally moulded or materially bonded.

[0020] In a further preferred embodiment according to the present invention, the abutting arrangement may - in a portion of the insertion path - simultaneously be abutable in the insertion direction against functional sections of the housings of both connector elements in which the first connector element is abutable against the second connector element via the abutting arrangement. By such construction, it is possible to achieve an especially defined deactivation behaviour of the insertion obstruction device by simple and efficient constructional means. By a construction like this, it is additionally possible to arrange tapered portions in the contact area of both connector elements so that the abutting arrangement is approximately parallelly dislodged from the centre line and ejected by a sort of "*plum kernel effect*". By this arrangement, a steeper slope of insertion obstruction force can be achieved shortly prior to deactivation of the insertion obstruction device (3) together with very pronounced pressure point.

[0021] In a further preferred embodiment according to the present invention, the abutting arrangement may, in a portion of the insertion path, be movable perpendicularly to the insertion direction and in its entirety be removable from the centre line connecting the centers of the connector elements in the insertion direction. By this means, said abutting arrangement can be deactivated and completely be removed from the position between both connector elements and thus, the travel enabling the complete mounting of the connector elements is cleared wherein the abutting arrangement rises, for example, onto the second connector element and slides along said second connector element while providing, for example, a further definable frictional force.

[0022] In a further preferred embodiment according to the present invention, an ejecting force which is directed against the insertion direction may be producible by the spring element. In this embodiment, it is possible to generate the ejecting force in a direction opposite to the insertion direction by the spring element without depending on auxiliary devices and thus, to realize the advantages of the ejecting force capable e.g. of substantially separating the connector elements from one another so that said elements, for example, come undone. In this case it is possible to verify the accurate mounting of the connector elements without controlling efforts.

[0023] In a further preferred embodiment according to the present invention, the insertion obstruction device may comprise a preferably substantially U-shaped leaf spring or structural spring which is preferably loadable with a force substantially in a direction of one arm of said leaf spring or structural spring. By such construction, the aforementioned demands in respect of the ejecting force can be realized in a constructionally inexpensive and efficient way. Furthermore, such construction provides the opportunity not only to resiliently connect the abutting arrangement to the first connector element but also to simultaneously hold and guide the abutting arrangement by said spring element and define a deactivation behaviour of the insertion obstruction device.

[0024] In a further preferred embodiment according to the present invention, the insertion obstruction device may abruptly be deactivatable upon insertion of the connector elements. In such case, by the abruptly suspended ejecting force by deactivation of the insertion obstruction device and simultaneous persistence of an insertion operation force being effective in the insertion direction and applied to the connector elements, an exceeding moment of force in the insertion direction compared to the entirety of all other insertion resistance forces except the ejecting force, consisting mainly of the frictional and meshing forces of connector housings, sealing components and electrically contacting structures, occurring during mounting is achievable. Thus, a strengthened momentum of movement in insertion direction can be effected wherein the other insertion resistance forces, occurring during further insertion of the connector elements, except the ejecting force can be overcompensated by this exceeding moment of force by an additional force excess amount. Thereby, a complete insertion and reliable locking of the connector elements is supportable and/or ensurable. In this way, a reliable so-called *Go-NoGo*-principle can simply be implemented by which an inaccurate or uncompleted mounting of the connector elements can reliably be prevented.

[0025] In a further preferred embodiment according to the present invention, when inserting the connector elements in the insertion direction, the insertion obstruction device may be deactivatable prior to occurrence of a maximum of a sum of all other insertion resistances except the ejecting force. By such construction, it is, for example, possible to reliably ensure the accurate mounting even

in cases of tight connectors, which are difficult to be mounted, featuring several pronounced pressure points, which would otherwise deceive the assembler. In this case, the delusive pressure points can be reliably overridden by the exceeding moment of force, when abruptly deactivating the insertion obstruction device, so that accurate mounting can be secured. Furthermore, the point of deactivation of the insertion obstruction device along the insertion path can be exactly set and preset in compliance with the technical requirements. In doing so, the load peak generated by the insertion obstruction device versus the insertion stroke of the connector elements relative to one another and in relation to the meshing action of, for example, electrical contacts of contact pins and contacting counter-structures or for example sealing means can be phased in accordance with the customers' mating requirements.

[0026] In a further preferred embodiment according to the present invention, a minimum mounting force for inserting and mounting the connector elements may be definable by the insertion obstruction device, upon excess of said minimum mounting force, the insertion obstruction device may be deactivatable and mounting of the connector elements may be achievable. Such construction may especially be preferred in case of force controlled mounting as it comes into effect, for example, in case of assembly by hands without support or with not-path-controlled or not-path-restricted auxiliary mounting devices to produce a well-defined exceeding moment of force for securing the correct mounting. By such means, a well-defined force feedback is given to the assembler and thus, an accidental connecting of the connector elements can be prevented and simultaneously, in case of desired locking of connecting elements, an accurate mounting and securing can be ensured.

[0027] In a further preferred embodiment according to the present invention, a maximum of the ejecting force over the course of the insertion path may preferably be substantially at least twice as large as the maximum of all other insertion resistances over the course of the insertion path except the ejecting force. By such construction, the exceeding moment of force after deactivation of the insertion obstruction device has a sufficient magnitude to reliably ensure the desired accurate mounting of the connector elements.

[0028] In a further preferred embodiment according to the present invention, the spring element may be deformable upon insertion of the connector elements by direct action of an insertion force and tiltable in a linkage point of the abutting arrangement. Such tilting of the spring element can be used in a preferable manner to incline the abutting arrangement from its initial position and thus, to support the deactivation of the insertion obstruction device.

[0029] In a further preferred embodiment according to the present invention, by deformation of the spring element caused by the insertion force, a tilting of an abutting surface of the abutting arrangement in respect of a sec-

tion of the housing of the second connector element being in contact with said abutting surface may be achievable by which the abutting arrangement may be tiltable off its abutting position and the insertion obstruction device may be deactivatable. By such construction, the spring element can actuate, induce or trigger the deactivation of insertion obstruction device without assistance or co-operation from further appliances.

[0030] In a further preferred embodiment according to the present invention, said tilting of the abutting arrangement may be actuatable and/or supportable by a tilting supporting arrangement which is preferably operatable upon insertion of the connector elements. By influence of such additional tilting supporting arrangement, the deactivation characteristics and deactivation reliability of the insertion obstruction device can potentially be improved so that a more precise engagement behaviour can be effected.

[0031] In a further preferred embodiment according to the present invention, said tilting supporting arrangement may be an integral functional portion, preferably a tapered portion or inclined portion of a section of the housing of one connector element. By such tapered portion of the housing of one connector element, the tilting supporting arrangement guaranteeing the precise deactivation of the insertion obstruction device, can be provided without additional work and expense.

[0032] In a further preferred embodiment according to the present invention, the tilting supporting arrangement may be attached to a section of the housing of that connector element to which the abutting arrangement is resiliently connected and is approachable in an abutted state of the abutting arrangement towards the abutting arrangement and is interactable with said abutting arrangement. This is, an especially expedient enhancement of the foregoing embodiment which conducts a precise deactivation of the insertion obstruction device when inserting the connector elements.

[0033] In a further preferred embodiment according to the present invention, the spring element and the abutting arrangement may be interactable with at least one section of the housing of one connector element or of two connector elements in a manner that the abutting arrangement, which is soundly abutting against at least one portion of one connector element in case of no or little deformation of the spring element, may be tiltable off the abutting position by further deformation of the spring element and/or by interaction with at least one section of the housing of one connector element or two connector elements and may be slidable off said abutting position. By expediently taking advantage of the elaborate interaction of said several components, e.g. spring element, abutting element and portions of the housings of the connector elements, a versatile and precise adaptation of the deactivation characteristics of the insertion obstruction device to the mounting demands is achievable.

[0034] In a further preferred embodiment according to the present invention, the connecting system may further

comprise a locking mechanism which may preferably comprise a locking means, preferably a locking arm, being loaded by an elastic force, attached to one connector element and a locking counter means attached to the other connector element whereby the connector elements are lockable in a mounted state. By such locking mechanism, a reliable locking and securing of the connector elements can be ensured and thus, accidental loosening or untightening of the connection can be prevented which is a special requirement in many fields of the application which demand or presuppose, in a particular manner, a high reliability of the connecting system. In such case of a connector with locking mechanism, it is notably favourable to simultaneously provide the connector with an insertion obstruction device according to the present invention since on the one hand, the locking mechanism ensures a durable long lasting connection without risk of accidental loosening or untightening. On the other hand, the insertion obstruction device can reliably assure the accurate and completed mounting and locking of the connector elements which is, in this case, of particular importance. At the same time, by such insertion obstruction device, an unwanted locking of a connector element can be prevented or rendered unlikely while the insertion obstruction force reaches a sufficiently large value which counteracts an undesirable moving together and engaging of the connector parts. In this way, incorrect locking and mounting of the connector elements can be prevented which, otherwise, would have to be laboriously separated.

[0035] By the very pronounced locking sensation and locking noise which is generated by such insertion obstruction device according to the present invention, the assembler obtains a high degree of mounting reliability. In doing so, it can also be prevented that tight connector combinations may be damaged by applying an overlarge mounting force, which also saves significantly costs and labour for replacing damaged connector elements. Simultaneously, the reject rates of incorrectly mounted connectors can significantly be lowered even without applying sumptuous retroactive control.

[0036] In a further preferred embodiment according to the present invention, the insertion obstruction device may spatially and functionally be separated from the locking device, wherein the insertion obstruction device may preferably be located on a side opposite to the locking device in relation to the centre line of the housing of the first connector element. By such separation and arrangement of said both appliances, the insertion obstruction device and the locking mechanism can work independently from one another and be adapted in an optimal way to the constructional and mounting demands.

[0037] In a further preferred embodiment according to the present invention, the connecting system may be a connecting system for electrical connectors, preferably multipolar electrical connectors wherein the advantages according to the present invention come into effect in an especially favourable manner.

[0038] The above-discussed embodiments merely represent a selection of practical representations of the subject matter of the present invention which are laid down in the respective subclaims. Specific features of these representations can be applied separately or, as far as technically possible and feasible, also in a combination of several of the afore-mentioned representations together with the connecting system according to claim 1, as is apparent from the respective back-relations of the dependent subclaims. By such combination of features the advantages discussed in connection with the specific embodiments can be additionally increased.

[0039] In the following the present invention is explained in greater detail by means of several embodiments thereof in conjunction with the accompanying drawings wherein:

Fig. 1a shows a schematic diagram of a median section in one axial plane through a multipolar electrical connector with transected insertion obstruction device and locking mechanism according to a preferred embodiment of the present invention in a first mounting situation;

Fig. 1b shows a schematic diagram of the progression of force versus insertion stroke during mounting of the connector elements;

Fig. 2 shows a schematic diagram of a median section in one axial plane through a multipolar electrical connector with transected insertion obstruction device and locking mechanism according to a preferred embodiment of the present invention in a second mounting situation;

Fig. 3 shows a schematic diagram of a median section in one axial plane through a multipolar electrical connector with transected insertion obstruction device and locking mechanism according to a preferred embodiment of the present invention in a third mounting situation;

Fig. 4 shows a schematic diagram of a median section in one axial plane through a multipolar electrical connector with transected insertion obstruction device and locking mechanism according to a preferred embodiment of the present invention in a fourth mounting situation;

Fig. 5 shows a schematic diagram of a median section in one axial plane through a multipolar electrical connector with transected insertion obstruction device and locking mechanism according to a preferred embodiment of the present invention in a fifth mounting situation;

Figure 1a shows a multipolar electrical connector with insertion obstruction device (3) and locking

mechanism (9-11) in a first mounting situation. In this state the first connector element (1) is put on the second connector element (2) without exerting mounting force. The first connector element (1) comprises a mother housing made of a polymeric material preferably a thermoplast or duroplast. The first connector element (1) comprises an outer sleeve (15) in which the father housing of a second connector element (2), also being made of a polymeric material preferably a thermoplast or duroplast, is insertable concentrically to the outer sleeve (15) and spaced apart from it, an inner sleeve (16) is arranged which shows in its central area a recess into which a spring eye bushing (13) can be inserted. This spring eye bushing (13) can for example, be crimped or soldered to the connecting line (not shown).

[0040] Furthermore, the inner sleeve (16) is provided with sealing elements (14) by which the clearances for the installation of the spring eye bushings (13) and the gap between the inner sleeve (16) of the first connector element (1) and the housing of the second connector element (2) can be sealed. The portion of the inner sleeve (16) being located at the end of the spring eye bushing (13) is inserted into the housing of the second connector element (2) and is centred in relation to the insertion axis by guiding structures such as guide ribs (17). A contact pin (12) being provided for contacting with the spring eye bushing (13) of the first connector element (1) is located in the second connector element (2) and fixed aligned with the spring eye bushing (13). This contact pin (12) is - in the state depicted in this Figure - not yet in contact to the spring eye bushing (13) of the first connector element (1) but is spaced apart from it in insertion direction (E).

[0041] The components described so far are also present in a standard connector of the state of the art. The connector according to the present invention exhibits, in the here-described embodiment, furthermore, an insertion obstruction device (3) with a structural spring element (8) bent in U-shape, the one arm of which is permanently or removably coupled to the inner sleeve (16) of the first connector element (1). The other arm of the U-shaped structural spring element (8) comprises an abutting arrangement (4) made of a polymeric material and being integrally connected to the spring element (8), which can be achieved by for example integrally moulding or materially bonding said abutting arrangement (4) to said spring element (8). The abutting arrangement (4) shows in its end portion being located in the insertion direction (E) an abutting surface (6) which, in this state of mounting depicted in Fig. 1, slightly abuts against the supporting counter surface (5) of the housing of the second connector element (2).

[0042] At the other end of the abutting arrangement (4) being located opposite to the insertion direction (E) a tapered portion (19) is located which corresponds to - and is designated for interaction with - a respective ta-

pered portion (7) of the inner sleeve of the first connector element (1) and is, due to its orientation, adapted and provided to travel the abutting arrangement (4) when pushing the tapered portion (7) of the first connector element (1) against the tapered portion (19) of the abutting arrangement (4) and to remove the abutting arrangement (4), at least at its end which is opposite to the insertion direction (E), in respect of the centre line (C). A region of the inner sleeve (16) being adjacent in a direction opposite to the insertion direction (E) to the tapered portion (7) of the first connector element (1) is shaped to form a spring stop unit (18), for the spring element (8) which serves for adjusting the spring element in a radial direction in respect of the centre line (C) and thus to also hold the abutting arrangement (4) in the desired position.

[0043] On the opposite side of the first connector element (1) in respect of the centre line (C), a locking mechanism is provided consisting of a locking hook (11) and a locking arm (9) which is loaded by a resiliency so that the locking hook (11) is forcedly moved towards the centre line (C) and placed against the housing of second connector element (2). A locking counter means (10) is arranged at the housing of the second connector element (2) and is located - in the state of mounting depicted in Figure 1a - in insertion direction (E) behind the locking hook (11). Upon further insertion of the first and second connector elements (1, 2), the locking hook (11) of the locking arm (9) can engage with the locking counter means (10) and thus, lock the connector elements (1, 2).

[0044] In the following, the mode of operations of the insertion obstruction devices (3) and the locking mechanism (9-11) during joining and mounting of the connector elements (1, 2), is further described by means of Figures 1 to 5:

[0045] During the procedure of mounting the initially disconnected and non-contacting connector elements, (1, 2) are brought together, nested and adjusted concentrically by a free travel guiding, consisting of the inner wall of the outer sleeve (15) of the first connector element (1) and the outer wall of the housing of the second connector element (2) on the one hand, and the outer wall of the inner sleeve (16) of the first connector element (1) and the guide rib (17) of the inner wall of the housing of the second connector element (2). Due to the clearance of the guiding pairings, the connector elements (1, 2) can be moved together without almost any interaction and expenditure of force until the zero of operation point of the insertion obstruction device (3) is reached (Stroke: 0 mm; Figure 1b) at which the abutting surface (6) of the abutting arrangement (4) contacts the supporting counter surface (5) of the second connector element (2) (Figure 1a). In this state, no sealing components (14) or contact elements (12, 13) are in mesh and thus, no mating friction occurs. In this condition, the abutting arrangement (4) of the insertion obstruction device (3) is held in position by the spring element (8), which is abutting against the spring stop unit (18) of the inner sleeve (16) of the first connector element (1), in such way that the abutting sur-

face (6) of the abutting arrangement (4) is aligned so as to abut against the supporting counter surface (5) of the housing of the second connector element (2) in a predetermined way.

[0046] Upon further insertion of the connector elements (1, 2), the abutting surface (6) of the abutting arrangement (4) is pushed against the supporting counter surface (5), and the free arm of the U-shaped structural spring element (8) is loaded with a force in the direction of the free arm of the spring element (8) by which the spring element (8) is deformed and bent up in its curved region. By this action, an ejecting force which is orientated opposite to the insertion direction (E) can be generated and the free arm of the spring element (8) is slightly tilted in relation to its original position. By said means, the abutting arrangement (4) is - at its end opposite to the insertion direction (E) - slightly tilted away from the centre line (C).

[0047] Figure 2 shows the condition in which the abutting arrangement (4) contacts in insertion direction (E) both connector elements (1, 2) simultaneously. In this state, the spring eye bushing (13) of the first connector element (1) starts contacting the contacting pin (12) of the second connector element (2) and the sealings (14) of the first connector element (1) start meshing with the second connector element (2).

[0048] Upon further insertion of the connector elements (1, 2), the tapered portion (7) of the housing of the first connector element (1) and the tapered portion (19) of the abutting arrangement (4) lie one on top of the other wherein the abutting arrangement (4) is further travelled from its rest position and risen onto the spring stop unit (18) of the spring element (8) of the housing of the first connector element (1) (Figure 3). Thereby, the free arm of the spring element (8) archs toward the outside and contacts the outer sleeve (15) of the first connector element (1). The locking hook (11) of the locking arm (9) has risen relatively completely onto the locking counter means (10) in this state and the locking arm has travelled against resiliency from its rest position. In this state the maximum of the ejecting force is reached (Stroke: 3,5 mm, Figure 1b).

[0049] Upon further insertion of the connector elements (1, 2), the tapered portion (7) of the inner sleeve (16), of the first connector element (1) presses against the tapered portion (19) of the abutting arrangement (4) and travels it toward the outside until the abutting surface (6) of the abutting arrangement (4) slides off the supporting counter surface (5) of the second connector element (2) and the spring element (8) is abruptly relieved and the abutting arrangement (4) rises onto the housing of the second connector element (2) (Figure 4).

[0050] By said abrupt relief of the spring element (8), the ejecting force collapses suddenly. Thus, the abruptly suspending ejecting force by deactivation of the insertion obstruction device (3) and simultaneous persistence of the insertion operation force being effective in the insertion direction (E) and applied to the housings of the con-

necter elements (1, 2) an exceeding moment of force compared to the entirety of the insertion resistance forces, consisting mainly of mating and frictional forces, is achievable. By this means a strengthened momentum of movement in the insertion direction (E) can be effected wherein the other insertion resistances occurring upon further insertion of the connector elements (1, 2) can be overcompensated by the exceeding moment of force by an additional force excess amount. Thereby, a complete insertion and reliable locking of the connector elements is supportable and/or ensurable. In this manner, a very effective Go-NoGo-principle can be realized in an efficient way by which an incorrect mounting of the connector elements can be reliably prevented.

[0051] In a favourable way, the maximum of the ejecting force along the insertion path is substantially at least twice as large as the maximum of the sum of all other insertion resistances along the insertion path - except the ejecting force - which are determined substantially by mating friction of sections of the housings of the connector elements (1, 2), friction between the sealings (14) and the contacted surfaces and the spring force and friction related meshing resistances in the contact region of the connector originating from the interaction of spring eye bushing (13) and contact pin (12).

[0052] In many cases, it may be of advantage if the insertion obstruction device (3) is deactivated while inserting both connector elements (1, 2) in the insertion direction (E) prior to occurrence of the maxima of the other individual insertion resistances except the ejecting force and prior to occurrence of the maximum of the sum of the other insertion resistances, except the ejection force. Thus, it can be prevented that the mounting procedure is stopped by the assembler prior to reaching the final condition of mounting. In the same way, a damage of the connector elements (1, 2) can be prevented, which might occur in case of exerting an overlarge mounting force, which obviates that the damaged connector elements (1, 2) have to be laboriously replaced. By an insertion obstruction device (3) according to the present invention, a very noticeable and pronounced locking sensation and locking noise can be generated which imparts a high degree of mounting security to the assembler.

[0053] Through this exceeding moment of force by sudden deactivation of the insertion obstruction device (3), a complete insertion of the connector elements (1, 2) and locking of the connector elements (1, 2), by the locking mechanism can reliably be achieved (Figure 5). By this deactivation of the insertion obstruction device (3) prior to reaching the maximum of the other insertion resistances, it can be ensured in a particularly favourable manner that tight and difficultly mountable connectors which exhibit several distinctive pressure points can reliably be mounted, since the assembler obtains a very reliable and pronounced force feedback by deactivation of the insertion obstruction device (3).

[0054] Furthermore, the maxima of frictional force occurring during the insertion path and generating decep-

tive pressure points, are reliably overridden by the exceeding moment of force originating from the sudden deactivation of the insertion obstruction device (3) and thus, an accurate, completed mounting can reliably be achieved.

[0055] Concerning the insertion obstruction device (3) and the locking mechanism, several variants are feasible and reasonable, some of which in the following will be exemplified and elucidated:

[0056] The spring element (8) can be moulded into the housing of the first connector element (1) and thus undetachably be connected with said housing. This variant can prove favourable in respect of manufacturing process and provide an especially reliable and loss-proof connection between the housing of the first connector element (1) and the insertion obstruction device (3). On the other hand, it can be of advantage if the spring element (8) is arranged to be lockable with the housing of the first connector element (1) and where appropriate, also be detachable from the housing. By this means, the spring element (8), for example, can be produced separately and with different characteristics and find application for a whole product line of connectors if these spring elements (8) can retrospectively be connected to the first connector element (1) whereby also production and storage costs can significantly be reduced. Furthermore, it is possible to provide different types and models of connectors with an assortment of spring elements (8) and thus create in a competitive and economic way a large range of articles by a sort of modular system.

[0057] Sometimes it may be required to achieve a longer spring travel or a different spring characteristics. This can easily be achieved by the employment of springs of different shapes such as plurally-bent leaf spring elements or structural spring elements, spring elements comprising reinforcing corrugations, crimpings or other structures or helical springs which can be attached in different positions of the connector. Furthermore, a construction applying a leaf spring or structural spring or one of the above mentioned embodiments of the spring element, provides further constructional opportunities to simultaneously improve a holding and guiding function for the abutting arrangement by said spring element and helps to better define the deactivation behaviour of the insertion obstruction device.

[0058] Also a variety of possibilities for deactivation of the insertion obstruction device (3) is conceivable. Thus, it is possible to tilt the abutting arrangement (4) due to the deformation of the spring element in a way that the abutting surface (6) of the abutting arrangement (4) slides off the supporting counter surface (5) of the housing of the second connector element (2). The deactivation of the insertion obstruction device (3) can also be actuated or supported via a tilting supporting arrangement (7). For this reason, several housing related structures are conceivable which, for example, can rigidly or movably be attached to the inner sleeves (16) or the outer sleeve (15) of the first connector element (1) and thus, induce or sup-

port tilting of the abutting arrangement (4). It is also conceivable to provide a supporting counter surface (5) of the housing of the second connector element (2), for example, with an inclined- or rounded-shape or differently-shaped profile which supports the sliding off of the abutting arrangement (4). Beyond this, it is also possible to arrange tapered portions in the contact area of both connector elements (1, 2) so that the abutting arrangement (4) is approximately parallelly dislodged from the centre line (C) and ejected by a sort of "*plum kernel effect*". By this arrangement, a steeper slope of insertion obstruction force can be achieved shortly prior to deactivation of the insertion obstruction device (3) together with a very pronounced pressure point.

[0059] On the basis of the aforementioned variations, a variety of possible configurations of insertion obstruction device (3) is conceivable which can be adapted in the best possible way to the mounting requirements.

[0060] Besides the afore-described version, in which the insertion obstruction device (3) is deactivated prior to the occurrence of the maximum of the sum of the other insertion resistances and prior to locking of the connector elements (1, 2), it is also conceivable to deactivate the insertion obstruction device (3) at a later stage of mounting, for example, after overriding the maximum of the sum of the other insertion resistances or after locking of the locking mechanism (9-11). In the latter case, for example, also by applying a path-controlled mounting instead of force-controlled mounting, the locking sensation and the locking noise generated by deactivation of the insertion obstruction device (3), reliably signalizes to the assembler that the mounting has accurately been completed.

[0061] In this way, it is also conceivable to provide a connection system which in case of inaccurate mounting and locking of the locking mechanism, pushes the connector elements apart so that the connection may come undone whereby a fault-proof mounting can be ensured.

[0062] By such construction of the insertion obstruction device the point of deactivation of the said device along the insertion path can exactly be set in compliance with the technical requirements. As can be gathered from the afore-presented comments, it may often be beneficial to deactivate the insertion obstruction device prior to occurrence of a maximum of a sum of all other insertion resistances except the ejecting force. In such way, it is, for example, possible to reliably ensure the accurate mounting even in cases of tight connectors, which are difficult to be mounted, featuring several pronounced pressure points, which otherwise would deceive the assembler. Thus, the delusive pressure points can reliably be overridden by the exceeding moment of force, when abruptly deactivating the insertion obstruction device, so that in this way accurate mounting can be secured.

[0063] Upon other terms and conditions, it may be preferable to arrange the point of deactivation of the insertion obstruction device at a later point of the insertion path or possibly after locking of the connector elements so that,

in any circumstance, the connection becomes undone unless insertion and locking of the connector elements is thoroughly completed. In doing so, the load peak generated by the insertion obstruction device versus the insertion stroke of the connector elements relative to one another and in relation to the meshing action of for example electrical contacts of contact pins and contacting counter-structures or for example sealing structures can be phased in accordance with the customers' mating requirements.

[0064] The locking mechanism is likewise not restricted to the variant described in the previous embodiment. So, it is also feasible to apply any latch, retaining device or device using positive locking, pressure locking, frictional engagement or adhesive engagement or any other type of appliance by which a separation force of both mounted connector elements (1, 2) opposite to the insertion direction (E) can be increased.

[0065] In many fields of the application, especially reliable connector systems may be required. In case of such demands, it is advisable to simultaneously provide the connector with both an insertion obstruction device (3) and a locking mechanism (9-11) since the locking mechanism allows for a permanent and reliable connection of connector elements without risk of accidental loosening or separation of the connection whereas the insertion obstruction device ensures the accurate and complete mounting and locking of the connector elements which, in this case, is of particular importance and simultaneously avoids the necessity of subsequent laborious controls. At the same time, by such insertion obstruction device (3), an undesired early locking of the connector elements can be prevented or rendered unlikely while the insertion obstruction force reaches a sufficiently large value which counteracts accidental slipping together and locking of the connector elements. In this way, incorrect or faulty mounting and locking of the connector elements (1, 2) can be prevented, which otherwise, would have to be laboriously separated, possibly resulting in a potential deterioration or damage of the connector elements.

[0066] Due to the pronounced mounting feedback by locking sensation and locking noise generated by deactivation of the insertion obstruction device (3), the exertion of an overlarge mounting force, which might damage the connector resulting in the necessity of laborious replacement of the connector parts, can efficiently be prevented. By this means, the working efficiency during mounting of the connector elements can be increased significantly while simultaneously the reject rate due to incorrect mounting is drastically reduced wherein additionally the necessity of subsequent laborious control of the connection can be eliminated.

Claims

1. Connecting system with at least a first (1) and a second (2) connector element which are insertable, one

into the other, comprising

- an insertion obstruction device (3), and further comprising
- an abutting arrangement (4) being connected to said first connector element (1) via a resilient, preferably arm-like connecting member and abutable against the second connector element (2) in at least a portion of the insertion path,

characterized in that

said abutting arrangement (4) is part of the insertion obstruction device (3) and movable in insertion direction (E) in an abutted state in respect of the first connector element (1) wherein the abutted state is deactivatable upon further insertion of the connector elements (1, 2) and said abutting arrangement (4) is movable in the insertion direction (E) in respect of the second connector element (2).

2. Connecting system according to claim 1, **characterized in that** the insertion obstruction device (3) comprises a spring element (8) being made of a resilient preferably metal-like material, by which the abutting arrangement (4) is guided und resiliently connected to the first connector element (1).
3. Connecting system according to at least one of the preceding claims, **characterized in that** the abutting arrangement (4) comprises a shaped part of a preferably polymeric material being attached to one free end of the spring element (8).
4. Connecting system according to at least one of the preceding claims, **characterized in that** said shaped part of the abutting arrangement (4) comprises at least one, preferably two, specifically formed contacting faces (5, 19) being arranged for interacting with at least one of the connector elements (1, 2).
5. Connecting system according to at least one of the preceding claims, **characterized in that** insertion obstruction device (3) and abutting arrangement (4) are producible as a single integral part.
6. Connecting system according to at least one of the preceding claims, **characterized in that** the abutting arrangement (4), in a portion of the insertion path, is simultaneously abutable in the insertion direction (E) against functional sections of the housings of both connector elements (1, 2) in which the first connector element (1) is abutable against the second connector element (2) via the abutting arrangement (4).
7. Connecting system according to at least one of the preceding claims, **characterized in that** the abut-

- ting arrangement (4) is, in a portion of the insertion path, movable perpendicularly to the insertion direction (E) and is in its entirety removable from a center line (C) connecting the centers of the connector elements (1, 2) in the insertion direction (E).
8. Connecting system according to at least one of the preceding claims, **characterized in that** an ejecting force which is directed against the insertion direction (E) is producible by the spring element (8).
 9. Connecting system according to at least one of the preceding claims, **characterized in that** the insertion obstruction device (3) comprises a preferably substantially U-shaped leaf spring or structural spring (8) which is preferably loadable with a force substantially in a direction of one arm of said leaf spring or structural spring (8).
 10. Connecting system according to at least one of the preceding claims, **characterized in that** the insertion obstruction device (3) is abruptly deactivatable upon insertion of the connector elements (1, 2).
 11. Connecting system according to at least one of the preceding claims, **characterized in that**, when inserting the connector elements (1, 2) in the insertion direction (E), the insertion obstruction device (3) is deactivatable prior to occurrence of a maximum of a sum of all other insertion resistances except the ejecting force.
 12. Connecting system according to at least one of the preceding claims, **characterized in that** a minimum mounting force for inserting and mounting the connector elements (1, 2) is definable by the insertion obstruction device (3), upon excess of said minimum mounting force, the insertion obstruction device (3) is deactivatable and mounting of the connector elements (1, 2) is achievable.
 13. Connecting system according to at least one of the preceding claims, **characterized in that** a maximum of the ejecting force over the course of the insertion path is preferably substantially at least twice as large as the maximum of the sum of all other insertion resistances over the course of the insertion path except the ejecting force.
 14. Connecting system according to at least one of the preceding claims, **characterized in that** the spring element (8) is deformable upon insertion of the connector elements (1, 2) by direct action of an insertion force and tiltable in a linkage point of the abutting arrangement (4).
 15. Connecting system according to at least one of the preceding claims, **characterized in that** by deformation of the spring element (8) caused by the insertion force a tilting of an abutting surface (6) of the abutting arrangement (4) in respect of a section of the housing of the second connector element (2) being in contact with said abutting surface (6) is achievable by which the abutting arrangement (4) is tiltable off its abutting position and the insertion obstruction device (3) is deactivatable.
 16. Connecting system according to at least one of the preceding claims, **characterized in that** said tilting of the abutting arrangement (4) is actuatable and/or supportable by a tilting supporting arrangement (7) which is preferably operatable upon insertion of the connector elements (1, 2).
 17. Connecting system according to at least one of the preceding claims, **characterized in that** said tilting supporting arrangement (7) is an integral functional portion, preferably a tapered or inclined portion of a section of the housing of one connector element (1, 2).
 18. Connecting system according to at least one of the preceding claims, **characterized in that** said tilting supporting arrangement (7) is attached to a section of the housing of that connector element (1) to which the abutting arrangement (4) is resiliently connected and is approachable in an abutted state of the abutting arrangement (4) towards the abutting arrangement (4) and is interactable with said abutting arrangement (4).
 19. Connecting system according to at least one of the preceding claims, **characterized in that** the spring element (8) and the abutting arrangement (4) are interactable with at least one section of the housing of one connector element or of two connector elements (1, 2) in a manner that the abutting arrangement (4) which is soundly abutting against at least one portion of one connector element (1, 2) in case of no or little deformation of the spring element (8) is tiltable off the abutting position by further deformation of the spring element (8) and/or by interaction with at least one section of the housing of one connector element or two connector elements (1, 2) and is slidable off said abutting position.
 20. Connecting system according to at least one of the preceding claims, **characterized in that** the connecting system further comprises a locking mechanism which preferably comprises a locking means, preferably a locking arm (9), being loaded by an elastic force, attached to one connector element (1) and a locking counter means (10) attached to the other connector element (2) whereby the connector elements (1, 2) are lockable in a mounted state.

21. Connecting system according to at least one of the preceding claims, **characterized in that** the insertion obstruction device (3) is spatially and functionally separated from the locking mechanism (9-11), wherein the insertion obstruction device (3) is preferably located on a side opposite to the locking device (9-11) in relation to the center line (C) of the housing of the first connector element (1). 5
22. Connecting system according to at least one of the preceding claims, **characterized in that** the connecting system is a connecting system for electrical connectors, preferably multipolar electrical connectors. 10

Amended claims in accordance with Rule 86(2) EPC.

1. Connecting system with at least a first (1) and a second (2) connector element which are insertable, one into the other, comprising an insertion obstruction device (3), and further comprising an abutting arrangement (4) being connected to said first connector element (1) via a resilient, preferably arm-like connecting member and abutable against the second connector element (2) in at least a portion of the insertion path, wherein said abutting arrangement (4) is part of the insertion obstruction device (3) and movable in insertion direction (E) in an abutted state in respect of the first connector element (1) wherein the abutted state is deactivatable upon further insertion of the connector elements (1, 2) and said abutting arrangement (4) is movable in the insertion direction (E) in respect of the second connector element (2), **characterized in that** the abutting arrangement (4) comprises a shaped part of a preferably polymeric material being attached to one free end of a spring element (8). 20 25 30 35 40
2. Connecting system according to claim 1, **characterized in that** the insertion obstruction device (3) comprises the spring element (8) being made of a resilient preferably metal-like material, by which the abutting arrangement (4) is guided and resiliently connected to the first connector element (1). 45
3. Connecting system according to at least one of the preceding claims, **characterized in that** said shaped part of the abutting arrangement (4) comprises at least one, preferably two, specifically formed contacting faces (5, 19) being arranged for interacting with at least one of the connector elements (1, 2). 50
4. Connecting system according to at least one of the preceding claims, **characterized in that** insertion obstruction device (3) and abutting arrangement 55

(4) are producible as a single integral part.

5. Connecting system according to at least one of the preceding claims, **characterized in that** the abutting arrangement (4), in a portion of the insertion path, is simultaneously abutable in the insertion direction (E) against functional sections of the housings of both connector elements (1, 2) in which the first connector element (1) is abutable against the second connector element (2) via the abutting arrangement (4).

6. Connecting system according to at least one of the preceding claims, **characterized in that** the abutting arrangement (4) is, in a portion of the insertion path, movable perpendicularly to the insertion direction (E).

7. Connecting system according to at least one of the preceding claims, **characterized in that** an ejecting force which is directed against the insertion direction (E) is producible by the spring element (8).

8. Connecting system according to at least one of the preceding claims, **characterized in that** the insertion obstruction device (3) comprises a preferably substantially U-shaped leaf spring or structural spring (8) which is preferably loadable with a force substantially in a direction of one arm of said leaf spring or structural spring (8).

9. Connecting system according to at least one of the preceding claims, **characterized in that** the insertion obstruction device (3) is abruptly deactivatable upon insertion of the connector elements (1, 2).

10. Connecting system according to at least one of the preceding claims, **characterized in that** when inserting the connector elements (1, 2) in the insertion direction (E), the insertion obstruction device (3) is deactivatable prior to occurrence of a maximum of a sum of all other insertion resistances except the ejecting force.

11. Connecting system according to at least one of the preceding claims, **characterized in that** a minimum mounting force for inserting and mounting the connector elements (1, 2) is definable by the insertion obstruction device (3), upon excess of said minimum mounting force, the insertion obstruction device (3) is deactivatable and mounting of the connector elements (1, 2) is achievable.

12. Connecting system according to at least one of the preceding claims, **characterized in that** a maximum of the ejecting force over the course of the insertion path is preferably substantially at least twice as large as the maximum of the sum of all other

insertion resistances over the course of the insertion path except the ejecting force.

13. Connecting system according to at least one of the preceding claims, **characterized in that** the spring element (8) is deformable upon insertion of the connector elements (1, 2) by direct action of an insertion force and tiltable in a linkage point of the abutting arrangement (4).

14. Connecting system according to at least one of the preceding claims, **characterized in that** by deformation of the spring element (8) caused by the insertion force a tilting of an abutting surface (6) of the abutting arrangement (4) in respect of a section of the housing of the second connector element (2) being in contact with said abutting surface (6) is achievable by which the abutting arrangement (4) is tiltable off its abutting position and the insertion obstruction device (3) is deactivatable.

15. Connecting system according to at least one of the preceding claims, **characterized in that** said tilting of the abutting arrangement (4) is actuatable and/or supportable by a tilting supporting arrangement (7) which is preferably operatable upon insertion of the connector elements (1, 2).

16. Connecting system according to at least one of the preceding claims, **characterized in that** said tilting supporting arrangement (7) is an integral functional portion, preferably a tapered or inclined portion of a section of the housing of one connector element (1, 2).

17. Connecting system according to at least one of the preceding claims, **characterized in that** said tilting supporting arrangement (7) is attached to a section of the housing of that connector element (1) to which the abutting arrangement (4) is resiliently connected and is approachable in an abutted state of the abutting arrangement (4) towards the abutting arrangement (4) and is interactable with said abutting arrangement (4).

18. Connecting system according to at least one of the preceding claims, **characterized in that** the spring element (8) and the abutting arrangement (4) are interactable with at least one section of the housing of one connector element or of two connector elements (1, 2) in a manner that the abutting arrangement (4) which is soundly abutting against at least one portion of one connector element (1, 2) in case of no or little deformation of the spring element (8) is tiltable off the abutting position by further deformation of the spring element (8) and/or by interaction with at least one section of the housing of one connector element or two connector elements (1, 2) and

is slidable off said abutting position.

19. Connecting system according to at least one of the preceding claims, **characterized in that** the connecting system further comprises a locking mechanism which preferably comprises a locking means, preferably a locking arm (9), being loaded by an elastic force, attached to one connector element (1) and a locking counter means (10) attached to the other connector element (2) whereby the connector elements (1, 2) are lockable in a mounted state.

20. Connecting system according to at least one of the preceding claims, **characterized in that** the insertion obstruction device (3) is spatially and functionally separated from the locking mechanism (9-11), wherein the insertion obstruction device (3) is preferably located on a side opposite to the locking device (9-11) in relation to the center line (C) of the housing of the first connector element (1).

21. Connecting system according to at least one of the preceding claims, **characterized in that** the connecting system is a connecting system for electrical connectors, preferably multipolar electrical connectors.

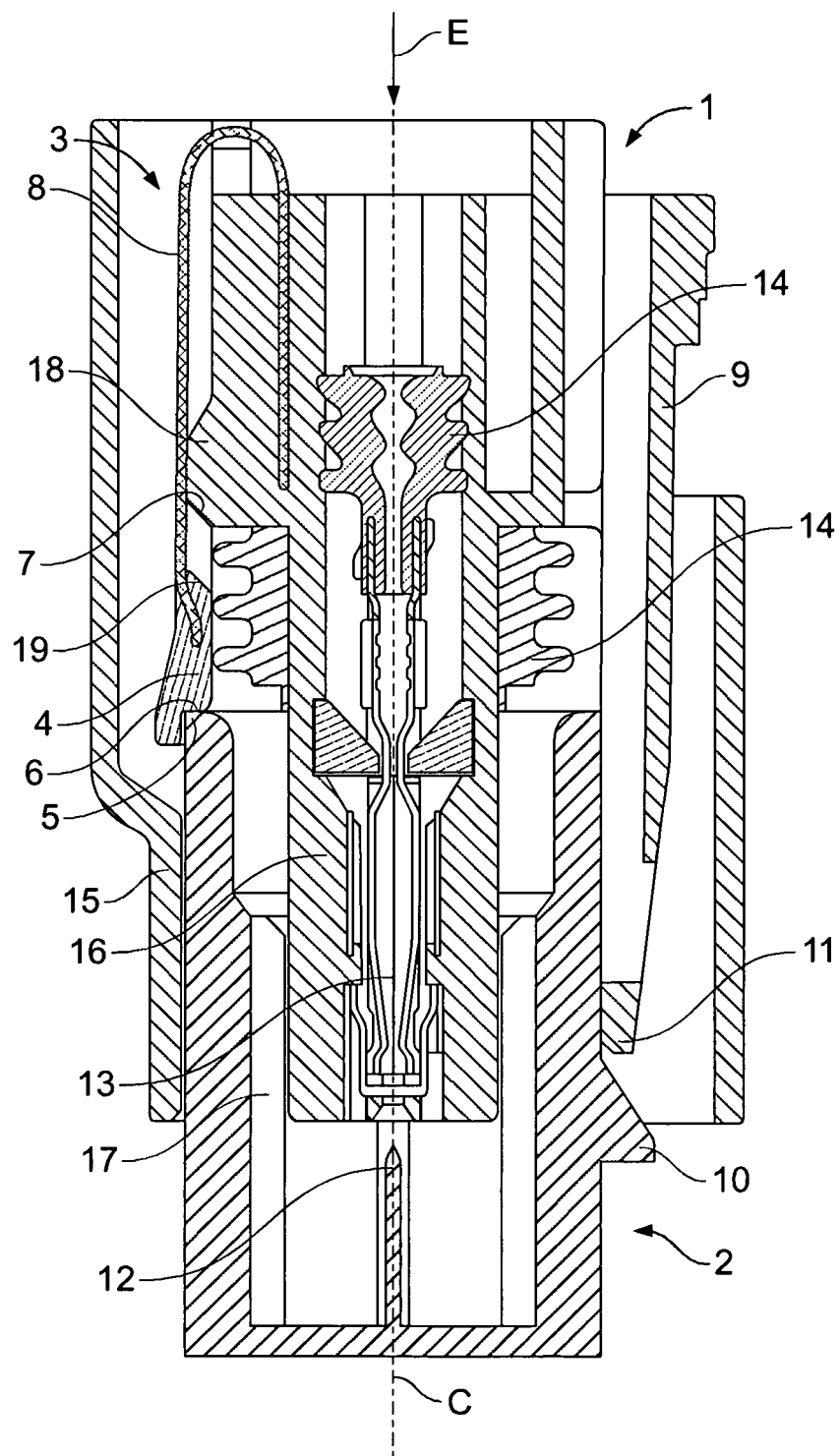
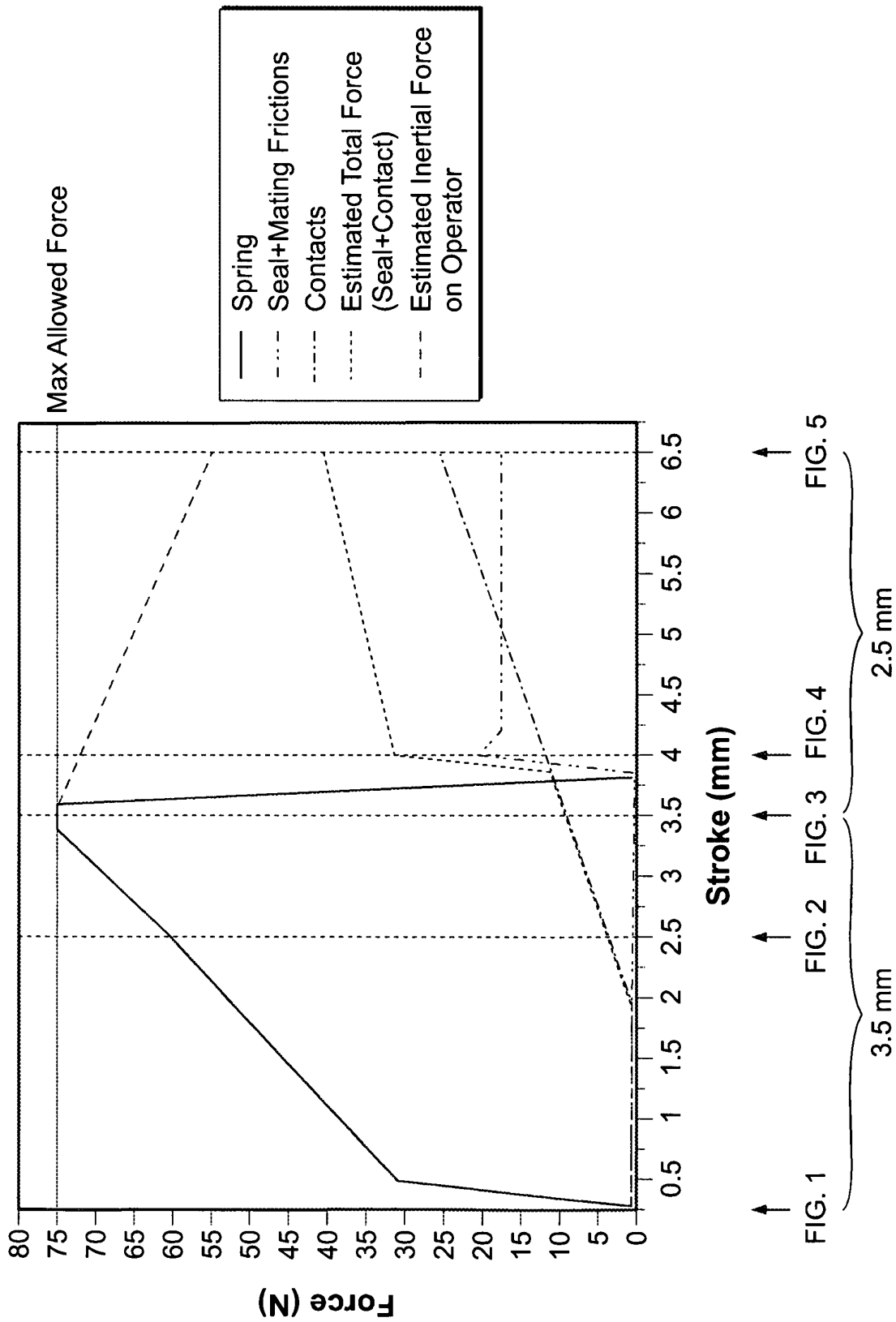


Fig. 1A



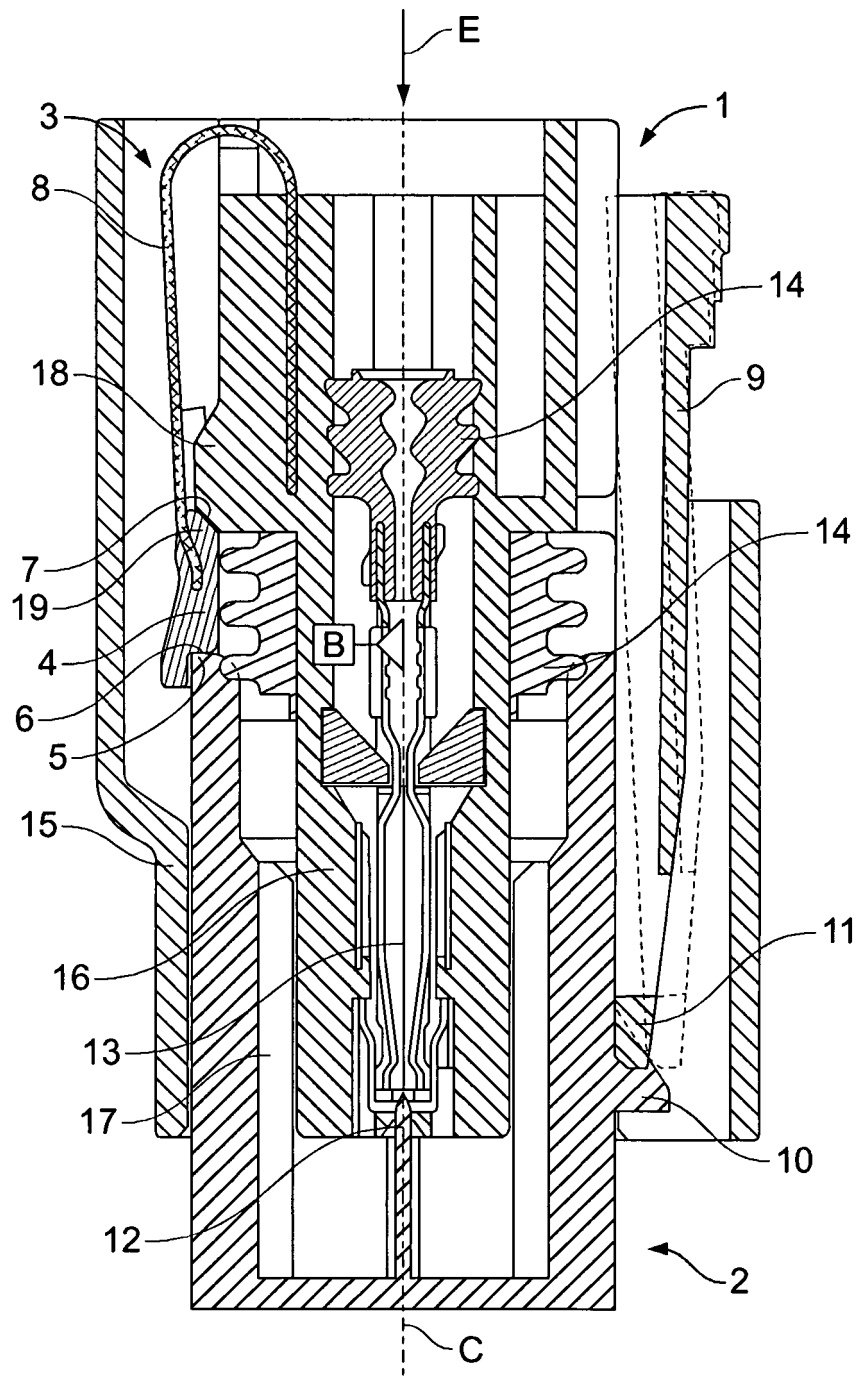


Fig. 2

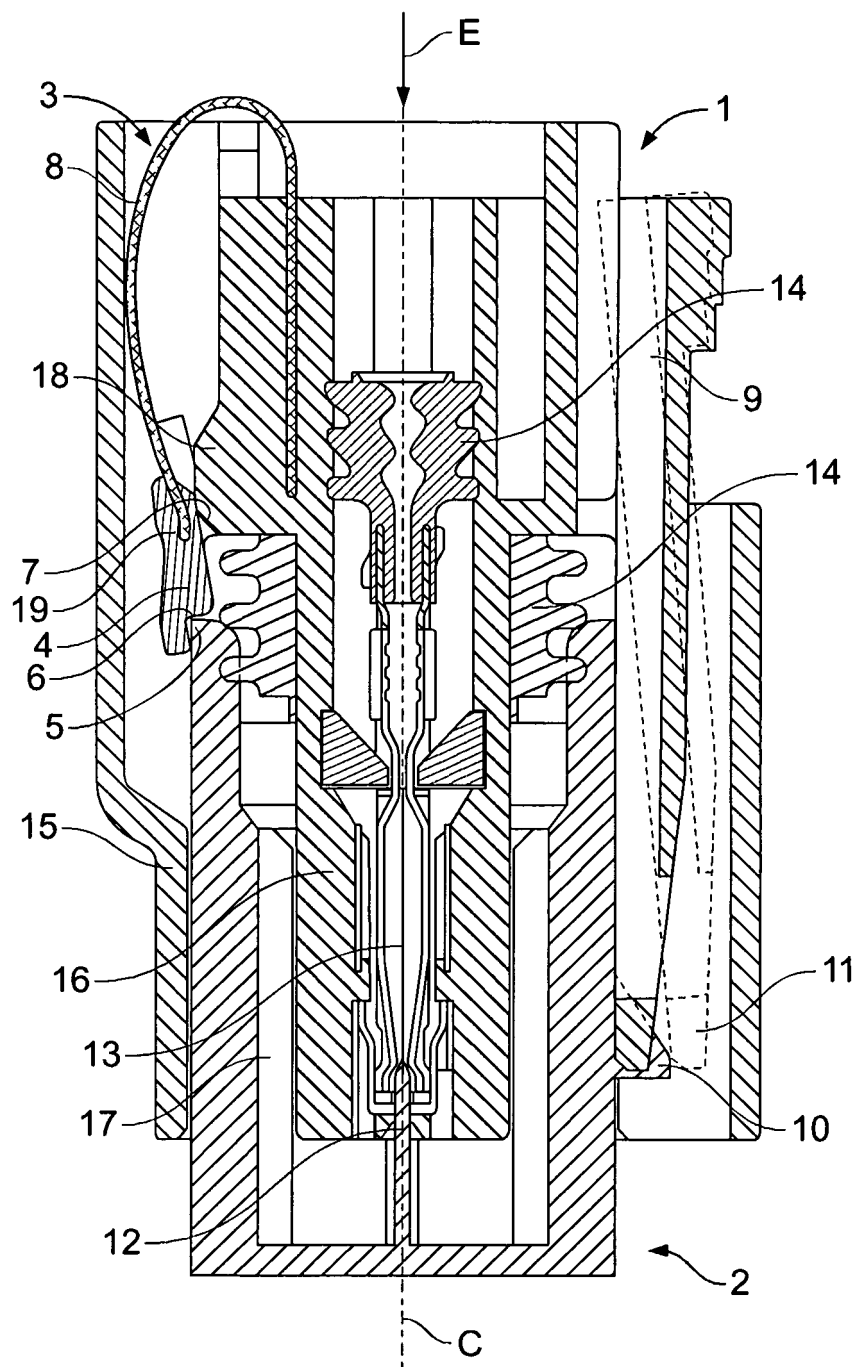


Fig. 3

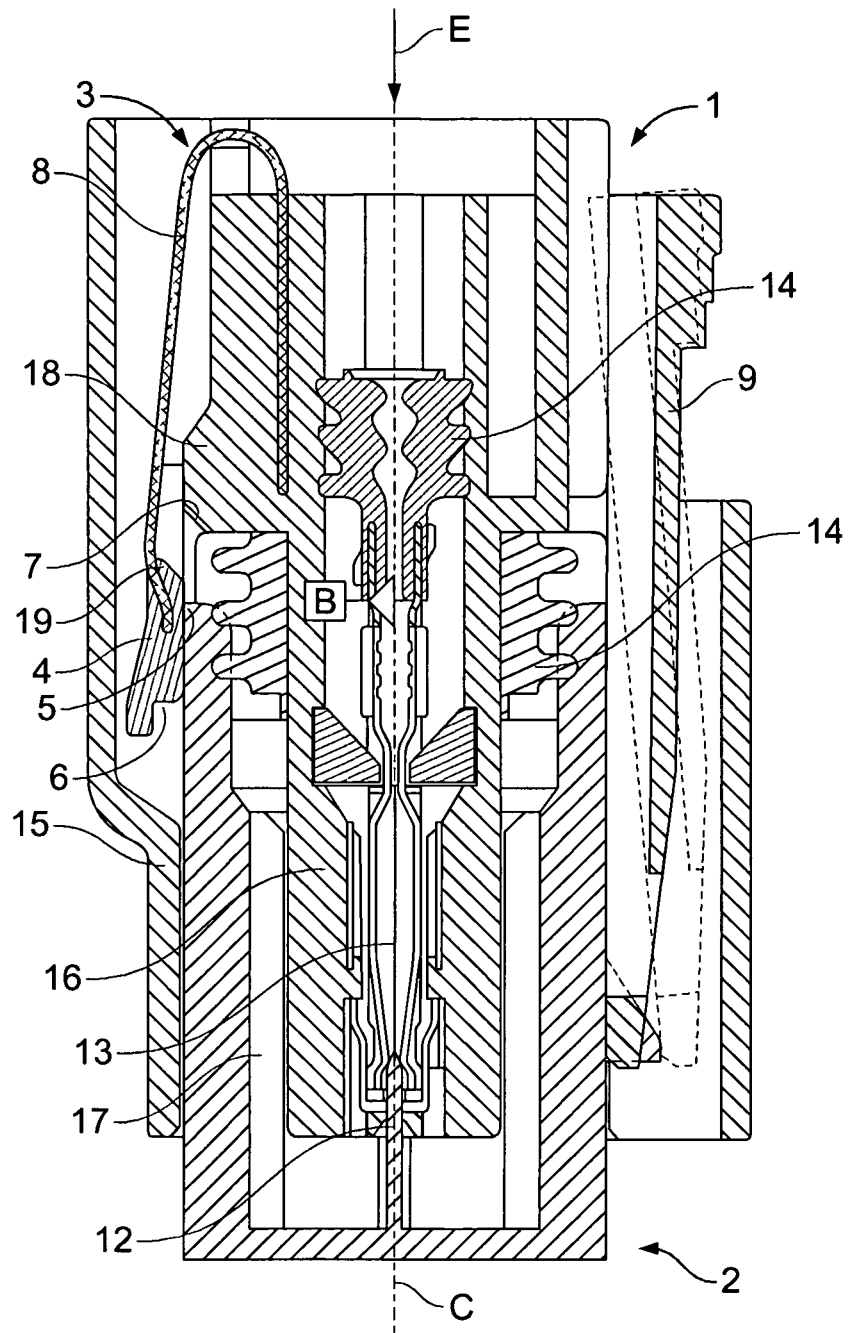


Fig. 4

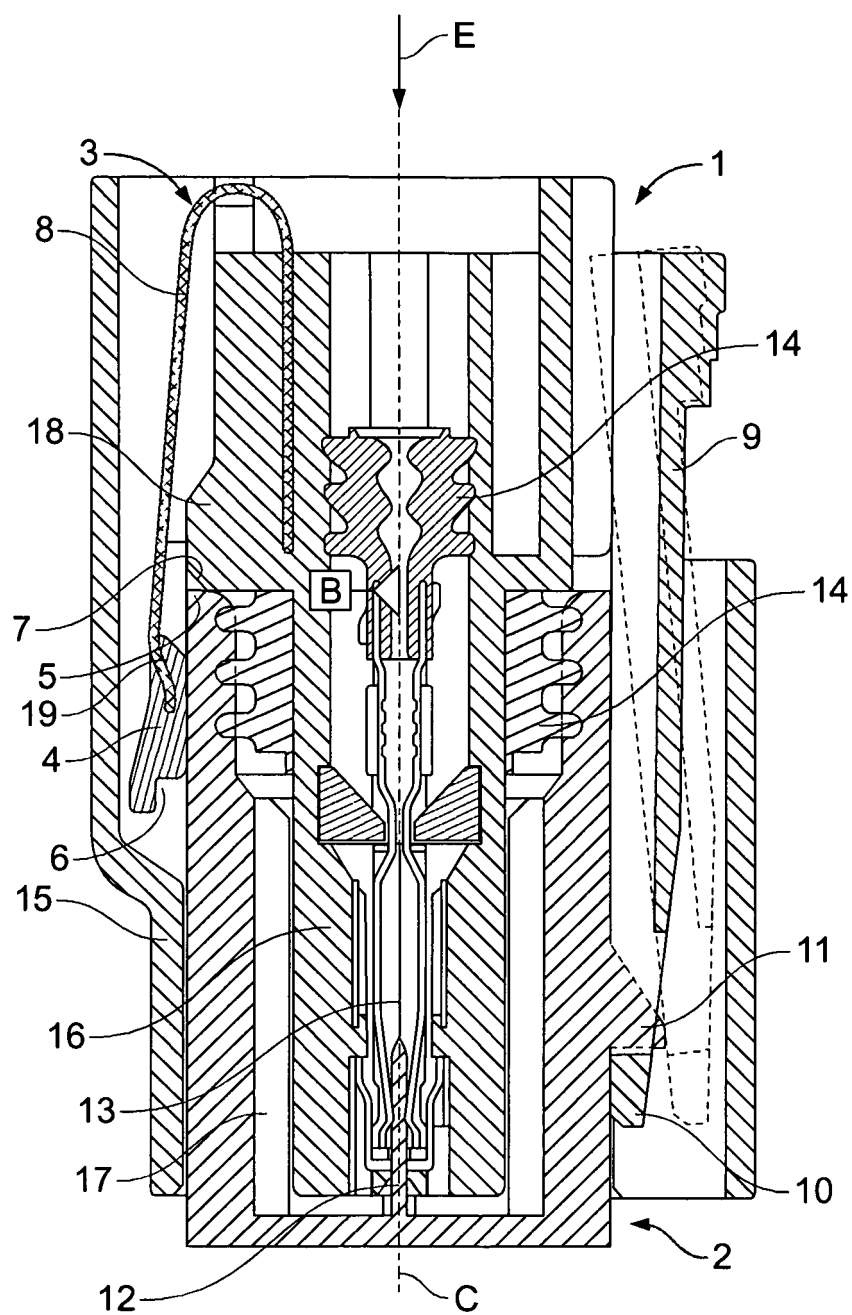


Fig. 5



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5170

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	EP 0 923 167 A (SIEMENS AKTIENGESELLSCHAFT) 16 June 1999 (1999-06-16) * the whole document * -----	1,2,5,6, 8,10,14, 16-22	INV. H01R13/627 H01R13/635
			TECHNICAL FIELDS SEARCHED (IPC)
			H01R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 September 2006	Examiner Salojärvi, Kristiina
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

3
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 06 42 5170

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25-09-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0923167 A	16-06-1999	DE 19754876 A1	24-06-1999
		JP 11238547 A	31-08-1999

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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