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(54) **Secondary locked electrical connector**

Elektrischer Verbinder mit Sekundärverriegelung

Connecteur électrique à verrouillage secondaire

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WO-A-96/34429 **DE-A- 19 532 381**

EP 0 971 450 B1

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Description

Technical Field

[0001] This invention relates to electrical connectors, and more particularly to electrical connectors having female terminals received in cavities of a connector housing.

Background of the Invention

[0002] It is common in the prior art to provide an electrical connector having a female terminal received in a terminal cavity of a connector housing. The female terminal may be held in the connector housing by flexible locking tangs or fingers. The flexible locking tangs or fingers may be formed as a part of the female terminal or the connector housing. Document DE-A-19532381, on which the preamble of claim 1 is based, discloses an electrical connector having a connector housing including a main body and an insert and a female electrical terminal, the connection between the main body and the terminal being achieved by means of elastic tabs on the terminal coacting with openings in the main body. Female terminals having flexible locking tangs or fingers are complicated structures to manufacture, often having at least two separate pieces to be assembled and often are large and bulky. Similarly, connector housings having flexible locking tangs or fingers are large and bulky, and are difficult to tool and injection mould. Another disadvantage of these devices having flexible locking tangs or fingers is that the system provides only a flexible locking member engaging a rigid locking member. Unfortunately, the flexible locking member may become inadvertently disengaged, allowing the female terminal to be removed from the connector body.

Summary of the Invention

[0003] It is an object of the present invention to provide advantages over, and alternatives to, the prior art.

[0004] An electrical connector in accordance with the present invention comprises a connector housing including a main body and an insert, the main body having a front face, a rear face, and a plurality of terminal receiving cavities extending in a longitudinal direction between the front and rear faces, each terminal receiving cavity being defined in part by opposed side walls, and a flexible beam which is attached at a first end to the front face and at a second end to the rear face and which has a rigid locking tab extending into the terminal receiving cavity, the insert having a planar front portion positioned adjacent the front face and an arm portion which makes a sliding fit in a direction substantially perpendicular to the longitudinal direction in a slot in the main body, the slot opening through the front face and into each terminal receiving cavity on a side opposite to the flexible beam, the arm portion defining a rigid side of

each terminal receiving cavity and having a rigid locking tab extending into each terminal receiving cavity; and a female electrical terminal positioned in one of the terminal receiving cavities and having a recess for receiving the locking tab on the flexible beam in a snap fit, a recess for receiving the locking tab on the arm portion in a sliding fit, and a first end for receiving a male terminal inserted through an opening in the front portion of the insert.

[0005] The electrical connector of the present invention is simple in design, allows easy manufacture of both the housing and the terminals, and provides a rigid to rigid locking feature for the terminal.

Brief Description of the Drawings

[0006] The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a sectioned perspective view of an electrical connector in accordance with the present invention when viewed from the front face of the connector;

Figure 2 is a sectioned perspective view of the electrical connector of Figure 1 when viewed from the rear face of the connector; and

Figure 3 is a sectioned perspective view of part of the electrical connector of Figure 1 when viewed from the front.

Description of the Preferred Embodiment

[0007] Referring to the drawings, an electrical connector 10 according to the present invention includes a connector housing 12 having a main body 11 with a plurality of terminal receiving cavities 14 formed therein, and an insert 15. The main body 11 includes a front face 16 and a rear face 18, and each terminal receiving cavity 14 extends between the front and rear faces in a longitudinal direction A. The rear face 18 has a plurality of openings 20, each aligned with a terminal receiving cavity 14 to facilitate insertion of a female terminal 22 into the cavity 14 through the opening 20. Each terminal receiving cavity 14 is defined in part by opposed side walls 26, 28, and a flexible beam 34. The beam 34 preferably has first and second ends 36, 38 attached to the front face 16 and rear face 18 of the main body 11, respectively. Preferably, the flexible beam 34 is attached only at the ends 36, 38 and not along sides 40 of the beam. A rigid locking tab 42 integral with the beam 34 extends from the beam into the terminal receiving cavity 14. A second cavity 44 may be defined in the main body 11 on the opposite side of the flexible beam 34 to the terminal receiving cavity 14 to facilitate movement or deflection of the beam 34.

[0008] A slot 17 is formed in the main body 11 and extends in a direction substantially perpendicular to the

longitudinal direction A. A groove 35 is formed in the main body 11 and extends in a direction substantially perpendicular to the longitudinal direction A and opens into the slot 17. The slot 17 opens through the front face 16 of the main body 11 and through each terminal receiving cavity 14 on a side of the terminal receiving cavity which is opposite to the beam 34. The insert 15 is substantially T-shaped and has a planar front portion 19 and an arm portion 21 which extends away from the front portion in a direction substantially perpendicular thereto. The arm portion 21 makes a sliding fit in the slot 17 in a direction substantially perpendicular to the longitudinal direction A such that the arm portion defines a substantially rigid side 24 of each terminal receiving cavity 14, and the front portion 19 lies alongside the front face 16 of the main body 11. The front portion 19 has a plurality of openings 64, each aligned with a terminal receiving cavity 14

[0009] The arm portion 21 has integral rigid locking tabs 30 which extend from the arm portion into each terminal receiving cavity 14 at a location generally opposite the locking tabs 42 formed on the beam 34. The tabs 30 are preferably defined by a rib 23 formed on the arm portion 21 with gaps 25 formed in the rib between adjacent tabs.

[0010] The main body 11 is constructed and arranged for receiving a female terminal 22 in each of the terminal receiving cavities 14. The female terminal 22 may include a first end 46 and second end 48, and a body portion 50 therebetween. The first end 46 is open to receive a male terminal. The second end 48 is constructed for attachment to a wire 52, and preferably includes a metal crimp section. The body portion 50 has a recess 58 or an aperture formed therein for receiving the locking tab 30, and a recess 27 or an aperture for receiving the locking tab 42. The recesses 58,27 may be connected as shown by a circumferentially extending groove 29. The recess 58 has a rearwardly facing shoulder 60 for engaging a corresponding forwardly facing shoulder 32 on the locking tab 30. The recess 27 has a rearwardly facing shoulder 31 for engaging a corresponding forwardly facing shoulder 33 on the locking tab 42.

[0011] To assemble the connector 10, the arm portion 21 of the insert 15 is slid into the slot 17, with the locking tabs 30 sliding in the groove 35, until the insert reaches a first position where the gaps 25 between the locking tabs 30 align with the terminal receiving cavities 14. The first end 46 of the female terminal 22 is inserted through the opening 20 in the rear face 18 and into the terminal receiving cavity 14. The first end 46 of the female terminal 22 passes through the gap 25 and engages the locking tab 42, and the beam 34 flexes into the second cavity 44 to accommodate the movement of the beam. The female terminal 22 is pushed forward further until the locking tab 42 makes a snap fit in the recess 27 due to the resilient force of the flexible beam 34. The insert 15 is then slid to a final position in which the locking tab 30 is positioned in the recess 58. The respective shoulders

31,60; 33,32 on the recesses 27,58 and the locking tabs 42,30 prevent inadvertent rearward withdrawal of the terminal 22 from the terminal receiving cavity 14. Unlike prior connectors with flexible locking tangs of fingers, the shoulders 31,32, 33,60 provide a rigid to rigid surface locking feature holding the terminal 22 in this final position. A male terminal (not shown) may be inserted through the opening 64 in the front portion 19 of the insert 15 and into the first end 46 of the female terminal 22 to make an electrical connection therewith.

[0012] In the first position of the insert 15, the openings 64 are offset from the terminal receiving cavities 14, and so the front portion 19 of the insert acts as a stop to prevent over insertion of the female terminals 22.

The openings 64 in the front portion 19 preferably have a diameter which is slightly smaller than the first end 46 of the terminals 22 so that the front portion also acts as a stop for the terminals when the insert 15 is in the final position. An additional insert (not shown) may be placed in each of the second cavities 44 to substantially prevent unintentional flexing of the beam 34 after installation of a female terminal 22.

[0013] As shown in Figure 3, the terminal receiving cavities 14 which are adjacent in a direction perpendicular to the longitudinal direction A on either side of the slot 17 are mirror images so that the arm portion 21 of the insert 15 simultaneously provides a rigid side 24 for each terminal receiving cavity on either side of the arm portion. Alternatively, additional arm portions 21 may be provided on the insert 15, with additional corresponding slots 17 being formed in the main body 11 of the housing 12.

[0014] The electrical connector according to the present invention has a low profile, is simple in design, easy to manufacture, and provides a rigid to rigid surface locking feature of the terminal that has previously been absent in prior art designs.

Claims

1. An electrical connector (10) comprising a connector housing (12) including a main body (11) and an insert (15), the main body having a front face (16), a rear face (18), and a plurality of terminal receiving cavities (14) extending in a longitudinal direction (A) between the front and rear faces (16,18), each terminal receiving cavity (14) being defined in part by opposed side walls (26,28), the insert (15) having a planar front portion (19) positioned adjacent the front face (16) and an arm portion (21) which makes a sliding fit in a direction substantially perpendicular to the longitudinal direction in a slot (17) in the main body, the arm portion defining a rigid side (24) inside of each terminal receiving cavity (14) and having a rigid locking tab (30) extending into each terminal receiving cavity (14); and a female electrical terminal (22) positioned in one of the terminal receiving

cavities and having a recess (58) for receiving the locking tab (30) on the arm portion (21) in a sliding fit, and a first end (46) for receiving a male terminal inserted through an opening (64) in the front portion of the insert (15), **characterised in that** the main body (11) further has a flexible beam (34) which is attached at a first end (36) to the front face (16) and at a second end (38) to the rear face (18) and which has a rigid locking tab (42) extending into the terminal receiving cavity, and the female electrical terminal (22) further has a recess (27) for receiving the locking tab (42) on the flexible beam (34) in a snap fit, the slot (17) opening through the front face (16) and into each terminal receiving cavity (14) on a side opposite to the flexible beam (34).

2. An electrical connector as claimed in Claim 1, wherein a groove (35) is formed in the main body (11) of the housing (12) which opens into the slot (17); and wherein the arm portion (21) of the insert (15) has a rib (23) formed thereon which makes a sliding fit in the groove, the rib defining the locking tab (30) of the rigid side (24) of each terminal receiving cavity (14).
3. An electrical connector as claimed in Claim 2, wherein the rib (23) has a number of gaps (25) formed therein, wherein in a first position of the insert (15) relative to the main body (11), the gaps align with the terminal receiving cavities (14) to allow insertion of the female terminal (22) into one of the cavities.
4. An electrical connector as claimed in any one of Claims 1 to 3, wherein terminal receiving cavities (14) are positioned on either side of the slot (17), and wherein the arm portion (21) of the insert (15) defines the rigid side of the terminal receiving cavities on either side of the slot.
5. An electrical connector as claimed in any one of Claims 1 to 4, wherein a second cavity (44) is formed in the main body (11) on the opposite side of the flexible beam (34) to the terminal receiving cavity (14).
6. An electrical connector as claimed in any one of Claims 1 to 5, wherein the front portion (19) of the insert (15) defines a stop surface for the female terminal (22).
7. An electrical connector as claimed in any one of Claims 1 to 6, wherein the recesses (27,58) in the female terminal (22) are defined by a circumferentially extending groove (29) formed in the terminal.

Patentansprüche

1. Elektrischer Verbinder (10), mit einem Verbindergehäuse (12), das einen Hauptkörper (11) und einen Einsatz (15) umfasst, wobei der Hauptkörper eine Vorderseite (16), eine Rückseite (18) und eine Vielzahl von Anschlussaufnahmehohlräumen (14) aufweist, die sich in einer Längsrichtung (A) zwischen der Vorderseite (16) und der Rückseite (18) erstrecken, wobei jeder Anschlussaufnahmehohlraum (14) zum Teil durch gegenüberliegende Seitenwände (26, 28) definiert ist, wobei der Einsatz (15) einen ebenen vorderen Abschnitt (19), der benachbart zu der Vorderseite (16) angeordnet ist, und einen Armabschnitt (21) aufweist, der einen Gleitsitz in einer Richtung im wesentlichen senkrecht zur Längsrichtung in einem Schlitz (17) in dem Hauptkörper herstellt, wobei der Armabschnitt eine steife Seite (24) in jedem Anschlussaufnahmehohlraum (14) definiert und eine steife Verriegelungsnase (30) aufweist, die sich in jeden Anschlussaufnahmehohlraum (14) hinein erstreckt, und mit einem elektrischen Buchsenanschluss (22), der in einem der Anschlussaufnahmehohlräume angeordnet ist und eine Ausnehmung (58), um die Verriegelungsnase (30) an dem Armabschnitt (21) in einem Gleitsitz aufzunehmen, und ein erstes Ende (46) aufweist, um einen Steckeranschluss aufzunehmen, der durch eine Öffnung (64) in dem vorderen Abschnitt des Einsatzes (15) eingeführt wird, **dadurch gekennzeichnet, dass** der Hauptkörper (11) des weiteren einen flexiblen Balken (34) aufweist, der an einem ersten Ende (36) an der Vorderseite (16) und an einem zweiten Ende (38) an der Rückseite (18) angebracht ist, und der eine steife Verriegelungsnase (42) aufweist, die sich in den Anschlussaufnahmehohlraum hinein erstreckt, und der elektrische Buchsenanschluss (22) des weiteren eine Ausnehmung (27) aufweist, um die Verriegelungsnase (42) an dem flexiblen Balken (34) in einem Schnappsitz aufzunehmen, wobei der Schlitz (17) sich durch die Vorderseite (16) und in jeden Anschlussaufnahmehohlraum (14) hinein auf einer dem flexiblen Balken (34) gegenüberliegenden Seite öffnet.
2. Elektrischer Verbinder nach Anspruch 1, **dadurch gekennzeichnet, dass** eine Nut (35) in dem Hauptkörper (11) des Gehäuses (12) ausgebildet ist, die sich in den Schlitz (17) hinein öffnet; und dass an dem Armabschnitt (21) des Einsatzes (15) eine Rippe (23) ausgebildet ist, die einen Gleitsitz in der Nut herstellt, wobei die Rippe die Verriegelungsnase (30) der steifen Seite (24) jedes Anschlussaufnahmehohlraums (14) definiert.
3. Elektrischer Verbinder nach Anspruch 2, **dadurch gekennzeichnet, dass**

in der Rippe (23) eine Anzahl von Aussparungen (25) ausgebildet ist, wobei sich die Aussparungen in einer ersten Stellung des Einsatzes (15) relativ zu dem Hauptkörper (11) mit den Anschlussaufnahmehohlräumen (14) ausrichten, um ein Einführen des Buchsenanschlusses (22) in einen der Hohlräume zu erlauben.

4. Elektrischer Verbinder nach einem der Ansprüche 1 bis 3,

dadurch gekennzeichnet, dass Anschlussaufnahmehohlräume (14) auf beiden Seiten des Schlitzes (17) angeordnet sind, und dass der Armabschnitt (21) des Einsatzes (15) die steife Seite der Anschlussaufnahmehohlräume auf beiden Seiten des Schlitzes definiert.

5. Elektrischer Verbinder nach einem der Ansprüche 1 bis 4,

dadurch gekennzeichnet, dass ein zweiter Hohlraum (44) in dem Hauptkörper (11) auf der dem Anschlussaufnahmehohlraum (14) gegenüberliegenden Seite des flexiblen Balkens (34) ausgebildet ist.

6. Elektrischer Verbinder nach einem der Ansprüche 1 bis 5,

dadurch gekennzeichnet, dass der vordere Abschnitt (19) des Einsatzes (15) eine Anschlagfläche für den Buchsenanschluss (22) definiert.

7. Elektrischer Verbinder nach einem der Ansprüche 1 bis 6,

dadurch gekennzeichnet, dass die Ausnehmungen (27, 58) in dem Buchsenanschluss (22) durch eine sich in Umfangsrichtung erstreckende Nut (29) definiert sind, die in dem Anschluss ausgebildet ist.

Revendications

1. Connecteur électrique (10) comprenant un boîtier de connecteur (12) incluant un corps principal (11) et un insert (15), le corps principal ayant une face frontale (16), une face arrière (18) et une pluralité de cavités (14) de logement de borne, s'étendant dans une direction (A) longitudinale entre les faces avant et arrière (16,18), chaque cavité (14) de logement de borne étant en partie délimitée par des parois de côté (26, 28) opposées, l'insert (15) ayant une partie avant (19) plane, positionnée de façon adjacente à la face avant (16), et une partie formant bras (21) qui s'ajuste à coulissement, en une direction substantiellement perpendiculaire à la direction longitudinale, en une fente (17) ménagée dans le corps principal, la partie formant bras définissant un

côté rigide (24) à l'intérieur de chaque cavité (14) de logement de borne, et ayant une patte de verrouillage rigide (30) s'étendant dans chaque cavité (14) de logement de borne, et une borne électrique femelle (22), positionnée dans une des cavités de logement de borne et ayant une cavité (58) pour loger la patte de verrouillage (30) sur la partie formant bras (21) par ajustement à coulissement, et une première extrémité (46) pour loger une borne mâle insérée par une ouverture (64) ménagée dans la partie avant de l'insert (15), **caractérisé en ce que** le corps principal (11) comprend en outre une poutre flexible (34) qui est attachée à une première extrémité (36) à la face avant (16), et à une deuxième extrémité (38) à une face arrière (18) et qui a une patte de verrouillage (42) rigide et s'étendant à l'intérieur de la cavité (16) de logement de borne, et la borne électrique femelle (22) comprend en outre une cavité (27) pour loger la patte de verrouillage (42) sur la poutre flexible (34), par un ajustement par encliquetage, la fente (17) s'ouvrant par la face avant (16) et dans chaque cavité (14) de logement de borne sur un côté opposé à la poutre flexible (34).

2. Connecteur électrique selon la revendication 1, dans lequel une gorge (35) est formée dans le corps principal (11) du boîtier (12) qui s'ouvre dans la fente (17); et dans lequel la partie formant bras (21) de l'insert (15) a une nervure (23) formée sur celui-ci, qui s'ajuste dans la gorge par glissement, la nervure définissant la patte de verrouillage (30) du côté rigide (24) de chaque cavité (14) de logement de borne.

3. Connecteur électrique selon la revendication 2, dans lequel la nervure (23) comporte en son sein une pluralité (25), dans lequel, en une première position de l'insert (15) par rapport au corps principal (11), les intervalles s'alignent avec les cavités (14) de logement de bornes, afin de permettre l'insertion des bornes femelles (22) dans l'une des cavités.

4. Connecteur électrique selon l'une quelconque des revendications 1 à 3, dans lequel les cavités (14) de logement de borne sont positionnées sur l'un quelconque des côtés de la fente (17), et dans lequel la partie formant bras (21) de l'insert (15) définit le côté rigide des cavités de logement de borne sur l'un quelconque des côtés de la fente.

5. Connecteur électrique selon l'une quelconque des revendications 1 à 4, dans lequel une deuxième cavité (44) est formée dans le corps principal (11), sur le côté opposé de la poutre flexible (34) par rapport à la cavité (14) de logement de borne.

6. Connecteur électrique selon l'une quelconque des

revendications 1 à 5, dans lequel la partie avant (19) de l'insert (15) définit une surface d'arrêt pour la borne femelle (22).

7. Connecteur électrique selon l'une quelconque des revendications 1 à 6, dans lequel les cavités (27, 58) ménagées dans la borne femelle (22) sont définies par une gorge (29) s'étendant de façon circconférentielle et formée dans la borne.

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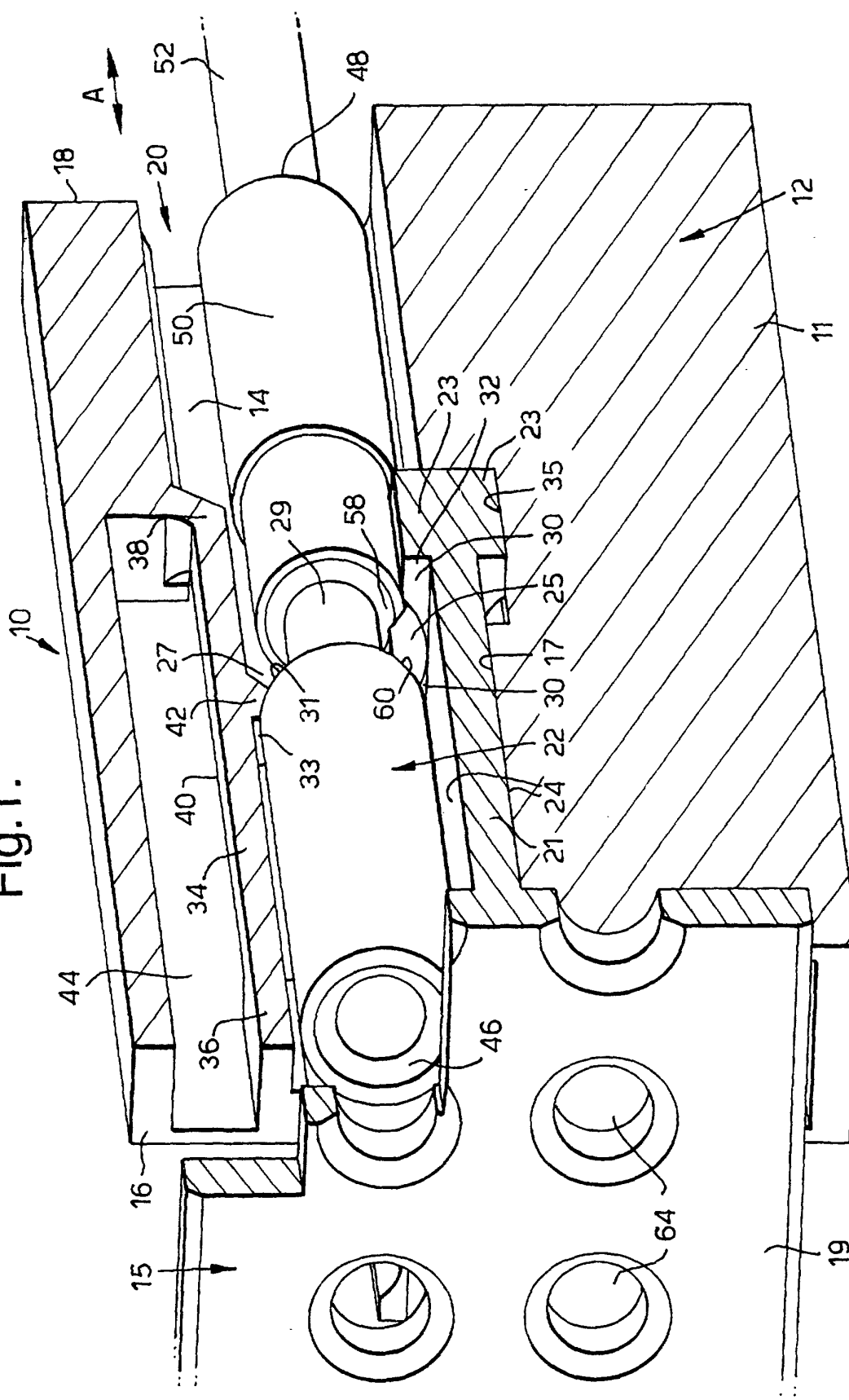
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Fig.1.



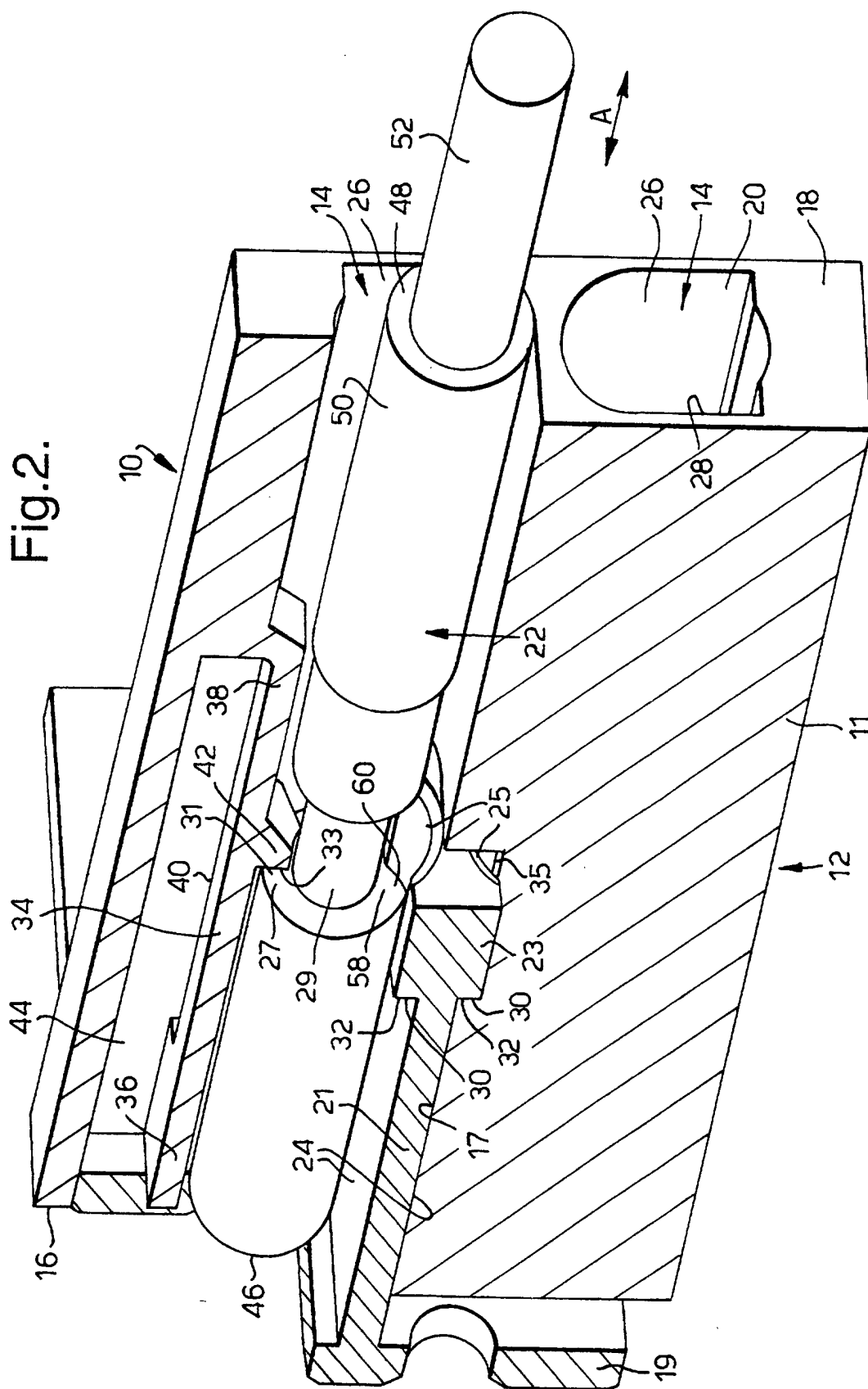


Fig.3.

