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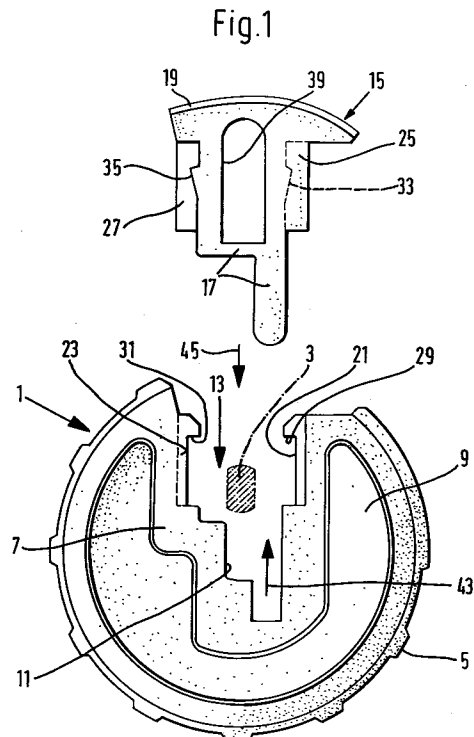
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Connection of a shaft with an element, in particular the shaft of a rotary setting member with a setting wheel.

For connecting a shaft (3) with a setting wheel (1), the setting wheel (1) comprises a recess (11) and an opening (13) which connects said recess with the outer edge of the setting wheel and through which the connection can be effected by relative movement of the shaft (3) and the setting wheel (1) transversely to the axis of the shaft. In order to secure the setting wheel (1) on the shaft (3) an element (15) is provided which can be inserted into the opening (13) of the setting wheel (1) by an insertion movement transversely to the axis of the shaft, with interlocking means (29, 31 and 33, 35 respectively) on the setting wheel (1) and the element (15) cooperating for fixing element (15) in the opening (13). Shape and dimensions of element (15) are adapted to those of the opening (13) and the outer contour of setting wheel (1) such that when element (15) is inserted the setting wheel is completed at least in the area of its outer edge and given a substantially closed shape.



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The invention relates to a connection of a shaft with an element, in particular the shaft of a rotary setting member with a setting wheel, said connection comprising a recess provided for seating the shaft in said element and an opening by which said recess is connected to the outer edge of said element and through which the connection can be effected by relative movement of the shaft and the element transversely to the axis of said shaft.

Connections of this type are as a rule used if lack of space or special spatial or constructional circumstances render it difficult or impossible to bring the shaft and the recess forming its seat or bearing into engagement by a relative movement in the axial direction (relative to the axis of the shaft). If there is not sufficient space available a given shaft length can prevent the shaft from being inserted by axial shifting into a recess which serves as a bearing in a bearing block or plate. If the first element including such a recess is a wheel which is to be brought into position on a shaft lack of space or special reasons of manufacture or assembly may also forbid shifting of the wheel onto the shaft from the shaft end.

It is the object of the invention to provide a connection of the generic type which is adapted for universal use and particularly advantageous in cases where a setting wheel has to be connected with the shaft of a rotary setting member.

According to the invention this object is attained with a connection of the aforementioned type in that a second element is inserted into the opening in a direction transverse to the axis of the shaft and in that interlocking means provided on said first and said second element cooperate to fix the second element in the opening of the first element.

Since, in accordance with the invention, a second element is provided which can be inserted into the opening of the first element, the first element whose outer contour was initially interrupted by the opening extending up to its edge, can be given a desired shape, e.g. a closed shape, by the insertion of the second element.

If the connection is intended for linking a shaft to a wheel the opening in the wheel portion, which forms the first element and includes the recess for the shaft, and the insert which forms the second element, can be shaped in a particularly advantageous manner such that when the connection is completed, the wheel connected with the shaft has a closed uninterrupted contour and/or exhibits the desired wheel shape.

If the second element is for example a wheel segment by which a setting wheel is completed, such wheel segment may be made from a material differing in color from the rest of the wheel and thus serving at the same time as a colored setting

mark on the circumference of the wheel.

The invention will be described in further detail with reference to embodiments illustrated in the drawing in which:

- 5 Fig. 1 shows a front view of a setting wheel adapted for the connection, with a noncircular portion of a shaft illustrated in section and the elements not yet connected;
- 10 Fig. 2 shows a front view corresponding to Fig. 1, with the elements connected;
- 15 Fig. 3 shows a front view of a circumferential section of the setting wheel according to Figs. 1 and 2, with parts broken away; and
- 20 Figs. 4 and 5 show front views, with parts broken away, of an embodiment of the connection, with a shaft in a bearing illustrated in section and the elements in positions prior to the completion and after completion of the connection respectively.
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Figs. 1 to 3 show the connection according to the invention with reference to a setting wheel 1 which is to be mounted on a non-circular portion of a shaft 3. In the embodiment illustrated shaft 3 is the setting shaft of an adjusting potentiometer (not illustrated) which serves as a rotary setting member. During the so-called surface mounting the potentiometer is attached to a printed circuit board (not illustrated) on the upper surface facing away from the conductors such that shaft 3 extends in parallel with the circuit board and setting wheel 1 is received with its rim in a slot of said circuit board. For connecting the circuit board with the potentiometer, the solder pins thereof are plugged through the circuit board and are then electrically connected with the conductor paths on the lower side of the circuit board in that said lower part of the circuit board along with the free ends of the solder pins is moved across a solder bath. This soldering operation must be carried out before the setting wheel is positioned on shaft 3 of the potentiometer because otherwise the setting wheel would be immersed in the solder bath with its rim projecting from the slot of the lower side of the circuit board. A setting wheel made from plastic for example would thus be damaged in that the portion immersed would melt.

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If, however, the potentiometer is connected with the circuit board without setting wheel 1 the setting wheel 1 cannot be axially mounted on shaft 3 if the rim of the setting wheel is to extend through the slot of the circuit board as in the case of the embodiment described. In such cases, there-

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fore, a connection of setting wheel 1 with shaft 3 can only be effected by a radial movement of said wheel relative to the axis of the shaft.

In the case of the embodiment setting wheel 1 is a center disk wheel molded from plastic and provided on part of its circumference with projections 5 forming a knurled surface which facilitates manual rotation. Between its rim featuring the projections 5 and an adjacent inner hub portion 7, the wheel disk has a portion 9 which is thinner than the rest and extends over the majority of the circumference of the wheel. Hub portion 7 includes a recess 11 in the central portion of wheel 1, which serves to seat the noncircular shaft 3. Recess 11 is part of an opening 13 which extends to the periphery of the wheel so that wheel 1 is open on part of its circumference. With the exception of recess 11, the entire opening 13 can be closed by a wedge 15 which is molded from plastic and shaped such that when it is placed in the opening 13 the circumference of setting wheel 1 is at least substantially completed and a closed wheel thus formed. Wedge portion 17 which is located close to recess 11 when the wedge is inserted is shaped like recess 11 such that it fits the noncircular portion of shaft 3 positioned in recess 11 and, in cooperation with the edge of recess 11, connects the shaft with setting wheel 3 in a manner preventing rotation.

In the case of the embodiment illustrated the thickness of wedge 15 corresponds to that of hub portion 7 of wheel 1. In an end section 19 facing radially outwards with respect to the axis of shaft 3, wedge 15 forms an arcuate section. In the areas close to the circumference of the wheel the edges of opening 13 are provided with strips 21 and 23 which are axially offset relative to each other (with respect to the axis of shaft 3) such that the outer surface of one strip is flush with the outer surface of hub portion 7 on one side of the wheel and the other strip is flush with the outer surface of hub portion 7 on the other side of the wheel. The strips 21 and 23 thus provide facing inner step surfaces for mounting the facing inner surfaces of lateral wings 25 and 27 respectively integrally formed with wedge 15 in a position complementary to that of the strips 21, 23 of wheel 1. In order to safely prevent wedge 15 from being rotated out of the plane of wheel 1 about an axis extending radially with respect to shaft 3 even if wheel 1 is very thin, the end faces of wheel 1, which in the area of the strips 21 and 23 face the end faces of wedge 15 and rest against said faces, may form acute angles with the step surfaces formed by the strips 21 and 23 so that when the end faces of wedge 15 are inclined accordingly, wedge 15 is locked with wheel 1.

The strips 21 and 23 have projections 29 and 31 respectively which are brought into locking en-

gagement with locking noses 33 and 35 respectively of wedge 15 when the wedge is inserted into opening 13.

The locking noses 33 and 35 respectively can override the rear sides of the projections 29, 31 in that wedge 15 is resilient in the range of noses 33, 35. The resiliency is brought about in that wedge 15 has in its central area a cut-out 39 which allows it to be deformed in the adjacent areas in the manner indicated in Fig. 3 in dash-dotted lines. This also allows wedge 15 to be removed after insertion by means of a tool such as a screwdriver blade 41, shown in section in Fig. 3, which is inserted between locking nose 35 and strip 23 to urge nose 35 out of engagement with projection 31.

The connection between setting wheel 1 and shaft 3 can be effected in that wheel 1 is moved transversely to the axis of shaft 3 as indicated by the arrow 43 in Fig. 1. When shaft 3 has been positioned by this movement in the recess 11 of hub portion 7 of wheel 1 wedge 15 is inserted by an opposite insertion movement transversely to the axis of shaft 3 - see arrow 45 in Fig. 1 - into opening 13, with the locking noses 33 and 35 engaging the projections 29 and 31 respectively. This position is shown in Fig. 2 which depicts the completed connection in which shaft 3 is fixed against rotation in recess 11 of hub portion 7 of the wheel.

Setting wheel 1 can be axially fixed on shaft 3 in various manners. In the case of a setting wheel that is fixed on the shaft of a potentiometer mounted on a printed circuit board, the edges of the slot of the circuit board in which setting wheel 1 is received, serve as abutments by which axial movement of the wheel is limited. Alternatively, the shaft section seated in hub portion 7 of wheel 1 could be a tapered section in the form of an annular groove.

Rather than connecting shaft 3 and setting wheel 1 in a manner preventing rotation, a wheel could also be rotatably mounted on the associated shaft. In such a case the recess in hub portion 7 of wheel 1 and the adjacent portion 17 of wedge 15 would have to be adapted to the circular shape of the shaft.

Wedge 15 may consist of a material which differs in color from the material of wheel 1 so that wedge 15 forms a colored section on the circumference of wheel 1, which may serve as a setting mark or the like.

In Figs. 4 and 5, those parts whose shapes or functions correspond to those of parts of the embodiment according to Figs. 1 to 3, have reference numerals to which 100 has been added in each case. They show an embodiment in which a rotary shaft 103 is to be connected with a stationary bearing block 101. In a manner analogous to that described with reference to the embodiment in

Figs. 1 to 3, the connection is effected by relative movement of the elements transversely to the axis of shaft 103. The design of recess 111 of bearing block 101 and portion 117 of wedge 115, which defines recess 111, is adapted to the round shape of shaft 103. Fig. 4 shows the elements prior to their connection, Fig. 5 shows the completed connection. As can be seen from these Figs. wedge 115 is shaped at its outside 119 such that it completes the outer contour of bearing block 101 and a closed body with a straight edge is thus obtained.

The above description and the drawing are restricted to features which are essential to the disclosure of an embodiment of the invention. Features not disclosed in the description and the drawing and not mentioned in the claims also serve if necessary to define the subject matter of the application.

Claims

1. Connection of a shaft (3; 103) with an element (1; 101), in particular the shaft (3) of a rotary setting element with a setting wheel (1), said connection comprising a recess (11; 111) provided for seating said shaft in said element and an opening (13; 113) by which said recess is connected with the outer edge of the element and through which the connection can be effected by relative movement of the shaft and the element transversely to the axis of said shaft, **characterized** in that a second element (15; 115) is inserted into the opening (13; 113) in a direction transversely to the axis of the shaft and that interlocking means provided on the first element (1; 101) and the second element (15; 115) cooperate to fix the second element (15; 115) in the opening (13; 113) of the first element (1; 101).
2. Connection according to claim 1, characterized in that shape and dimensions of the second element (15; 115) are adapted to those of the opening (13; 113) and the outer contour of the first element (1; 101) such that when the second element (15; 115) is inserted, the latter is completed at least in the area of its outer edge and given a substantially closed shape.
3. Connection according to claim 2, characterized in that the first element is designed as a wheel (1) and the closed shape is the outer contour of the wheel.
4. Connection according to one of claims 1 to 3, characterized in that the interlocking means consist of locking means (29; 31 and 33; 35 respectively) which are provided at the edges of the opening (13; 113) of the first element (1; 101) and in associated edge areas of the second element (15; 115).
5. Connection according to claim 4, characterized in that the second element is designed as a wedge (15; 115) which can be inserted into the opening (13; 113) of the first element (1; 101) and in that the locking means comprise resilient locking noses (33, 35) provided on wall portions of the wedge and adapted to cooperate with projections (29 and 31 respectively) in the opening (13; 113).
6. Connection according to one of claims 1 to 5, characterized in that the first and/or the second element (1 and 15 respectively) have a cut-out (39) in the range of the interlocking means, said cut-out allowing the element to be resiliently deformed and the interlocking means to be unlocked.
7. Connection according to one of claims 1 to 6, characterized in that shaft (3) is noncircular at least in the area which is to be connected with the first element (1) and that the shape of recess (11) and/or the adjacent area (17) of the second element (15) is adapted to said noncircular shape in order to connect said element with shaft (3) in a manner preventing rotation.

Fig.1

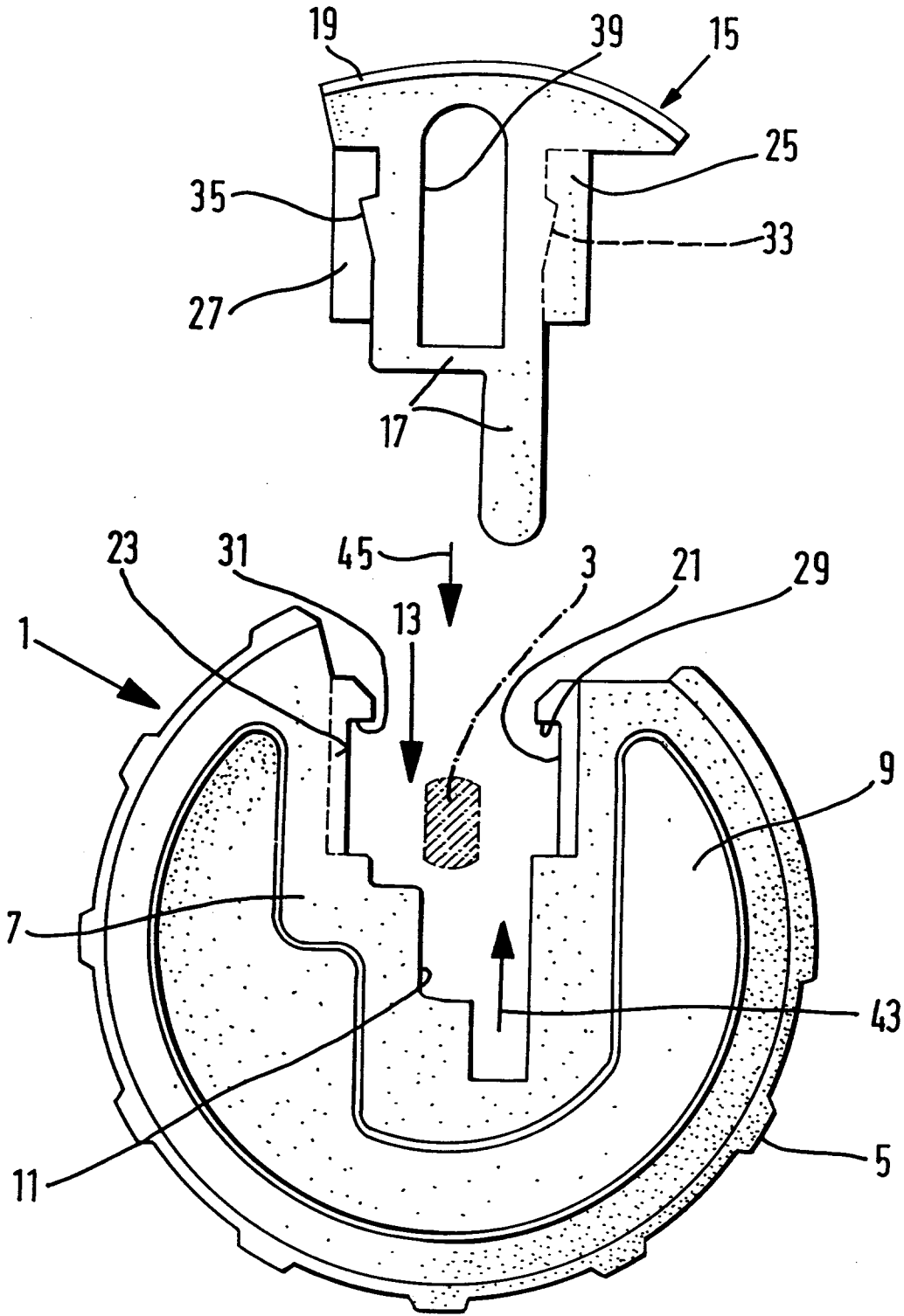


Fig.2

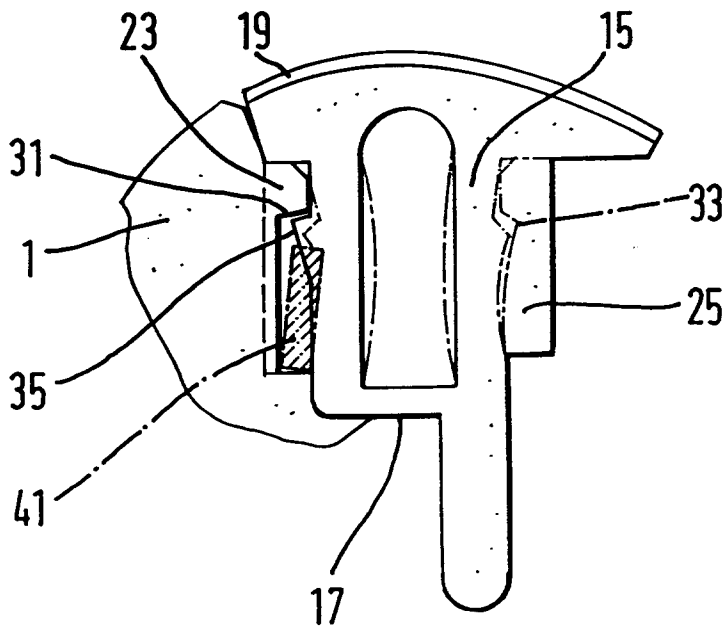
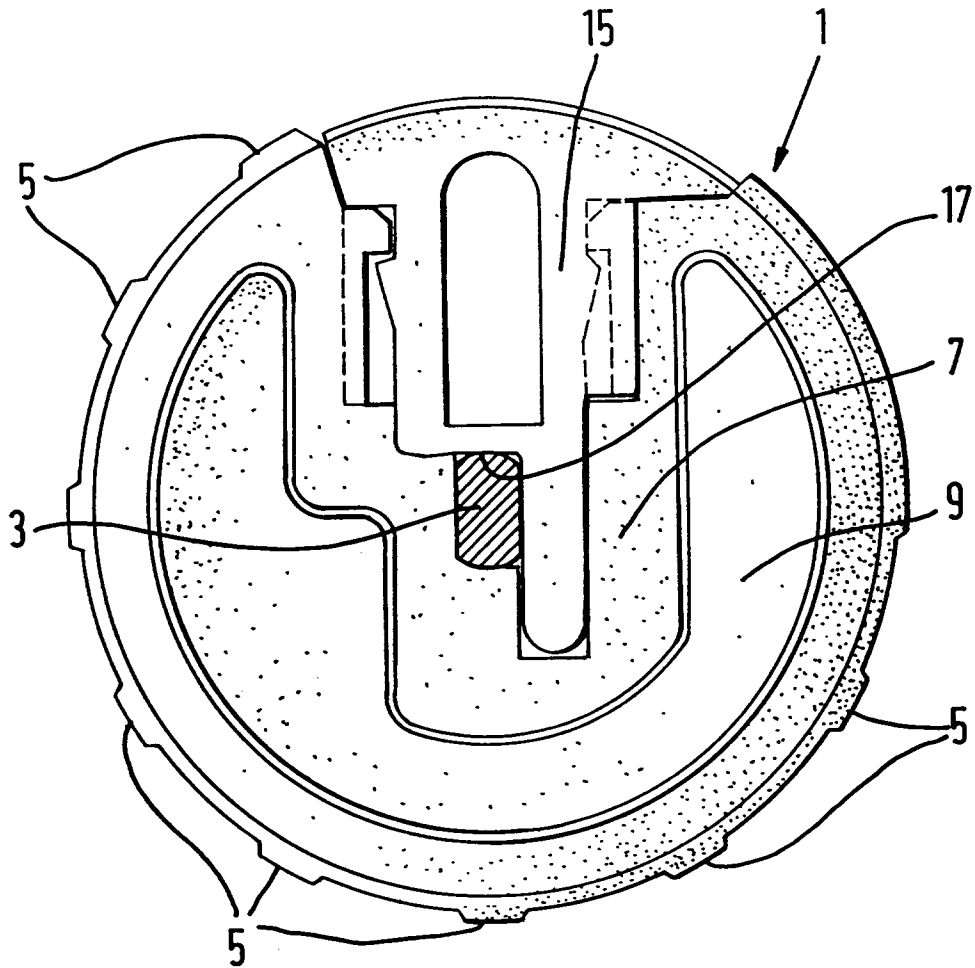


Fig.3

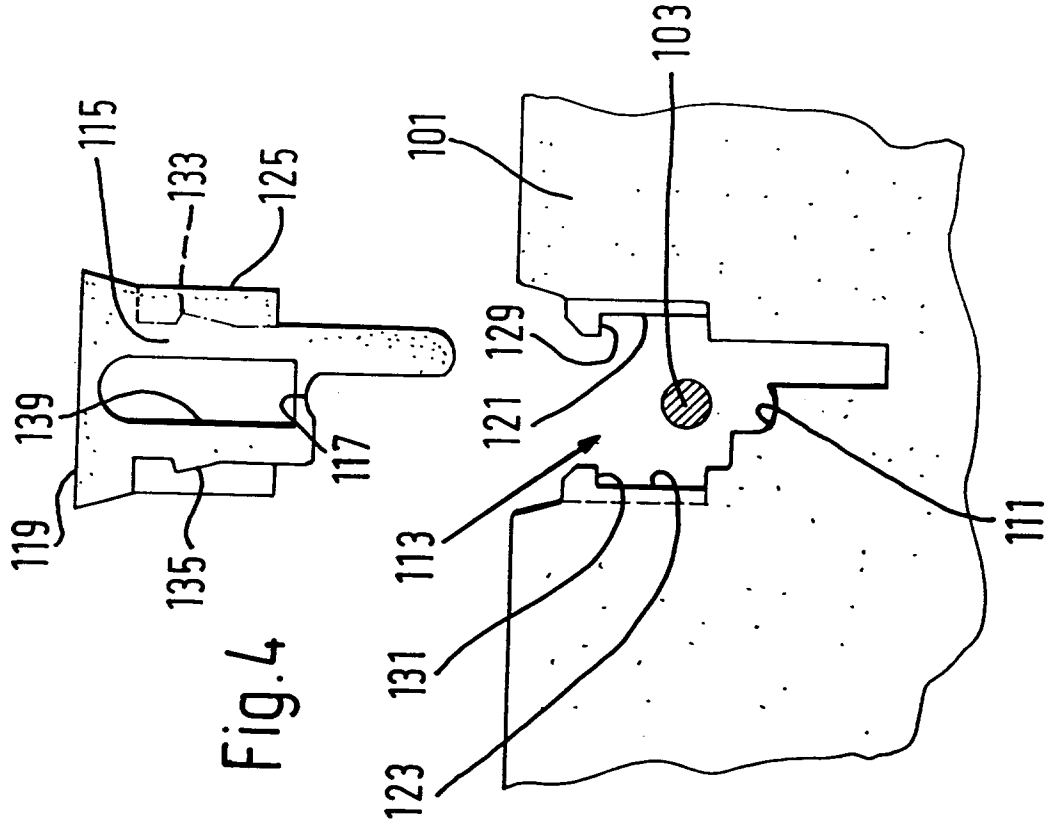


Fig. 4

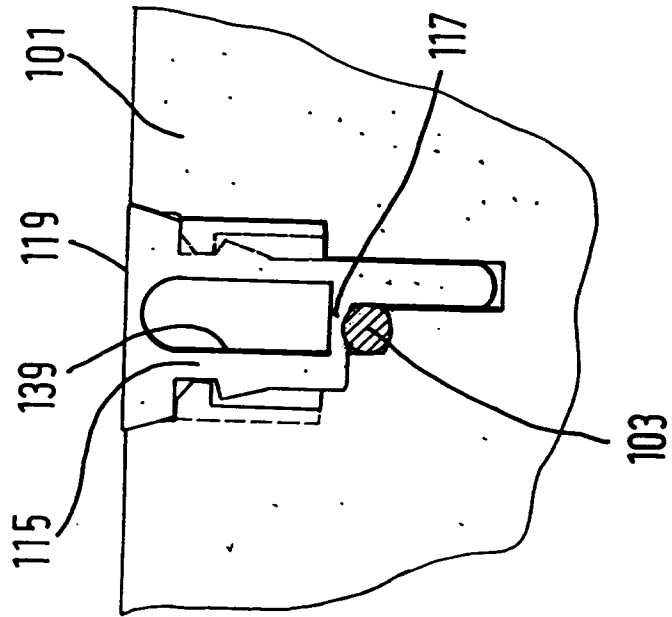


Fig. 5



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	WO-A-8 601 266 (AMERICAN SNAPNUT ASSOCIATES) * page 3; figures * ---	1-7	G05G1/12 F16D1/06 F16D1/08
A	FR-A-328 905 (KOTTBUSH) ---		
A	DE-C-836 372 (STECHE) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			G05G F16D F16B H01H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22 APRIL 1993	Examiner DE SCHEPPER H.P.H.
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	

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