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(54) **Method for forming a plug on one end of a cable, as well as plugs**

Herstellungsverfahren eines Steckers an einem Ende eines Kabels sowie Stecker

Méthode pour former un connecteur à une extrémité d'un câble ainsi que des connecteurs

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(56) References cited:
EP-A- 0 210 621
EP-A- 0 691 705
GB-A- 2 152 301
JP-A- 7 130 436
US-A- 4 704 091
US-A- 5 417 585

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Description

[0001] The invention relates to a method for forming a plug on one end of a cable, which plug comprises a connecting piece, a casing of plastic material and a colour code, whereby the connecting piece is attached to the end of the cable, after which part of the connecting piece and part of the cable comprising said end are enveloped by the plastic casing.

[0002] The invention also relates to plugs comprising a connecting piece, a casing of plastic material and possibly a colour code.

[0003] With such a method, which is known per se, the connecting piece, which for example comprises electrically conducting pins, is attached to the end of a cable comprising electrically conducting wires. Then the casing is formed on the end of the cable by means of a plastic injection moulding technique, whereby a portion of the connecting piece projects from the casing.

[0004] In order to make it easier to connect a cable to an appliance, the plug is provided with a colour code, which for example corresponds with a colour code present on the appliance.

[0005] With a known plug such a colour code is made up of an annular tape of a selected colour different from the colour of the casing, which is provided round the casing. One drawback of such a tape is that the tape will come loose with the lapse of time, and that affixing the tape is a relatively labourious activity. Furthermore the tape affects the appearance of the plug.

[0006] It has to be noted that from US-A-4.704.091 a method for forming a plug is known whereby a first part comprises portions which fully extend through openings in a second part. The first part needs to be positioned in the mould very accurate to obtain a correct position of the visible portion from the first part with respect to the second part.

[0007] The object of the invention is to provide a method for forming a plug, wherein the plug is provided with a colour code in a simple manner.

[0008] This objective is accomplished with the method according to the invention in that the plastic casing is made of at least two interconnected, differently coloured parts of plastic material, whereby the first part, which comprises a cylindrical portion, is first attached to the end of the cable, after which the end of the cable provided with said first part is placed into a mould, whereby said cylindrical portion abuts at least partially against the mould near its centre, whilst said cylindrical portion is clear of the mould on either side of said centre, after which a second plastic part is formed in the mould, which plastic part abuts against said first part on either side of said centre of said cylindrical portion.

[0009] Said first and said second part have different colours, whereby the second part has the same colour as the cable, for example, and the colour of the first part forms the colour code.

[0010] Since the first part comprises a cylindrical portion, of which only a small part located near the centre will be visible after the second part has been formed, the accuracy with which first part is to be positioned in the mould is not very critical. As a result of this the placing of the first part in the mould can take place relatively quickly. Furthermore this makes it possible to compensate for dimensional tolerances of the connecting piece relative to the first part. Said dimensional tolerances result from the shrinking of the plastic material, for example. The second part can thus be accurately positioned relative to the connecting piece, whereby the fact that the first part is not accurately positioned relative to the connecting piece does not constitute a problem.

[0011] One embodiment of the method according to the invention is characterized in that said first part is provided with teeth.

[0012] Said teeth ensure a proper fixation of the second part to the first part.

[0013] The invention also relates to a plug comprising a connecting piece, a casing of plastic material and a colour code, which plug is characterized in that said casing comprises at least two interconnected, differently coloured parts of plastic material, whereby the first part comprises a cylindrical portion, which is connected to the second part on either side of its centre, seen in axial direction, leaving clear a portion located near the centre.

[0014] Further preferred embodiments of the plug according to the invention are defined by the features of claims 4 to 10.

[0015] The colour of the first part thereby forms the colour code of the plug. Said colour code cannot be removed from the plug, this in contrast to the above-described known plug.

[0016] It is noted that with another plug which is known per se, the entire plug has a characteristic colour, for example white or red. One drawback of such a colour code, whereby the entire plug has a selected characteristic colour, is that such a plug is relatively conspicuous, which has an adverse effect on the appearance of the plug and the appliance to which the plug is connected.

[0017] With the plug according to the invention the portion of the first part that is exposed to view may be provided on the plug on a relatively subtle manner.

[0018] The invention will be explained in more detail hereafter with reference to the drawings, wherein:

Figures 1A-1E show various steps of the method according to the invention;
Figure 2 is a cross-sectional view of a mould for the provision of a first part;
Figure 3 is a cross-sectional view of a mould for the provision of a second part;
Figure 4 is a view of a plug attached to a cable, wherein the central axes of the cable and the plug are in line;
Figure 5 shows the plug of Figure 4, wherein the cable is bent relative to the plug.

[0019] Like parts are numbered alike in the figures.

[0020] Figures 1A-1E show various steps of the forming of a plug on one end of a cable in accordance with the invention.

[0021] Figure 1A shows a cable 1, which comprises two electrically insulated wires 2, 3, which have been stripped of their electric insulation near their ends. A connecting piece 4 is disposed near the end of cable 1, which connecting piece for example comprises an electrically conducting sleeve 5 and an electrically conducting pin 6 concentrically positioned therein. The ends of wires 2, 3 are connected to pin 6 and sleeve 5 respectively by means of a soldering technique, for example.

[0022] In Figure 1B a first part 7 of plastic material is fixed round a portion of connecting piece 4 and one end of cable 1. First part 7 comprises a cylindrical portion 8, which extends parallel to the central axes of cable 1 and connecting piece 4. Teeth 9 are provided near one end of first part 7.

[0023] First part 7 is formed by means of a plastic injection moulding technique, using mould 10 of Figure 2. Mould 10 comprises two identical mould halves 11, 12, which are capable of movement relative to each other. Each mould half 11, 12 is provided with a gate 13, via which plastic material is injected into mould 10. When the cable shown in Figure 1A and the connecting piece 4 attached thereto are placed into mould 10, cable 1 will abut against a corresponding edge 14 of mould 10, whilst sleeve 5 of connecting piece 4 will abut against an edge 15 of mould 10, which forms a stop member. First part 7 is injection-moulded from a plastic having a selected characteristic colour, for example red, white or yellow. The portion of the plug to be formed that forms a colour code is present on cylindrical portion 8, which has a width B which is larger than the colour code that will eventually be visible.

[0024] Figure 1C is a view of the cross-section shown in Figure 1B of a cable and a plug to be formed thereon.

[0025] Cable 1 and the connecting piece 4 fixed thereto and first part 7 are then placed into a second mould 20 (see Figure 3).

[0026] Mould 20 comprises two identical mould halves 21, 22, which are capable of movement relative to each other, which mould halves are each provided with gates 23. The mould is formed with a profile, which corresponds with the eventual desired profile on the plug to be formed. Said profile 24 comprises three annular flanges 25, 26, 27, which are separated from each other by two annular recesses 28, 29. Annular flange 26 extends further towards the central axis of mould 20 than adjacent flanges 25, 27. Flange 26 extends in the direction of the central axis, so far that when a cable comprising a first part 7 already formed thereon is present in mould 20, flange 26 abuts against cylindrical portion 8 of first part 7. The width b of flange 26 is thereby smaller than width B of cylindrical portion 8 of first part 7. When the cable shown in Figures 1B and 1C and the first part 7 formed thereon are placed into mould 20, a front edge 30 of sleeve 5 will be aligned to extend parallel to an edge 31 of mould 20. Mould 20 abuts against sleeve 5 and cable 1 with edges 32 and 33 respectively. Then plastic material is injected into mould 20 via gates 23, thus forming second part 34 on cable 1. Second part 34 comprises an annular recess 35 defined by flange 26, which has a width b through which part of cylindrical portion 8 of first part 7 is visible. Second part 34 is provided with annular flanges 36 on either side of annular recess 35. Annular recesses 37 defined by flanges 27 of mould 20 are formed on sides of flanges 36 that face away from each other.

[0027] If no dimensional variations were to occur upon forming first part 7 on connecting piece 4 and if edge 30 of sleeve 5 is accurately aligned with respect to edge 31 of mould 20, annular recess 35 would be located in the centre of cylindrical part 8. If, however, the distance from edge 30 of sleeve 5 to cylindrical portion 8 differs from the distance to be theoretically expected, due to dimensional tolerances, or if edge 30 cannot be accurately aligned with respect to edge 31 of mould 20, recess 35 will be offset from the centre of cylindrical portion 8 in the direction indicated by arrow P or in the opposite direction. Since width b of recess 35 is smaller than width B of cylindrical portion 8, this will not be visible on the outside of second part 34. From the outside of the plug 38 formed on cable 1 the part of cylindrical portion 8 that is visible through recess 35 will remain positioned symmetrically relative to annular recesses 37.

[0028] Teeth 9 provide a firm fixation of second part 34 to first part 7.

[0029] During the forming of second part 34 an arrow 39 and a flexible portion 40 providing pull relief are formed on plug 38 by means of mould 20.

[0030] Arrow 39 may point in the direction indicated by arrow P, or in the opposite direction, with arrow 39 indicating the direction of the signal to be passed through cable 1. This is especially important with cables through which a signal can or must be passed in one direction only.

[0031] The flexible part 40 providing pull relief comprises a number of flanges 41, which are separated from each other by slots 42. Flange 43 located furthest away from connecting piece 4 is thicker, so that a solid connection with cable 1 is formed.

[0032] Figure 4 shows cable 1 and the plug 38 formed thereon in a position wherein central axis 44 of cable 1 is in line with central axis 45 of plug 38. When cable 1 pivots in the direction indicated by arrow P2 relative to plug 38, the right-hand portions, seen in Figure 4, of flanges 41 will be bent towards each other, and the left-hand portions, seen in Figure 4, of flanges 41 will bend away from each other. The width of slots 42 and flanges 41 is such that when the angle between central axis 44 of cable 1 and central axis 45 of plug 38 is about 90°, flanges 41 will touch one another in a continuous arc 46. In this manner it is possible to insert the plug horizontally into an appliance, for example on the rear side of the

appliance, after which the cable 1 connected to the plug is bent downwards or upwards through an angle of about 90°. The flanges 41 abutting against one another prevent cable 1 from being bent through a larger angle and coming into contact with the appliance.

[0033] It is possible to provide the plug, in a similar manner as described above, with a colour code in the form of ring segments or otherwise, with likewise only part of the cylindrical portion of the first part being visible.

Claims

1. A method for forming a plug on one end of a cable (1), which plug comprises a connecting piece (4), a casing of plastic material and a colour code, whereby the connecting piece (4) is attached to the end of the cable (1), after which part of the connecting piece (4) and part of the cable (1) comprising said end are enveloped by the plastic casing, whereby the plastic casing is made of at least two interconnected, differently coloured parts of plastic material, characterized in that the first part (7), which comprises a cylindrical portion (8), is first attached to the end of the cable (1), after which the end of the cable (1) provided with said first part (7) is placed into a mould (20-22), whereby said cylindrical portion (8) abuts at least partially against the mould (20-22) near its centre, whilst said cylindrical portion (8) is clear of the mould (20-22) on either side of said centre, after which the second plastic part (34) is formed in the mould (20-22), which plastic part (34) abuts against said first part (7) on either side of said centre of said cylindrical portion (8).

2. A method according to claim 1, characterized in that said first part (7) is provided with teeth (9).

3. A plug comprising a connecting piece (4), a casing of plastic material and a colour code,whereby said casing comprises at least two interconnected, differently coloured parts (7, 34) of plastic material, characterized in that the first part (7) comprises a cylindrical portion (8), which is connected to the second part (34) on either side of its centre, seen in axial direction, leaving clear a portion located near said centre.

4. A plug according to claim 3, characterized in that the part of the cylindrical portion (8) that is left clear is annular.

5. A plug according to claim 3 or 4, characterized in that said second part (34) is provided with an annular recess (37) on either side of the part of the cylindrical portion (8) that is left clear.

6. A plug according to any one of the preceding claims 3 - 5, characterized in that the casing is provided on a side remote from said connecting piece (4) with a flexible part providing pull relief, which comprises a number of flanges (41) separated from each other by slots (42), wherein the flanges (41) positioned adjacent to each other touch one another when the angle between the central axis of the casing and the central axis of the cable is substantially square, thus forming a continuous arc (46).

7. A plug according to claim 6, characterized in that the flange (43) which is located furthest away from the connecting piece is thicker than the other flanges (41).

8. A plug according to claim 6 or 7, characterized in that said flanges (41-43) are interconnected by a rib extending parallel to the central axis of the cable (1).

9. A plug according to any one of the preceding claims 3 - 8, characterized in that said plug is provided with a sign which indicates the direction of signals to be passed therethrough.

10. A plug according to claim 9, characterized in that said sign is an arrow (39).

Patentansprüche

1. Verfahren zum Bilden eines Steckers auf einem Ende eines Kabels (1), wobei der Stecker ein Verbindungsteil (4), ein Gehäuse aus Kunststoffmaterial und einen Farb-Code umfaßt, bei welchem Verfahren das Verbindungsteil (4) an dem Ende des Kabels (1) angebracht wird, woraufhin ein Teil des Verbindungsteils (4) und ein Teil des Kabels (1) mit dem Ende durch das Kunststoffgehäuse umhüllt werden½ bei dem das Kunststoffgehäuse aus zumindest zwei miteinander verbundenen, unterschiedlich gefärbten Kunststoffmaterialteilen hergestellt wird, dadurch gekennzeichnet, dass der erste Teil (7), der einen zylindrischen Abschnitt (8) umfasst, zunächst an dem Ende des Kabels (1) angebracht wird, woraufhin das Ende des Kabels (1), das mit dem ersten Teil (7) versehen ist, in eine Form (20-22) angeordnet wird, wobei der zylindrische Abschnitt (8) zumindest teilweise an der Form (20-22) in Nähe deren Mitte anliegt, während der zylindrische Abschnitt (8) beiderseits des Zentrums außer Kontakt mit der Form (20-22) steht, woraufhin der zweite Kunststoffteil (34) in der Form (20-22) gebildet wird, wobei der Kunststoffteil (34) am ersten Teil (7) zu beiden Seiten des Zentrums des zylindrischen Abschnitts (8) anliegt.

2. Verfahren nach Anspruch 1, dadurch gekennzeich-

net, dass der erste Teil (7) mit Zähnen (9) versehen ist.

3. Stecker mit einem Verbindungsteil (4), einem Gehäuse aus Kunststoffmaterial und einem Farb-Code, wobei das Gehäuse zumindest zwei miteinander verbundene, unterschiedlich gefärbte Teile (7, 34) aus Kunststoffmaterial umfasst, dadurch gekennzeichnet, dass der erste Teil (7) einen zylindrischen Abschnitt (8) umfasst, der mit dem zylindrischen Teil (34) beiderseits seines Zentrums, in axialer Richtung gesehen, verbunden ist, und einen in der Nähe des Zentrums angeordneten Abschnitt freilässt.

4. Stecker nach Anspruch 3, dadurch gekennzeichnet, dass der Teil des zylindrischen Abschnitts (8), der freigelassen ist, Ringform besitzt.

5. Stecker nach Anspruch 3 oder 4, dadurch gekennzeichnet, dass der zweite Teil (34) mit einer ringförmigen Eintiefung (37) beiderseits des Teils des zylindrischen Abschnitts (8), der freigelassen ist, mit einer ringförmigen Eintiefung (37) versehen ist.

6. Stecker nach einem der vorangehenden Ansprüche 3 bis 5, dadurch gekennzeichnet, dass das Gehäuse auf einer Seite entfernt von dem Verbindungsteil (4) mit einem flexiblen Teil versehen ist, der ein Zugrelief bereitstellt, das eine Anzahl von Flanschen (41) umfasst, die voneinander durch Schlitze (42) getrennt sind, wobei die benachbart zueinander angeordneten Flansche (41) einander berühren, wenn der Winkel zwischen der Mittenachse des Gehäuses und der Mittenachse des Kabels im wesentlichen rechteckig ist, wodurch ein kontinuierlicher Bogen (46) gebildet wird.

7. Stecker nach Anspruch 6, dadurch gekennzeichnet, dass der Flansch (43), der am weitesten entfernt von dem Verbindungsteil angeordnet ist, dikker als die übrigen Flansche (41) ist.

8. Stecker nach Anspruch 6 oder 7, dadurch gekennzeichnet, dass die Flansche (41-43) durch eine Rippe miteinander verbunden sind, die parallel zur Mittenachse des Kabels (1) verläuft.

9. Stecker nach einem der Ansprüche 3 bis 8, dadurch gekennzeichnet, dass der Stecker mit einer Markierung versehen ist, welche die Richtung der Signale anzeigt, die durch ihn laufen.

10. Stecker nach Anspruch 9, dadurch gekennzeichnet, dass es sich bei der Markierung um einen Pfeil (39) handelt.

Revendications

1. Procédé destiné à former une fiche sur une extrémité d'un câble (1), laquelle fiche comprend une pièce de raccordement (4), un revêtement en matière plastique et un code de couleur, dans lequel la pièce de raccordement (4) est fixée à l'extrémité du câble (1), après quoi une partie de la pièce de raccordement (4) et une partie du câble (1) comprenant ladite extrémité sont enveloppées par le revêtement en plastique, le revêtement en plastique se composant d'au moins deux pièces en matière plastique interconnectées et de couleurs différentes, caractérisé en ce que la première pièce (7), qui comprend une partie cylindrique (8), est d'abord fixée à l'extrémité du câble (1), après quoi l'extrémité du câble (1) équipée de ladite première pièce (7) est placée dans un moule (20 à 22), ladite partie cylindrique (8) venant en butée, au moins partiellement, contre le moule (20 à 22) à proximité de son centre, tandis que ladite partie cylindrique (8) ne touche pas le moule (20 à 22) sur l'un ou l'autre côté dudit centre, après quoi la seconde pièce en plastique (34) est formée dans le moule (20 à 22), laquelle pièce en plastique (34) vient en butée contre ladite première pièce (7) sur l'un ou l'autre côté dudit centre de ladite partie cylindrique (8).

2. Procédé selon la revendication 1, caractérisé en ce que ladite première pièce (7) est équipée de dents (9).

3. Fiche comprenant une pièce de raccordement (4), un revêtement en matière plastique et un code de couleur, ledit revêtement comprenant au moins deux pièces (7, 34) en matière plastique interconnectées et de couleurs différentes, caractérisée en ce que la première pièce (7) comprend une partie cylindrique (8) qui est reliée à la seconde pièce (34) sur l'un ou l'autre côté de son centre, si on l'observe dans une direction axiale, ce qui laisse libre une partie située à proximité dudit centre.

4. Fiche selon la revendication 3, caractérisée en ce que la portion de la partie cylindrique (8) qui est laissée libre est en forme d'anneau.

5. Fiche selon la revendication 3 ou la revendication 4, caractérisée en ce que ladite seconde pièce (34) est munie d'un creux annulaire (37) sur l'un ou l'autre côté de la portion de la partie cylindrique (8) qui est laissée libre.

6. Fiche selon l'une quelconque des revendications précédentes 3 à 5, caractérisée en ce que le revêtement est muni, sur un côté situé à distance de ladite pièce de raccordement (4), d'une partie flexible fournissant un soulagement de traction, qui com-

prend un certain nombre de brides (41) séparées les unes des autres par des encoches (42), dans lesquelles les brides (41) positionnées de manière adjacente l'une par rapport à l'autre se touchent lorsque l'angle entre l'axe central du revêtement et l'axe central du câble est sensiblement droit, formant ainsi un arc continu (46).

7. Fiche selon la revendication 6, caractérisée en ce que la bride (43) qui est située de manière la plus éloignée de la pièce de raccordement est plus épaisse que les autres brides (41).

8. Fiche selon la revendication 6 ou la revendication 7, caractérisée en ce que lesdites brides (41 à 43) sont interconnectées par une nervure de renforcement s'étendant parallèlement à l'axe central du câble (1).

9. Fiche selon l'une quelconque des revendications précédentes 3 à 8, caractérisée en ce que ladite fiche est équipée d'un symbole qui indique la direction des signaux devant passer à travers cette dernière.

10. Fiche selon la revendication 9, caractérisée en ce que ledit symbole est une flèche (39).

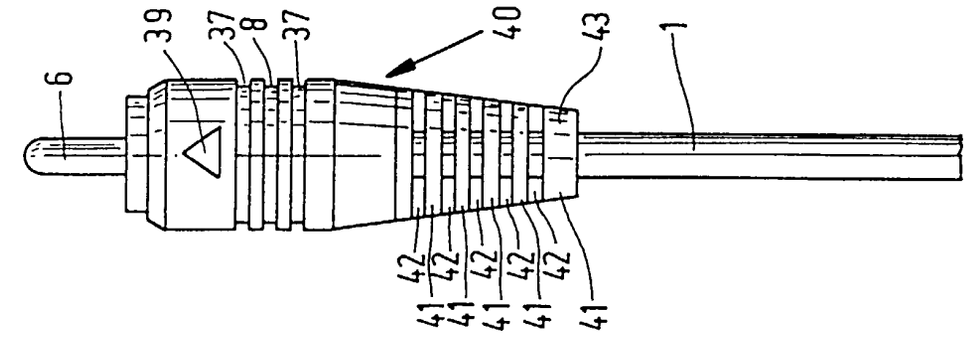


FIG.1E

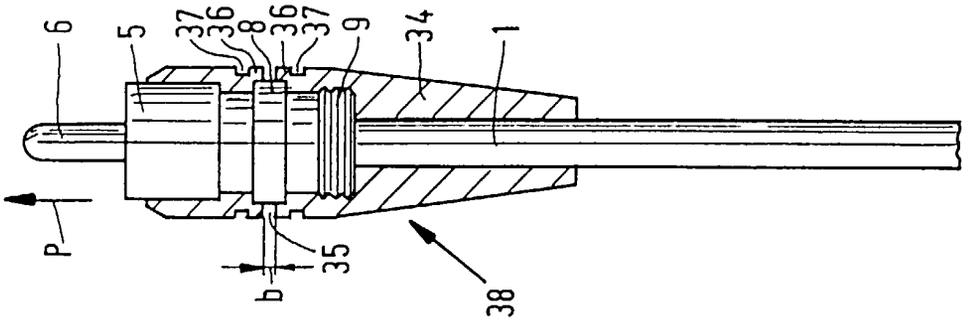


FIG.1D

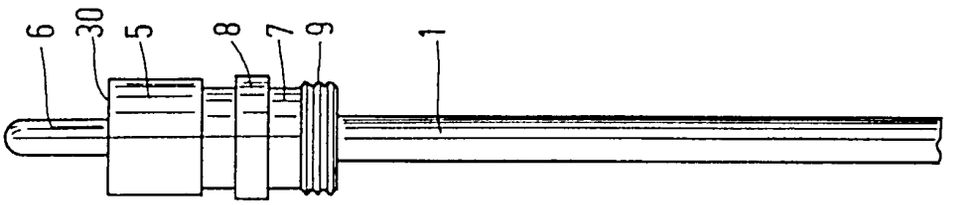


FIG.1C

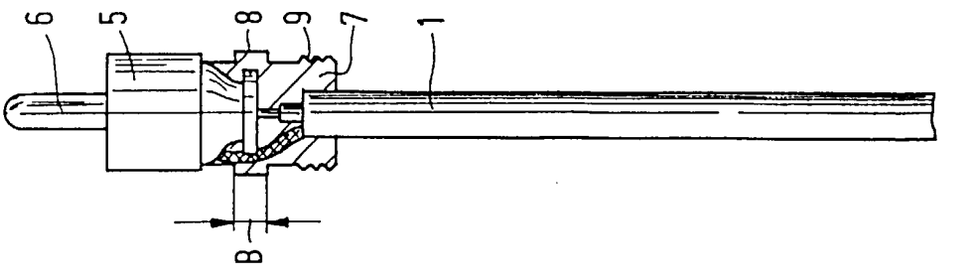


FIG.1B

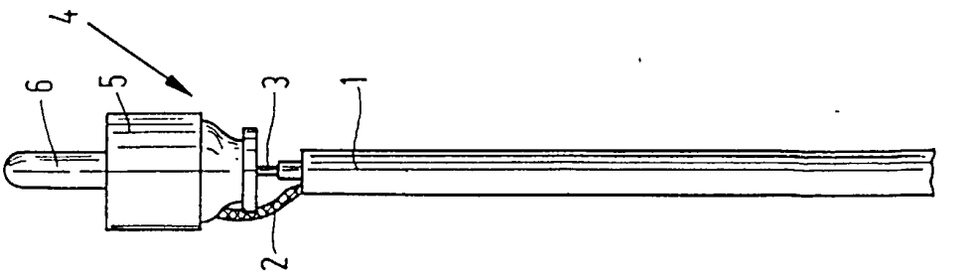


FIG.1A

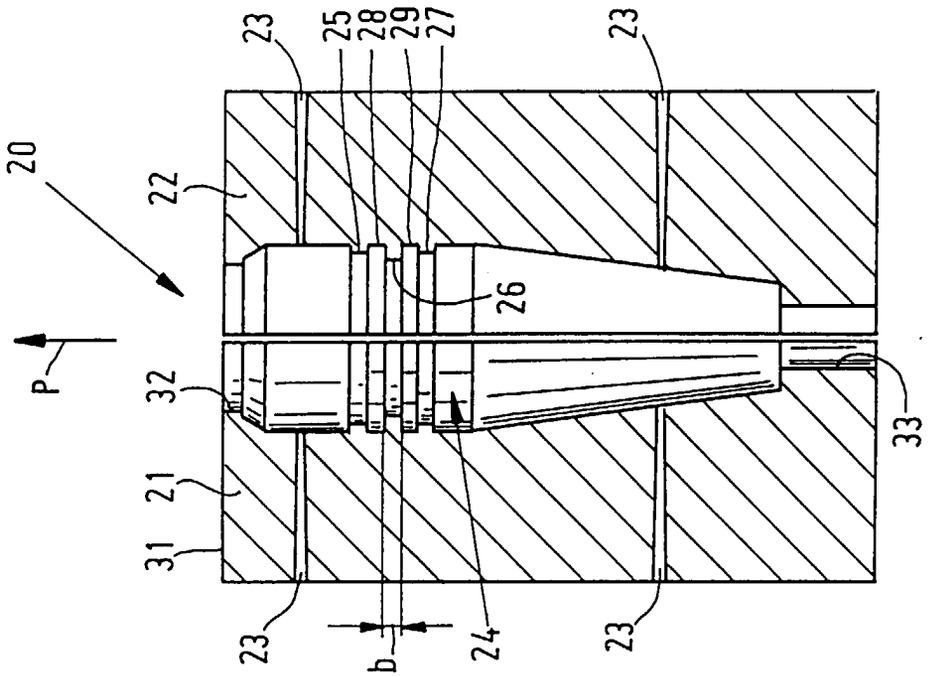


FIG. 3

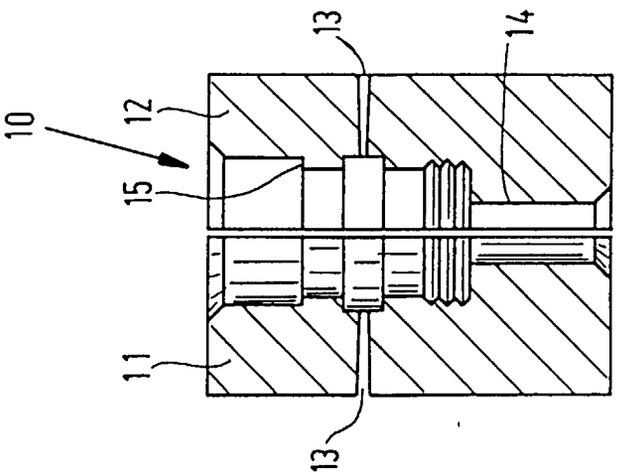


FIG. 2

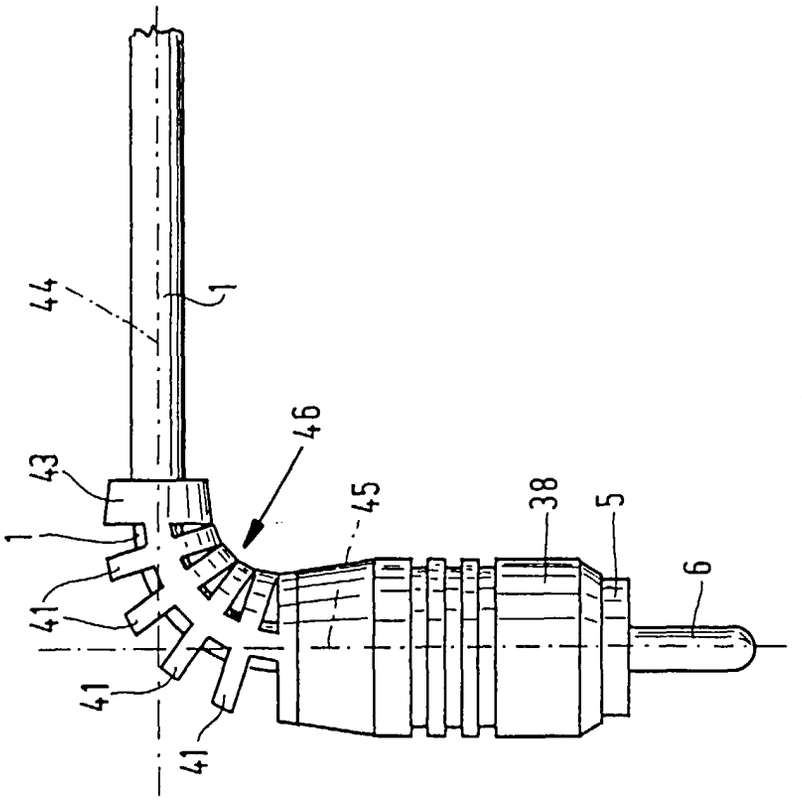

44
1
46
43
45
38
5
6
1
41
41
41

FIG. 5

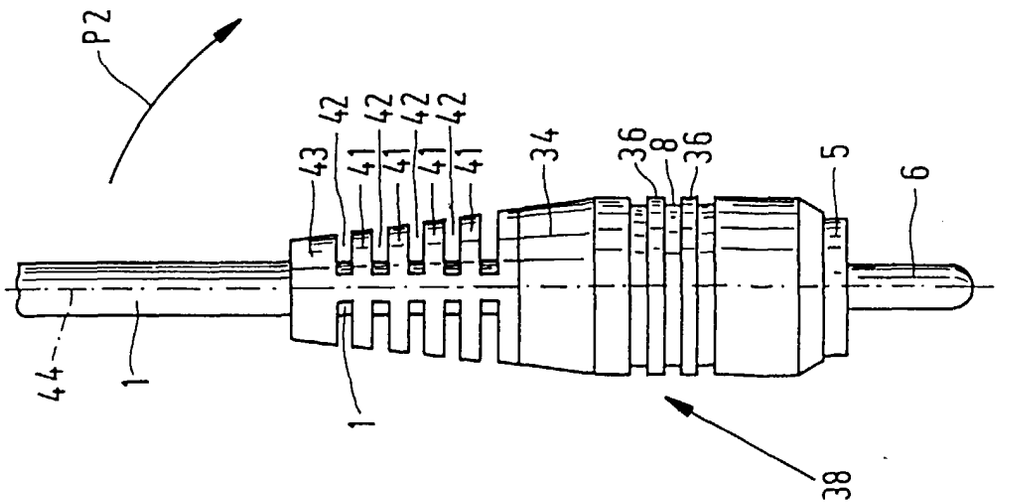

P2
42
42
42
42
43
41
41
41
41
34
36
8
36
5
6
44
1
1
38

FIG. 4