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(54) **DRAWING SPINNERET**

(57) The invention comprises at least one drawing core provided with a centred through-opening in the axial direction with a shaping neck where at least an inflow portion with a truncated cone shape forming part of the centred through-opening converges, the drawing core being immobilied on a support structure. The support structure comprises a first front frame and a second rear frame coupled to each other in such a way that they can be disassembled by screwing, the assembly of the two frames defining an inner space where at least the drawing core is housed such that it is held in an undetachable manner both in the axial direction and in the radial direction.

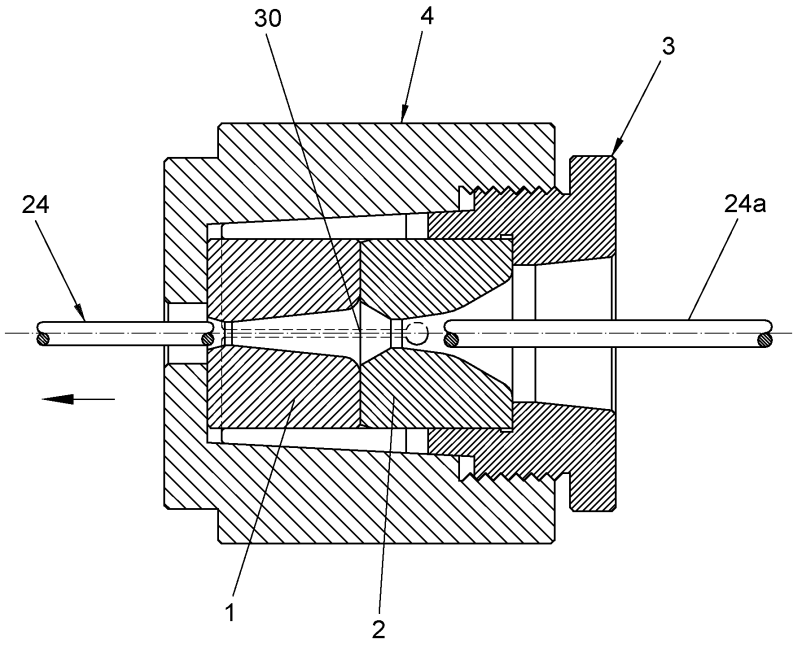

FIG. 1

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Description

OBJECT OF THE INVENTION

[0001] As expressed in the title of this descriptive report, the present invention refers to a drawing spinneret by means of which the cold shaping operation is carried out to reduce the section of a thread (wire) or bar composed of different metallic materials, by making them go through a cone-shaped opening executed in the spinneret.

[0002] The most usual materials for the drawing are steel, copper, aluminium and brass, although it may be applied to any metal or ductile alloy.

[0003] Starting from this premise, the objective of the invention is to provide a new drawing spinneret that comprises an easy and simplified structure, being more economical and functional, and which allows for long-term operation with fewer external elements to operate, such as presses and furnaces, as compared to known drawing spinnerets.

BACKGROUND OF THE INVENTION

[0004] Currently, there are three drawing spinneret models.

[0005] The first model is a drawing spinneret set that consists in connecting a drawing core with a frame for the drawing core and wherein in a continuous process the thread is drawn by going through the drawing core.

[0006] The second model consists in a pressure drawing spinneret set, which consists in connecting a drawing core with the frame of the drawing core plus the connection of a pressure core with the frame for the pressure core, these elements being in turn joined.

[0007] In a continuous process, the thread is drawn by going through the pressure core and afterwards through the drawing core.

[0008] The third model consists in a pressure drawing spinneret set as the one described in the second model, with the difference that the cores may be dismounted and replaced, and the frame may be reused.

[0009] In the first and second models, the cores are fixed to the metal frame by an interference fit, for which purpose methods such as cold-pressed or thermal contraction may be used, or else the cores may be fixed to the frame by welding. Each core is then perforated with an inner opening of the required section.

[0010] The frames are in turn fastened inside a die holder. When a drawing spinneret or pressure drawing spinneret is worn out, its size is changed by machining a larger inner opening. The drawing spinneret or pressure drawing spinneret may be re-used to draw threads with larger openings, such that said change in the size of the opening may only be repeated a limited number of times for each drawing spinneret or pressure drawing spinneret, such that after that the spinneret is disposed of.

[0011] In the third drawing spinneret model, each core is perforated prior to the required inner opening. The frames are in turn fastened inside a die holder. The cores are fixed to the metal frame by an interference fit, for which purpose methods such as cold-pressed or thermal contraction may be used. When the drawing core is worn out, it may be replaced, but it needs a press or thermal expansion system, which enormously complicates the operation of replacing the drawing core.

[0012] In the second and third type of drawing spinneret, the lubricant for the pressure drawing spinneret is forced by pressure to be introduced in the lubricant pressure chamber defined between the pressure core and the drawing core.

DESCRIPTION OF THE INVENTION

[0013] With the aim of reaching the goals and preventing the inconveniences mentioned in the previous sections, the invention proposes a drawing spinneret comprising at least one drawing core that is made up of a centred through-opening in an axial direction with a shaping neck where at least one inlet portion with a truncated-cone shape forming part of the centred through-opening converges, the drawing core being immobilized on a support structure.

[0014] The shaping neck matches the reduction in diameter of the drawing thread or rod of an original diameter of greater section.

[0015] The support structure comprises a first front frame and a second rear frame coupled to each other in such a way that they can be disassembled by screwing, the assembly of the two frames defining an inner space where at least one drawing core is housed such that it is held in an undetachable manner, both in axial and in radial direction.

[0016] The front frame comprises a tubular configuration that features a head and a tubular extension that defines a cylindrical hole wherein at least one drawing core is fitted and which is axially retained in both directions, and also radially retained.

[0017] The rear frame comprises a bowl-shaped structure, whose bottom contains in its centre an outlet through-perforation for a rod to be drawn, whereas the inner lateral side of the rear frame comprises a truncated-cone configuration onto which the outer truncated-cone surface of the tubular extension, which is part of the front frame, is additionally supported.

[0018] The wall of the tubular extension of the front frame is made up of several longitudinal slots that enormously facilitate the radial tightening against at least the drawing core.

[0019] The coupling of both frames creates a radial tightening at least on the drawing core by contacting the truncated-cone surfaces of both frames.

[0020] It is also worth noting that the coupling of the two frames generates an axial tightening wherein a rear end of the drawing core acts as stop against the bottom of the rear frame.

[0021] The head of the front frame has an inlet that converges inwards, as lubrication means for the rod to be drawn, wherein said converging inlet is part of the inner hole of the tubular structure of the front frame.

[0022] The longitudinal slots end with widened perforations.

[0023] The front frame comprises a peripheral step for axial holding integrated in the head of the front frame itself, located at the junction of the head and the tubular extension of the front frame.

[0024] The centred through-opening of the drawing core comprises an inlet portion converging inwards, an outlet portion diverging outwards and the shaping neck where both above-mentioned portions converge.

[0025] The through-perforation of the bottom of the rear frame comprises a configuration diverging outwards.

[0026] In an embodiment, the male threading is integrated in the head of the front frame, whereas the female threading is located in an area adjacent to the mouth of the rear frame, which features a bowl-shaped configuration.

[0027] The front frame and the rear frame have, respectively, outer terminal portions with a section other than the circular one, as a means to assemble and disassemble both frames.

[0028] In a main embodiment, the drawing spinneret of the invention comprises, apart from the drawing core, a pressure core housed and fitted also within the cylindrical hole of the tubular extension forming part of the front frame, where an end of the drawing core and an end of the pressure core are in contact with each other.

[0029] The pressure core integers a centred through-opening in axial direction that comprises a central portion converging inwards and an outlet portion diverging outwards, both portions defining a passage neck of greater diameter than the initial or original diameter of the rod to be drawn.

[0030] In the junction area of the drawing core and the pressure core, a lubricant pressure chamber made up of the outlet portion of the pressure core and the converging inlet portion of the drawing core is defined, where both portions converge.

[0031] Taking into account the main embodiment of the invention, a front end of the pressure core acts as axial stop against the peripheral step of the front frame.

[0032] According to the embodiment of the invention where the pressure core is dispensed with, a front end of the drawing core acts as axial stop against the peripheral step of the front frame, selected between the first peripheral step and the second peripheral step.

[0033] With the arrangement described, it is possible to easily assemble and disassemble the set of the elements composing the drawing spinneret, such that when the drawing core is worn out, it may be easily and simply replaced, reassembling the components of the set afterwards.

[0034] The pressure core and the drawing core are located inside the frames in a fixed and stable way, such that both are pressed against each other, them being tightened axially and radially by the two frames, front and rear, such that the lubricant pressure chamber is defined between both cores, the lubricant being provided through the pressure core itself.

[0035] The pressure core and the drawing core may be assembled at the same time inside the inner space defined by the frames, using a single movement and without requiring a press or furnace as it regularly occurs.

[0036] It is also worth noting that the pressure core and the drawing core may be disassembled at the same time, using a single movement and without requiring a press or furnace as it also occurs regularly.

[0037] Likewise, the radial and axial tightening is carried out simultaneously using a single movement and without requiring a press or furnace.

[0038] In addition, it is worth noting that both the pressure core and the drawing core have the standard dimensions of the market.

[0039] The pressure core and the drawing core are of the same dimensions and, therefore, interchangeable.

[0040] In addition, the invention provides a pressure drawing spinneret set, where the pressure core is manufactured with tungsten carbide, steel, ceramic, natural diamond, single-crystal synthetic diamond, multiple-crystal synthetic diamond or similar materials. Likewise, the drawing core is manufactured with tungsten carbide, steel, ceramic, natural diamond, single-crystal synthetic diamond, multiple-crystal synthetic diamond or similar materials, featuring a flat cylindrical outer surface which is adapted inside the cylindrical hole of the front frame, as previously mentioned.

[0041] The complementary conicities of the inner lateral side of the rear frame and the outer surface of the tubular extension of the front frame provide the necessary radial tightening on both cores as the front frame is screwed onto the rear frame, and with this operation it is also possible to achieve the necessary axial tightening to fully immobilize the set of both cores in a stable manner.

[0042] The pressure core and the drawing core are configured and arranged so that they match through their adjacent sides being in contact with each other and the lubricant pressure chamber is defined, and the lubricant is introduced in said lubricant pressure chamber during the drawing process through the front part of the pressure core.

[0043] Therefore, the inner diameter of the axial opening of the pressure core with respect to the diameter of the inlet thread is an effective system to control the lubricant pressure and it is not necessary to provide additional mechanical means to maintain the pressure.

[0044] When the drawing core is worn out, the related frames may be unscrewed and the worn out core may be easily extracted from the cylindrical hole of the front frame and replaced.

[0045] Therefore, the frames may be used for a long period, as compared with other known systems.

[0046] The pressure drawing spinneret set may have an outer profile in a truncated-cone shape that converges in the drawing direction to be fit in a similar shaped seat into a die holder, thus the drawing operation again tends to be tightened and the pressure drawing spinneret set to be fitted, thus eliminating the need for designs and complicated and expensive die holders that contain mechanical fasteners to secure the pressure drawing spinneret set in the die holder.

[0047] The pressure drawing spinneret set may also have other kinds of outer profiles, for example, one that is completely cylindrical.

[0048] Hereinafter, in order to ensure a better understanding of the present description, the object of the invention has been detailed in a series of drawings that are an integral part of said description and are included for illustrative on purposes and should not be construed as limiting said invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0049]

Figure 1 shows an elevation view of a drawing spinneret according to a first embodiment of the invention.

Figure 2 shows an exploded view of the drawing spinneret shown in figure 1.

Figure 3 shows a sectional elevation view of another drawing spinneret according to a second embodiment of the invention.

Figure 4 shows an exploded view of the drawing spinneret shown in figure 3.

DESCRIPTION OF A SAMPLE EMBODIMENT

[0050] Considering the numbering adopted in the figures, the drawing spinneret has the following nomenclature used in the description:

1.- Drawing core.
2.- Pressure core.
3.- Front frame.
4.- Rear frame.
5.- Male threading.
6.- Female threading.
7.- Inner lateral side.
8.- Bottom.
9.- Through perforation.
10.- Head.
11.- Tubular extension.
12.- End border.
13.- Longitudinal slots.
14.- Widened perforation.
15.- Front end.
16.- Peripheral step.
17.- Rear end.
18.- Front end.
19.- Lubricant inlet.
20.- Hexagonal terminal portion.
21.- Inlet portion.
21 a.- Conical widening.
22.- Outlet portion.
23.- Passage neck.
24.- Drawing rod.
24a.- Rod to be drawn.
25.- Outer truncated-cone surface.
26.- Hexagonal outer portion.
27.- Converging inlet portion.
28.- Diverging outlet portion.
29.- Shaping neck.
30.- Lubricant pressure chamber.

[0051] It comprises a drawing core (1), a pressure core (2), a front frame (3) and a rear frame (4), both frames (3-4) defining an inner space where the drawing core (1) set and the pressure core (2) in a first embodiment as shown in Figures 1 and 2 is adjusted, and in a second embodiment inside the inner space of which only the drawing core (1) is adjusted, dispensing with the pressure core (2).

[0052] The drawing spinneret may be disassembled to be able to change in a quick and simple way the drawing core (1) and/or the pressure core (2), when necessary. For said purpose, both frames (3-4) may be disassembled, being coupled to each other by means of a male threading (5) located in the front frame (3) and a female threading (5) located in the rear frame (4).

[0053] The rear frame (4) features a bowl-shaped structure whose inner lateral side (7) comprises a conical configuration converging toward its bottom (8) which contains in its centre an outlet through-perforation (9) diverging outwards.

[0054] The inner lateral side (7) of the rear frame (4) is discontinued in the end that is adjacent to its mouth through the female threading (6) where the male threading (5) is additionally coupled to the front frame (3).

[0055] In principle, this front frame (3) comprises a tubular structure that includes a head (10) provided with the male threading (5) and a tubular extension (11) which features in its outside a conical configuration that is complemented with the conical configuration of the inner lateral side (7) of the rear frame (4), such that upon joining both frames (3-4) with each other by means of the male threading (5) and the female threading (6), the tubular extension (11) of the front frame (3) is adjusted against the inner lateral side (7) of the rear frame (4), without coming into contact at any point with the end border (12) of the tubular extension (11) of the front frame (3) against the bottom (8) of the rear frame (4), thus achieving the necessary tightening to immobilize both cores (1-2).

[0056] The wall of the tubular extension (11) of the front frame (3) has several longitudinal slots (13) that end in several widened perforations (14).

[0057] Taking into account the first embodiment shown in Figures 1 and 2, inside the cylindrical hole defined by

the tubular extension (11) of the front frame (3), the drawing core (1) and also the pressure core (2) are adjusted, both being in contact through their related adjacent ends, at the same time that both cores (1-2) are immobilized both in radial and axial direction thanks to the coupling of both frames (3-4), such that when screwing the front frame (3) onto the rear frame (4), the tubular extension (11) radially presses against the drawing core (1) and also against the pressure core (2) thanks to the complementary conicities of said tubular extension (11) and of the inner lateral side (7) of the rear frame (4). Both the drawing core (1) and the pressure core (2) have an outer cylindrical configuration with a same diameter that is adjusted in the cylindrical hole defined by the wall of the tubular extension (11).

[0058] The two cores (1-2) are axially immobilized since a front end (15) of the pressure core (2) is adjusted against a peripheral step (16) of the head (10) of the front frame (3), whereas a rear end (17) of the drawing core (1) acts as a stop against the bottom (8) of the rear frame (4).

[0059] The simpler embodiment shown in Figures 3 and 4 mainly differs from the embodiment shown in figures 1 and 2 in that said simpler embodiment dispenses with the pressure core (2), as previously mentioned, therefore, the drawing core (1) acts as stop of a front end (18) against the peripheral step (16) of the head (10) of the front frame (3). This peripheral step (16) is located in the junction area of the tubular extension (11) and head (10) of said front frame (3).

[0060] Both the pressure core (2) and the drawing core (1) are manufactured with a material selected among tungsten carbide, steel, ceramic, natural diamond, synthetic single-crystal diamond or synthetic polycrystalline diamond.

[0061] Both the front frame (3) and the rear frame (4) are manufactured with steel material.

[0062] The front frame (3) features the cylindrical hole defined by the wall of the tubular extension (11) which leads to an inlet (19) converging inwards for the lubricant in a front end of the front frame (3) intended for the pressure core (2), being said inlet (19) located in the head (10) of the front frame (3).

[0063] Considering the second embodiment of the invention, the peripheral step (16) of the front frame (3) is created between the cylindrical hole and the converging inlet (19) for the lubricant, which is established in the head (10) of said front frame (3).

[0064] The head (10) of the front frame (3) features a hexagonal terminal portion (20) to facilitate the rotation of the front frame (3) by assembling and disassembling the spinneret of the invention. Both the pressure core (2) and the drawing core (1) are adjusted inside the cylindrical hole of the front frame (3).

[0065] The pressure core (2) has a centred through-opening in axial direction that comprises an inlet portion (21) converging inwards and a shorter outlet portion (22) diverging outwards, both portions defining a passage neck (23) of greater diameter than the initial diameter of the rod to be drawn (24a) and of the drawn rod (24).

[0066] The rear frame (4) has an outer truncated-cone surface (25) that converges towards the drawing direction to simplify the design of the die holder and the female threading (6) in their front ends to receive the front end of the front frame (3) which has the male threading (5).

[0067] The inner lateral side (7) of the rear frame (4) is extended backwards from the female threading (6) to receive the tubular extension (11) of the front frame (3) which has an outer conical surface.

[0068] The hole defined by the inner lateral side (7) of the rear frame (4) connects with the through-perforation (9) located at the bottom (8) of said rear frame (4). In its rear end, the rear frame (4) comprises a hexagonal outer portion (26) or of another shape to facilitate the screwing and unscrewing of said frames (3, 4).

[0069] The rear frame (4) has an inner and converging conical surface to be received by the outer converging conical surface of the tubular extension (11) of the front frame (3).

[0070] Internally, the drawing core, (1) has an inner opening with an inlet portion (27) converging inwards and an outlet portion (28) diverging outwards. Both portions converge to a shaping neck (29) coinciding with the nominal diameter of the drawn thread or rod.

[0071] When the two frames (3 and 4) are screwed together as shown in Figure 1, the pressure core (2) is tightened against the peripheral step (16), pressing firmly against the drawing core (1), generating an axial tightening without requiring any fastening means that the cores may need.

[0072] When the two frames (3 and 4) are screwed together, the pressure core (2) and the drawing core (1) are firmly tightened due to the tightening generated between the inner conical surface related to the inner lateral side (7) of the rear frame (4), and the outer converging conical surface related to the outer lateral side of the tubular extension (11) of the front frame (3), generating a radial tightening without requiring any fastening means that any of the two cores (1-2) may need.

[0073] When the drawing core (1) is worn out, the front frame (3) and the rear frame (4) may be unscrewed and the drawing core (1) may be extracted from the cylindrical hole of the rear frame (3) to be replaced.

[0074] During the drawing process, the lubricant is introduced through the converging inlet (19) for the lubricant by means of the thread or rod to be drawn (24a) itself and an initial conical widening (21 a) and the central trough-opening of the pressure core (2) that ends in the lubricant pressure chamber (30) that is formed by the junction of the outlet portion (22) diverging from the pressure core (2) and the converging inlet portion (27) of the drawing core (1). The pressure level developed by the lubricant retained in the lubricant pressure chamber (30) will depend on the original diameter (24a) difference between the inlet thread (24) upon being drawn and the passage neck (23) of the central through-opening of the

pressure core (2).

[0075] The invention is applicable to a wide array of drawing sets and it is evident that this provides a simple way of replacing worn-out cores (1-2) and an optimum use of the frames (3) and (4).

[0076] As it has been previously mentioned, there may be another type of embodiment of the invention, which only requires an assembly of the drawing core (1) inside the front frame (3) for the drawing core (1), and the pressure core and the frame for the pressure core may be replaced by a new screwed frame that would apply pressure on the front end of the drawn core, generating an axial tightening without any fastening means that the cores may require.

[0077] The drawing core (1) will also be radially and firmly tightened due to the tightening generated between the conical surfaces in contact with the rear frame (4) and the tubular extension (11) of the front frame (3).

Claims

1. A drawing spinneret, which comprises at least one drawing core that is made up of a centred through-opening in an axial direction with a shaping neck where at least one inlet portion with a truncated-cone shape forming part of the centred through-opening converges, the drawing core being immobilized on a support structure;
   characterized in that:

   - the support structure comprises a first front frame (3) and a second rear frame (2) coupled to each other in such a way that they can be disassembled by screwing, the assembly of the two frames defining an inner space where at least one drawing core (1) is housed such that it is held in an undetachable manner both in axial direction and in radial direction;
   - the front frame (3) comprises a tubular configuration that features a head (10) and a tubular extension (11) that defines a cylindrical hole wherein at least one drawing core (1) is adjusted and which is axially retained in both directions, and is also radially retained;
   - the rear frame (4) comprises a bowl-shaped structure, whose bottom (8) contains in its centre a through-perforation (9) for the exit of a rod (24) to be drawn, whereas the inner lateral side (7) of the rear frame (4) comprises a truncated-cone configuration onto which the outer truncated-cone surface of the tubular extension (11) is complementary supported, said tubular extension (11) being part of the front frame;
   - the wall of the tubular extension (11) of the front frame (3) comprises several longitudinal slots (13);
   wherein the coupling of both frames (3 and 4) creates a radial tightening at least on the drawing core (1) by contacting the truncated-cone surfaces of both frames (3, 4);
   and wherein the coupling of the two frames (3 and 4) generates an axial tightening wherein a rear end (17) of the drawing core (1) acts as stop against the bottom (8) of the rear frame (4).

2. A drawing spinneret, according to claim 1, **characterised in that** the head (10) of the front frame (3) features an inlet (19) that converges inwards, as a lubricating means for the rod (24) to be drawn, wherein said inlet (19) is part of the inner hole of the tubular structure of the front frame (3).

3. A drawing spinneret, according to any of the preceding claims, **characterised in that** the longitudinal slots (13) end in several widened perforations (13).

4. A drawing spinneret, according to any of the preceding claims, **characterised in that** the front frame (3) comprises a peripheral step (16) for axial retention integrated in the head (10) of the front frame (3), located at the junction of the head (10) and tubular extension (11) of the front frame (3).

5. A drawing spinneret, according to any of the preceding claims, **characterised in that** the centred through-opening of the drawing core (1) comprises an inlet portion (27) converging inwards, an outlet portion (28) diverging outwards and the shaping neck (29) where both portions (27) and (28) converge.

6. A drawing spinneret, according to any of the preceding claims, **characterised in that** the through-perforation (9) of the bottom of the rear frame (4) comprises a configuration diverging outwards.

7. A drawing spinneret, according to any of the preceding claims, **characterised in that** the male threading (5) is integrated in the head (10) of the front frame (3), whereas the female threading (6) is located in an area adjacent to the mouth of the rear frame (4) which features a bowl-shaped configuration.

8. A drawing spinneret, according to any of the preceding claims, **characterised in that** the front frame (3) and the rear frame (4) have, respectively, outer terminal portions (20) and (26), with a section other than circular as a means for assembling and disassembling both frames (3-4).

9. A drawing spinneret, according to any of the preceding claims, **characterised in that**:

   - it also comprises a pressure core (2) housed

and adjusted also inside the cylindrical hole of the tubular extension (11) forming part of the front frame (3), where an end of the drawing core (1) and an end of the pressure core (2) are in contact with each other;

- the pressure core (1) comprises a central through-opening in axial direction that comprises an inlet portion (21) converging inwards and an outlet portion (22) diverging outwards, both portions defining a passage neck (23) of greater diameter than the initial diameter of the rod to be drawn (24a) and of the drawn rod (24);
- in the junction area of the drawing core (1) and the pressure core (2), a lubricant pressure chamber (30) is defined, made up by the outlet portion (22) of the pressure core (2) and by the converging inlet portion (26) of the drawing core (1), where both portions converge.

10. A drawing spinneret, according to claims 4 and 9, **characterised in that** a front end (15) of the pressure core (2) acts as an axial stop against the peripheral step (16) of the front frame (3).

11. A drawing spinneret, according to claim 4, **characterised in that** a front end (18) of the drawing core (1) acts as an axial stop against the peripheral step of the front frame (3).

12. A drawing spinneret, according to any of the preceding claims, **characterised in that** the rear frame (4) comprises an outer truncated-cone surface (25).

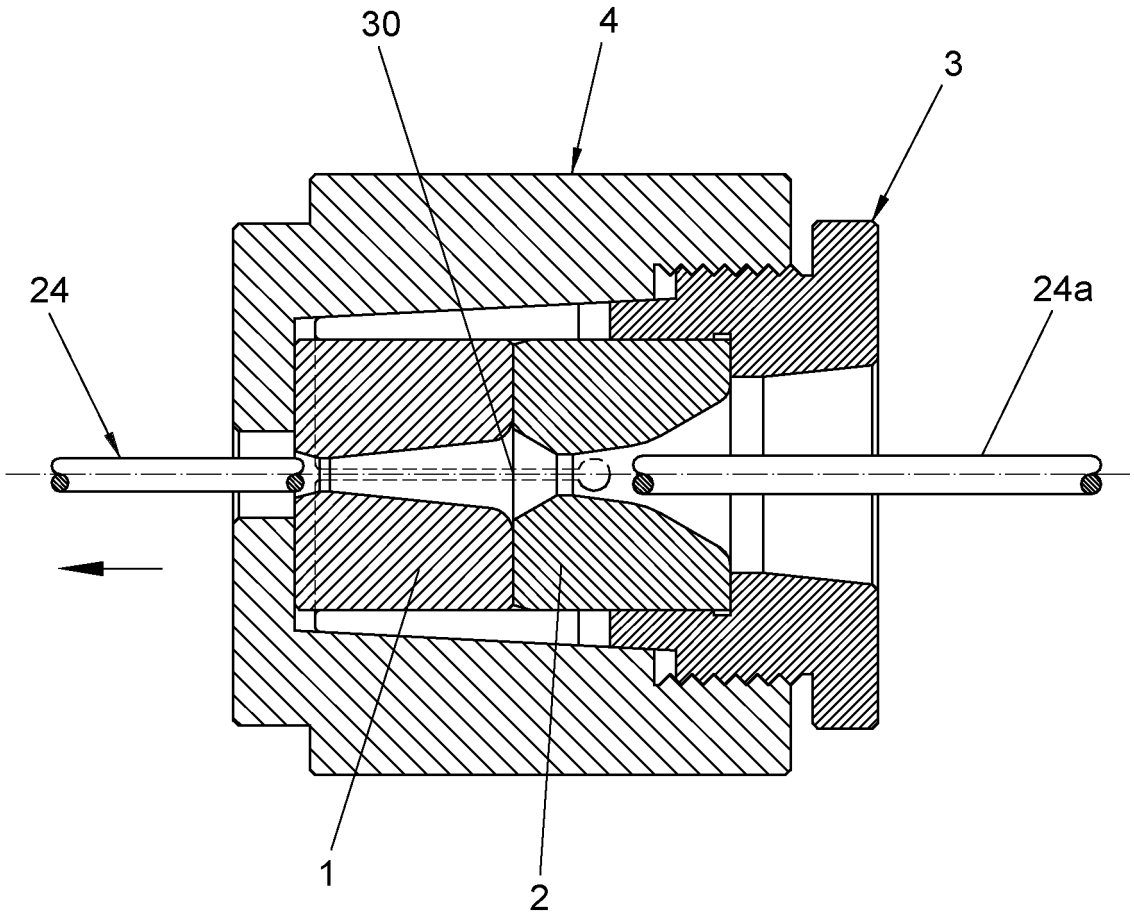

FIG. 1

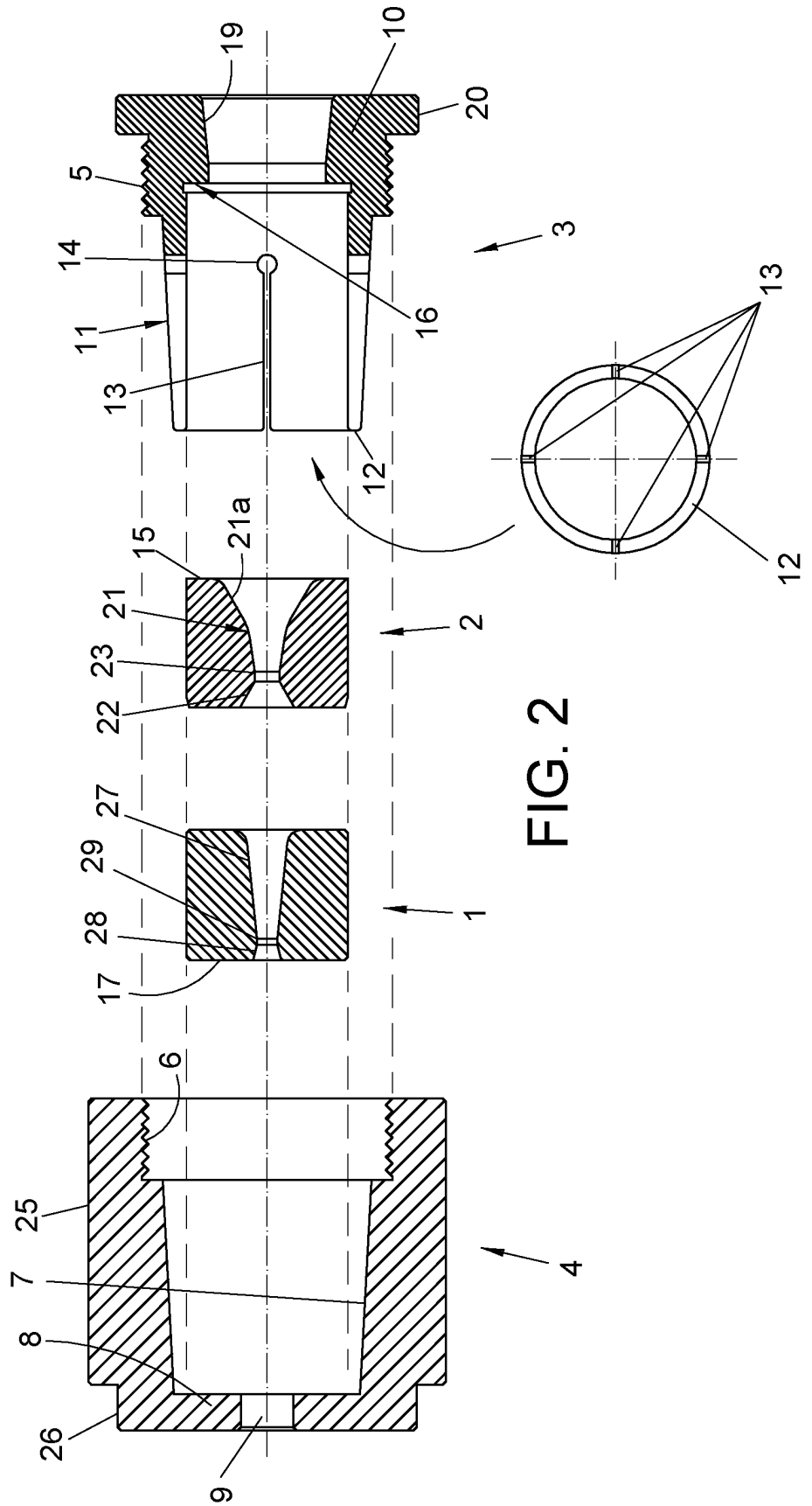
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FIG. 2

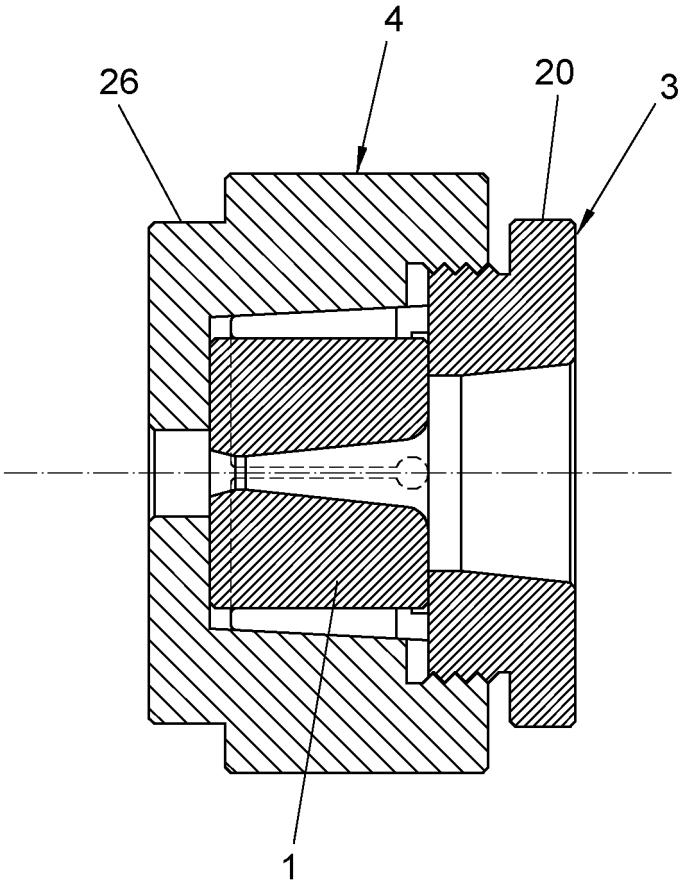

FIG. 3

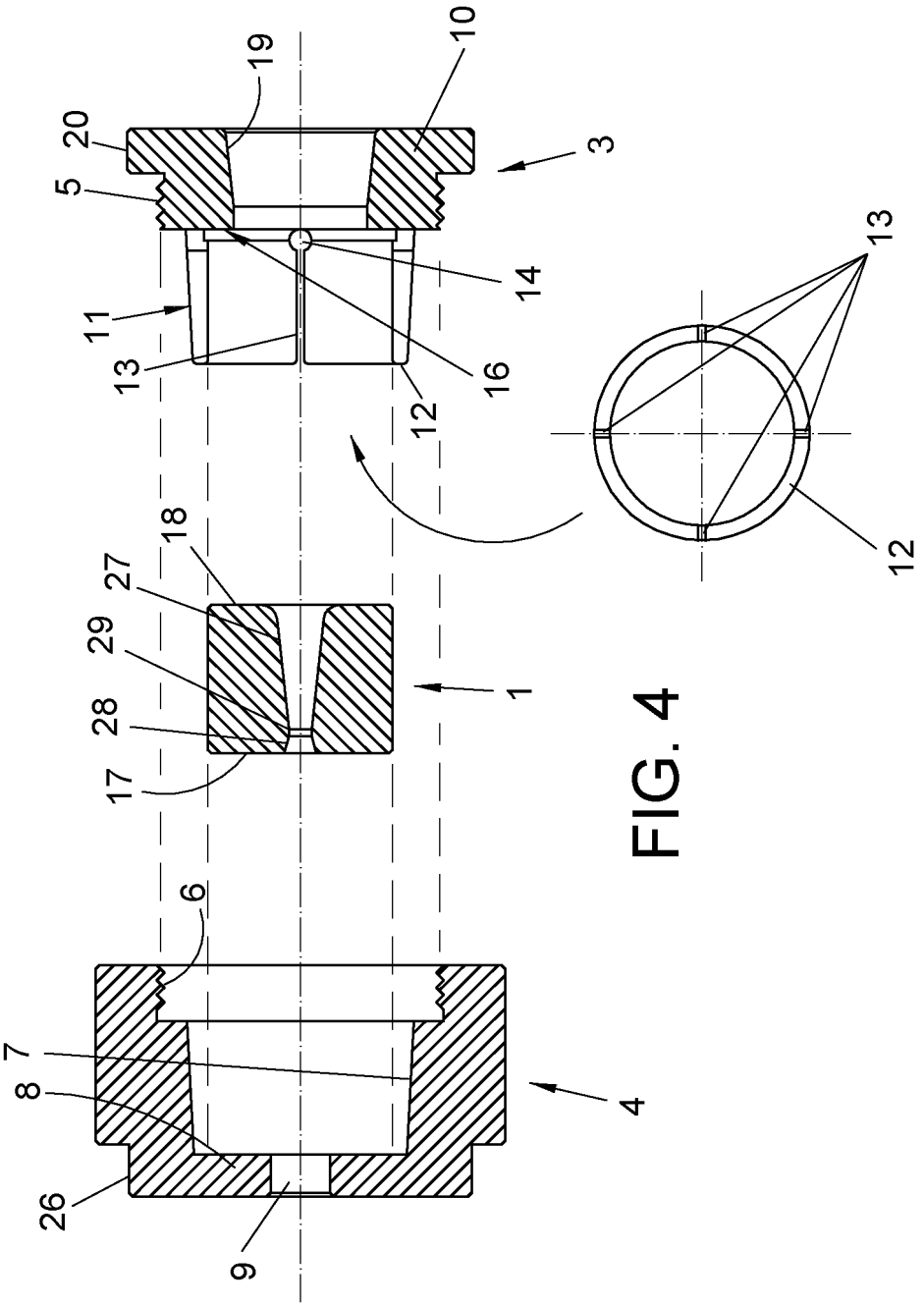

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2013/070682

A. CLASSIFICATION OF SUBJECT MATTER

B21C3/12 (2006.01)
B21C3/14 (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B21C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 565080 A (A C WICKMAN LTD ET AL.) 25/10/1944, page 3, lines 24 - 57; figures 5 - 6.	1-5,7,11
Y		6,8-10,12
Y	US 5402664 A (SARVER DOUGLAS R ET AL.) 04/04/1995, column 2, line 50 - column 3, line 68; figures 1 - 2.	6,8-10,12
X	GB 549407 A (FREDERICK CHARLES JEARUM ET AL.) 19/11/1942, page 4, lines 39 - 103; figures 5 - 6.	1,4,5,7,11
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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20/06/2014	**(23/06/2014)**
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INTERNATIONAL SEARCH REPORT

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