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(72) Inventors:
• **Jegerings, Henri Frans Marie**
5731 CK Mierlo (NL)
• **van Maurik, Wim**
5731 CD Mierlo (NL)

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(74) Representative:
Smulders, Theodorus A.H.J., Ir. et al
Vereenigde Octrooibureaux
Nieuwe Parklaan 97
2587 BN 's-Gravenhage (NL)

(71) Applicant:
Verenigde Bedrijven van Thiel B.V.
5741 SX Beek en Donk (NL)

(54) **Scaffolding tube connecting piece comprising a male and a female coupling part, and scaffolding tube**

(57) Scaffolding tube connecting piece for interconnecting two scaffolding tubes in longitudinal direction, comprising a male and a female coupling part (1,2) that can each be undetachably connected, by a connecting end (3,4) thereof, to a scaffolding tube end (T), of which coupling parts (1,2) the maximum external diameter corresponds to the external diameter of the scaffolding

tubes (T) to be connected, wherein the male and female coupling parts (1,2) can be interconnected by means of a bayonet connection (7), wherein according to the invention, the bayonet connection (7) is of a self-locking construction through a special selection of the angles of run-on faces (14).

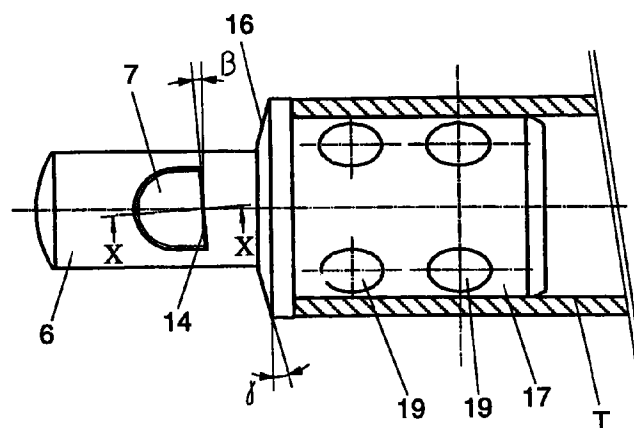


FIG. 9

EP 0 835 970 A1

Description

The invention relates to a scaffolding tube connecting piece for interconnecting two scaffolding tubes in longitudinal direction.

In the European scaffolding practice, for interconnecting scaffolding tubes in longitudinal direction, use is made of couplings which form an interruption in the external profile of the intercoupled scaffolding tubes. As a consequence of this interruption, at the location of the longitudinal connection, no so-called cross coupling can be provided for mounting a cross scaffolding tube extending at an angle to the scaffolding tubes that are interconnected in longitudinal direction. As efforts are presently directed to shortening the lengths of the scaffolding tubes in view of the lower weight of such shorter scaffolding tubes, the freedom for positioning the cross couplings for the cross scaffolding tubes is limited considerably. In practice, this has as a consequence that the different floors of a scaffold cannot be provided at the desired height.

The US scaffolding industry teaches a scaffolding tube connecting piece for interconnecting two scaffolding tubes in longitudinal direction, which scaffolding tube connecting piece comprises a male and a female coupling part that are each undetachably connectable, by a connecting end thereof, to a scaffolding tube end, and of which scaffolding tube connecting piece the maximum external diameter corresponds to the external diameter of the scaffolding tubes to be connected. At a free end remote from the connecting end, the male coupling part is provided with a stub having smaller external cross dimensions than the internal diameter of the scaffolding tubes. The stub comprises two bayonet cross protrusions evenly distributed over the circumference of the stub. At a free end remote from the connecting end, the female coupling part is provided with a receiving recess which is bounded, at this free end, by a bayonet ring having two recesses for letting through the bayonet cross protrusions when the male part is in an inserting position relative to the female coupling part. The stub-receiving recess has internal cross dimensions such that the stub is fittingly receivable therein. At the end of the bayonet ring remote from the free end, the stub-receiving recess is provided with a cross protrusion receiving portion having enlarged internal cross dimensions relative to the stub receiving recess, such that from the inserting position relative to the female coupling part, the male coupling part is rotatable into a coupled position in which the male and the female coupling parts are interconnected. Each bayonet ring segment located between two recesses is provided with a bayonet ring run-on face which, viewed in the rotary direction of the male coupling part to be followed relative to the female coupling part during the coupling operation, encloses an angle of inclination α with a plane extending perpendicularly to the longitudinal axis of the female coupling part. Each cross protrusion is provided, on a

side facing the connecting end, with a cross protrusion run-on face which, viewed in the rotary direction of the male part to be followed relative to the female coupling part during the coupling operation, encloses an angle of inclination β with a plane extending perpendicularly to the longitudinal axis of the coupling part. The female coupling part has its free end provided with an abutting face which, in coupled position of the male and female coupling parts and under influence of the run-on faces of the bayonet cross protrusions and the bayonet ring segments in a contact area abuts against an abutting face on the male part 1. This known scaffolding tube connecting piece has the particular advantage that due to the fact that the maximum external diameter of the coupling parts corresponds to the external diameter of the scaffolding tubes to be connected, an uninterrupted outside profile of the coupled scaffolding tubes is obtained at the location of the scaffolding tube connecting piece in coupled condition of the scaffolding tubes. This enables mounting a cross coupling at any desired location of the coupled scaffolding tubes for fitting a cross scaffolding tube. This creates the possibility of positioning a floor of the scaffolding at any desired position. Moreover, the rapidity at which the scaffolding tubes can be interconnected in longitudinal direction by means of this scaffolding tube connecting piece is particularly great and the coupling parts are particularly durable, because they are manufactured from two castings only and do not further contain any moving parts.

However, a drawback of the scaffold couplings known from the US scaffolding practice is that they do not comply with the European safety requirements. For instance, the scaffolding tubes may uncouple inadvertently and unintentionally and, moreover, deflection in the case of lateral load is greater than is permitted according to the European standards.

The object of the invention is to provide a scaffolding tube connecting piece which provides the possibility of positioning cross couplings at any desired position of two longitudinally interconnected scaffolding tubes, which scaffolding tube connecting piece complies with the safety standards set in Europe, for instance the standard EN-74.

The scaffolding tube connecting piece for longitudinally interconnecting two scaffolding tubes is characterized in that it is provided with a male and a female coupling part that are each, by a connecting end thereof, undetachably connectable to a scaffolding tube end, of which coupling parts the maximum external diameter corresponds to the external diameter of the scaffolding tubes to be connected, wherein at a free end remote from the connecting end, the male coupling part comprises a stub having smaller external cross dimensions than the internal diameter of the scaffolding tubes, which stub comprises at least two bayonet cross protrusions evenly distributed over the circumference of the stub, wherein at a free end remote from the connecting end, the female coupling part comprises a stub-receiv-

ing recess bounded, at this free end, by a bayonet ring having at least two recesses for letting through the bayonet cross protrusions when the male coupling part is in an inserting position relative to the female coupling part, wherein the stub-receiving recess has internal cross dimensions such that the stub is fittingly receivable therein, wherein at the end of the bayonet ring remote from the free end, the stub-receiving recess comprises a cross protrusion-receiving portion having enlarged internal cross dimensions relative to the stub-receiving recess, such that the male coupling part is rotatable from the inserting position relative to the female coupling part into a coupled position in which the male and the female coupling part are interconnected, wherein each bayonet ring segment located between two recesses is provided with a bayonet ring run-on face which, viewed in the rotary direction of the male coupling part to be followed relative to the female coupling part 2 during the coupling operation, encloses an angle of inclination α with a plane extending perpendicularly to the longitudinal axis of the female coupling part, wherein on a side facing the connecting end, each cross protrusion comprises a cross protrusion run-on face which, viewed in the rotary direction of the male coupling part to be followed relative to the female coupling part during the coupling operation, encloses an angle of inclination β with a plane extending perpendicularly to the longitudinal axis of the male coupling part, wherein at the free end, the female coupling part comprises an abutting face which, in coupled position of the male and the female coupling part and under influence of the run-on faces of the bayonet cross protrusions and the bayonet ring segments in a contact area abuts against an abutting face on the male part, wherein the angles of inclination α and β are so small that in the coupled position, a self-locking connection is established between the male and the female coupling part.

As, according to the invention, the angles of inclination α and β are so small that in the coupled position a self-locking connection is created between the male and the female coupling part, it is impossible that the two coupling parts uncouple unexpectedly and unintentionally.

In order to render the resistance to deflection of the scaffolding tube connecting piece particularly great, according to a further elaboration of the invention, it is particularly favorable that the area of contact between the abutting face of the male coupling part and the abutting face of the female coupling part is a substantially annular area extending adjacent the outer circumference of the male and female coupling parts. As the area of contact extends adjacent the outer circumference of the male and female coupling parts, a greater arm is created during bending of the scaffolding tube connecting piece than in the case of the scaffolding tube connecting piece known from the US practice. By this arm is meant the distance between the area of contact and the neutral line in which no stresses occur during bend-

ing of the coupling parts. In the male coupling part known from the US practice, the area of contact was close to the base of the stub, so that the stresses occurring at that location as a result of the deflecting moment became too great and an unduly great deflection of the scaffolding tube connecting piece occurred during lateral loading. As according to the invention, the area of contact of the abutting faces extends adjacent the outer circumference of the coupling parts, this problem has been solved.

When the coupling parts are manufactured from cast iron or cast steel, it is particularly favorable when the angles of inclination α and β are less than 7° , while it is preferred that the angles α and β be about 4° .

The invention also relates to a scaffolding tube provided at one end thereof with a male coupling part of a scaffolding tube connecting piece according to the invention, and provided at the other end thereof with a female coupling part of a scaffolding tube connecting piece according to the invention.

Further elaborations of the invention are described in the subclaims and will hereinafter be specified on the basis of an exemplary embodiment, with reference to the accompanying drawings.

Fig. 1 is a front view of the female coupling part;
 Fig. 2 is a right-side view of the female coupling part shown in Fig. 1;
 Fig. 3 is a left-side view of the female coupling part shown in Fig. 1;
 Fig. 4 is a longitudinal sectional view of the female coupling part shown in Fig. 1;
 Fig. 5 is a cross sectional view taken on line V-V in Fig. 1;
 Fig. 6 is a sectional view of a bayonet ring segment taken on line VI-VI in Fig. 4;
 Fig. 7 is a front view of a male coupling part;
 Fig. 8 is a left-side view of the male coupling part shown in Fig. 7;
 Fig. 9 is a top plan view of the male coupling part shown in Fig. 7; and
 Fig. 10 is a sectional view of a transverse protrusion taken on the line X-X in Fig. 9.

Figs. 1-6 show elevations, sections and a detail of the female coupling part 2 and Figs. 7-10 show elevations, a section and a detail of the male coupling part 1 of the scaffolding tube connecting piece for interconnecting two scaffolding tubes T in longitudinal direction. Both the male coupling part 1 and the female coupling part 2 comprise a connecting end 3, 4 respectively, formed by a cylindrical part 17, 18 respectively having an external diameter that is fittingly receivable in the scaffolding tube T associated therewith. The surface of the cylindrical part 17, 18 has been provided with a number of recesses 19. After the cylindrical part 17, 18 has been fitted in a scaffolding tube end, the scaffolding tube surface is pressed, by local plastic deformation,

into the recesses 19 to form an undetachable connection between the scaffolding tube T and the coupling part 1, 2. It is understood that the recesses 19 may also of a design other than shown, for instance in the form of two perpendicularly extending grooves into which the scaffolding tube surface can be pressed. The maximum external diameter of the coupling parts 1, 2 corresponds to the external diameter of the scaffolding tubes T to be connected.

At a free end 5 remote from the connecting end 3, the male coupling part 1 shown in Figs. 7-10 comprises a stub 6 having smaller external cross dimensions than the internal diameter of the scaffolding tubes T. The stub 6 comprises two bayonet cross protrusions 7 evenly distributed over the circumference of the stub 6.

At a free end 8 remote from the connecting end 4, the female coupling part 2 shown in Figs. 1-6 comprises a stub-receiving recess 9 bounded, at this free end 8, by a bayonet ring 10 having at least two recesses 11. The recesses 11 serve for letting through the bayonet cross protrusions 7 when the male coupling part 1 is in an inserting position relative to the female coupling part 2. The stub-receiving recess 9 has internal cross dimensions such that the stub 6 is fittingly receivable therein. At the end of the bayonet ring remote from the free end 8, the stub-receiving recess comprises a cross protrusion-receiving portion 12 having enlarged internal cross dimensions relative to the stub-receiving recess 9, such that the male coupling part 1 is rotatable from the inserting position relative to the female coupling part 2 into a coupled position in which the male and the female coupling part 1, 2 are interconnected. Each bayonet ring segment 10, 10' located between two recesses 11 is provided with a bayonet ring run-on face 13 which, viewed in the rotary direction of the male part 1 to be followed relative to the female coupling part 2 during the coupling operation, encloses an angle of inclination α with a plane extending perpendicularly to the longitudinal axis of the female coupling part 2. On a side facing the connecting end 3, each cross protrusion 7 also comprises a cross protrusion run-on face 14 which, viewed in the rotary direction of the male coupling part 1 to be followed relative to the female coupling part 2 during the coupling operation, encloses an angle of inclination β with a plane extending perpendicularly to the longitudinal axis of the male part. At the free end 4, the female coupling part 2 comprises an abutting face 15 which, in coupled position of the male and the female coupling part 1, 2 and under influence of the run-on faces 14, 13 respectively of the bayonet cross protrusions 7 and the bayonet ring segments 10, 10' in a contact area 15a, 16a abuts against an abutting face 16 on the male part 1. According to the invention, the angles of inclination α and β are so small that in the coupled position, a self-locking connection is established between the male and the female coupling part 1, 2. For this purpose, the angles of inclination α and β should be less than 7° , and in the present, preferred exemplary embodiment, the

angles of inclination α and β are about 4° . When the coupling parts 1, 2 are manufactured from cast iron, such angles of inclination α and β furnish a self-locking connection between the male and the female coupling parts, so that the unintentional loosening of the connection between the two coupling parts 1, 2 is prevented.

In order to create sufficient resistance to deflection of the scaffolding tube connecting piece, it is particularly favorable when the contact area 15a, 16a between the abutting face 16 of the male coupling part 1 and the abutting face 15 of the female coupling part 2 is a substantially annular area 15a, 16a, extending adjacent the outer circumference of the male and the female coupling parts 1, 2. In the present exemplary embodiment, this is realized in that the abutting face 16 of the male coupling part 1 has a frusto-conical configuration, wherein the axis of the conical abutting face 16 coincides with the longitudinal axis of the male part 1, wherein the conical abutting face 16 encloses an angle γ with a plane extending perpendicularly to the longitudinal axis of the male part 1, wherein the abutting face 15 of the female coupling part 2 also has a frusto-conical configuration, wherein the axis of that conical abutting face 15 coincides with the longitudinal axis of the female part 2, wherein the conical abutting face 15 of the female part 2 encloses an angle δ with a plane extending perpendicularly to the longitudinal axis of the female part, and wherein angle γ is smaller than angle δ . Precisely because the angle γ of the male part 1 is smaller than the angle δ of the female part 2, the conical abutting face 15 of the female part 2 will abut against the abutting face 16 of the male part only at the outer edge 15a thereof, to obtain an annular contact area 15a, 16a extending adjacent the outer circumference of the male and the female coupling parts 1, 2. In the present exemplary embodiment, the magnitude of the angle γ is about 15° and the magnitude of the angle δ is about 20° .

Both the male and the female coupling part 1, 2 are provided with marks 21 and 20 respectively, indicating whether the two coupling parts 1, 2 in the coupled position have been rotated relative to each other insufficiently, sufficiently or, by contrast, too much. In the present exemplary embodiment, the marks 20, 21 are formed by two notches 20 on the female coupling part 2 and one notch 21 on the male coupling part 1. Of course, the marks 20, 21 may also be provided the other way round or be of a different design. When in the coupled position one notch 21 on the male coupling part 1 is located between the two notches 20 on the female coupling part, a proper coupling has been effected. When the rotation of the male coupling part 1 relative to the female part 2 is so slight that the notch 21 is not located between the notches 20, the male coupling part 1 has not been properly inserted into the female coupling part 2. When the male coupling part 1 can be rotated into the female coupling part 2 so far that the notch 21 can be rotated beyond the area bounded by the two notches 20, at least one of the run-on faces 13,

14 is worn in such a manner that the scaffolding tube connecting piece is no longer usable and has to be replaced.

As is clearly shown in Figs. 6 and 10, the run-on faces 13, 14 of the bayonet ring segments 10, 10' and the cross protrusions 7 respectively are likewise of frusto-conical design. The frusto-conical surface encloses an angle ϕ with a plane extending perpendicularly to the longitudinal direction, which angle is about 5°. Together with the conical abutting faces 15, 16, this angle provides a centering of the two coupling parts 1, 2 relative to each other in the coupled condition. Moreover, on account of this, the castings are withdrawable, so that they can easily be removed from the mold.

It is readily understood that the invention is not limited to the exemplary embodiment described, but that various modifications are possible within the framework of the invention. For instance, the stub 6 may be provided with three or more bayonet cross protrusions 7. Also, the kinematic reversal of the two coupling parts is possible, with two bayonet ring segments being provided on the stub 6 and two internally directed cross protrusions being provided in the stub-receiving recess 9 of the female part 2.

Claims

1. A scaffolding tube connecting piece for interconnecting two scaffolding tubes (T) in longitudinal direction, provided with a male and a female coupling part (1 and 2 respectively) that are each, by a connecting end (3, 4) thereof, undetachably connectable to a scaffolding tube end (T), of which coupling parts (1, 2) the maximum external diameter corresponds to the external diameter of the scaffolding tubes (T) to be connected, wherein at a free end (5) remote from the connecting end (3), the male coupling part (1) comprises a stub (6) having smaller external cross dimensions than the internal diameter of the scaffolding tubes (T), said stub (6) comprising at least two bayonet cross protrusions (7) evenly distributed over the circumference of the stub (6), wherein at a free end (8) remote from the connecting end (4), the female coupling part comprises a stub-receiving recess (9) bounded, at said free end (8), by a bayonet ring (10) having at least two recesses (11) for letting through the bayonet cross protrusions (7) when the male coupling part (1) is in an inserting position relative to the female coupling part (2), wherein the stub-receiving recess (9) has internal cross dimensions such that the stub (6) is fittingly receivable therein, wherein at the end of the bayonet ring (10) remote from the free end (8), the stub-receiving recess (9) comprises a cross protrusion-receiving portion (12) having enlarged internal cross dimensions relative to the stub-receiving recess (9), such that the male coupling part (1) is rotatable from the inserting position relative to the female coupling part (2) into a coupled position in which the male and the female coupling part (1, 2) are interconnected, wherein each bayonet ring segment (10, 10') located between two recesses (11) is provided with a bayonet ring run-on face (13) which, viewed in the rotary direction of the male coupling part (1) to be followed relative to the female coupling part (2) during the coupling operation, encloses an angle of inclination α with a plane extending perpendicularly to the longitudinal axis of the female coupling part (2), wherein on a side facing the connecting end (3), each cross protrusion (7) comprises a cross protrusion run-on face (14) which, viewed in the rotary direction of the male coupling part (1) to be followed relative to the female coupling part (2) during the coupling operation, encloses an angle of inclination β with a plane extending perpendicularly to the longitudinal axis of the male coupling part (1), wherein at the free end (4), the female coupling part (2) comprises an abutting face (15) which, in the coupled position of the male and the female coupling part (1, 2) and under influence of the run-on faces (14 and 13 respectively) of the bayonet cross protrusions (7) and the bayonet ring segments (10) in a contact area (15a, 16a) abuts against an abutting face (16) on the male coupling part (1), wherein the angles of inclination α and β are so small that in the coupled position, a self-locking connection is established between the male and the female coupling part (1, 2).
2. A scaffolding tube connecting piece according to claim 1, characterized in that the contact area (15a, 16a) between the abutting face (16) of the male coupling part (1) and the abutting face (15) of the female coupling part (2) is a substantially annular area (15a, 16a) extending adjacent the outer circumference of the male and the female coupling part (1, 2).
3. A scaffolding tube connecting piece according to claim 1 or 2, characterized in that angle α and angle β are smaller than 7 degrees.
4. A scaffolding tube connecting piece according to claim 3, characterized in that angle α and angle β are about 4 degrees.
5. A scaffolding tube connecting piece according to claim 2, characterized in that the abutting face (16) of the male coupling part (1) has a frusto-conical configuration, wherein the axis of said conical abutting face (16) coincides with the longitudinal axis of the male coupling part (1), wherein the conical abutting face (16) encloses an angle γ with a plane extending perpendicularly to the longitudinal axis of the male coupling part (1), wherein the abutting

face (15) of the female coupling part (2) has a frusto-conical configuration, wherein the axis of said conical abutting face (15) coincides with the longitudinal axis of the female coupling part (2), wherein the conical abutting face (15) encloses an angle δ with a plane extending perpendicularly to the longitudinal axis of the female part (2), and wherein angle γ is smaller than angle δ .

the preceding claims.

6. A scaffolding tube connecting piece according to claim 5, characterized in that the magnitude of angle γ is about 15° and the magnitude of angle δ is about 20° .
7. A scaffolding tube connecting piece according to any one of the preceding claims, characterized in that the connecting end (3, 4) of both the male and the female coupling part (1, 2) is formed by a cylindrical part (17 and 18 respectively) having an external diameter which is fittingly receivable in the associated scaffolding tube (T).
8. A scaffolding tube connecting piece according to claim 7, characterized in that the surface of the cylindrical part (17, 18) which forms the connecting end (3, 4) has been provided with a number of recesses (19), wherein, after the cylindrical part (17, 18) has been fitted in a scaffolding tube end (T), the scaffolding tube surface is pressed, by local plastic deformation, into the recesses (19) to form the undetachable connection between the scaffolding tube (T) and the coupling part (1, 2).
9. A scaffolding tube connecting piece according to any one of the preceding claims, characterized in that the coupling parts (1, 2) are manufactured by casting.
10. A scaffolding tube connecting piece according to any one of the preceding claims, characterized in that both the male and the female coupling part (1, 2) are provided with marks (20, 21) indicating whether the two coupling parts (1, 2) in the coupled position have been rotated relative to each other insufficiently, sufficiently or, by contrast, too much.
11. A scaffolding tube connecting piece according to claim 10, characterized in that the marks (20, 21) are formed by two notches (20) on the female coupling part (2) and one notch (21) on the male coupling part (1) or vice versa.
12. A scaffolding tube (T) provided, at one end thereof, with a male coupling part (1) of a scaffolding tube connecting piece according to any one of the preceding claims, and provided, at the other end thereof, with a female coupling part (2) of a scaffolding tube connecting piece according to any one of

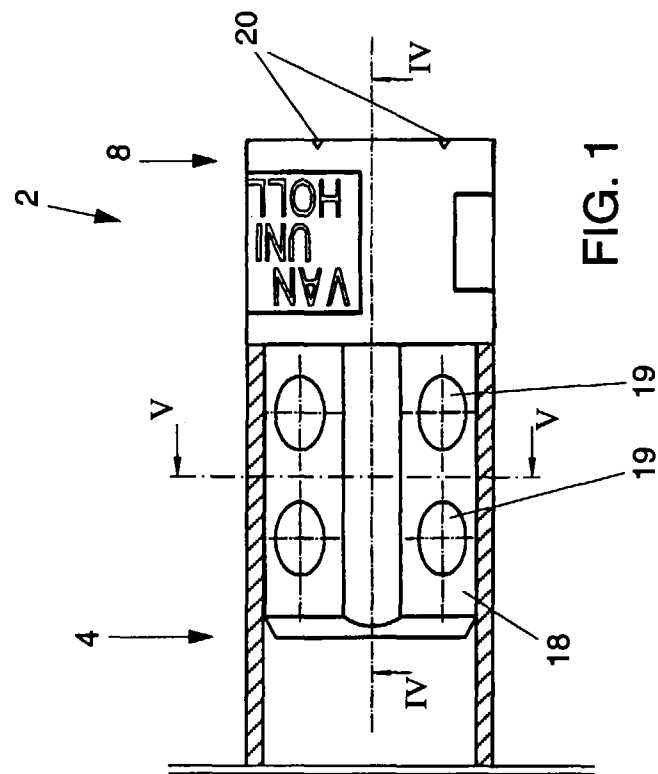


FIG. 1

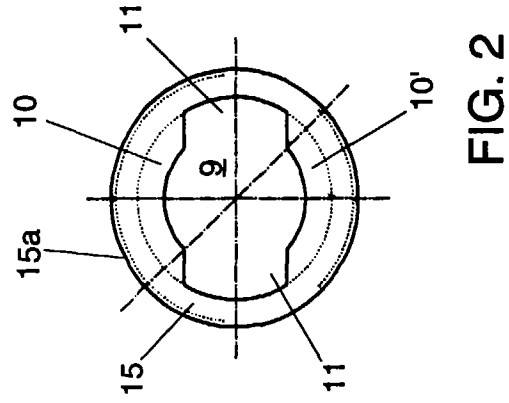


FIG. 2

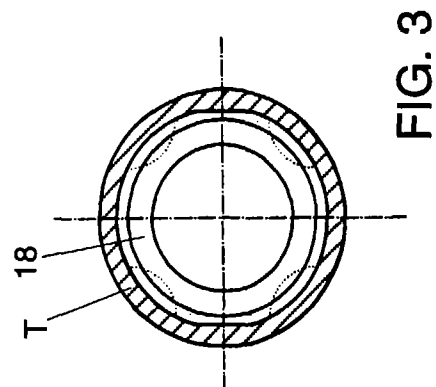


FIG. 3

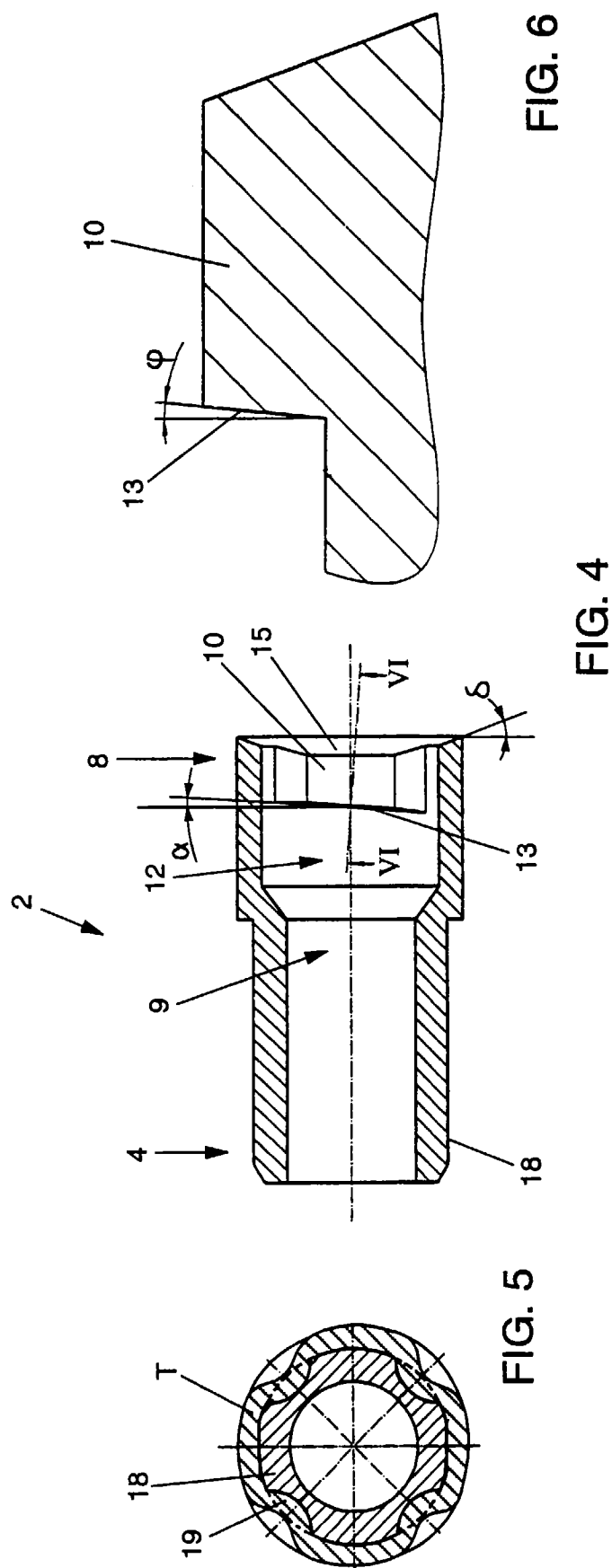
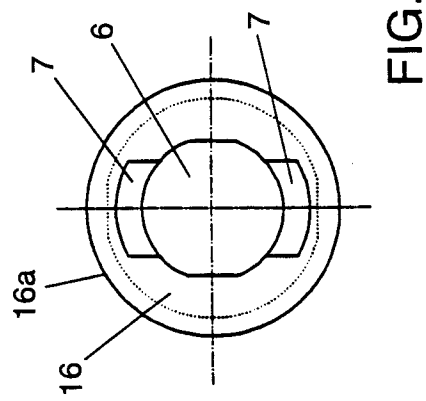
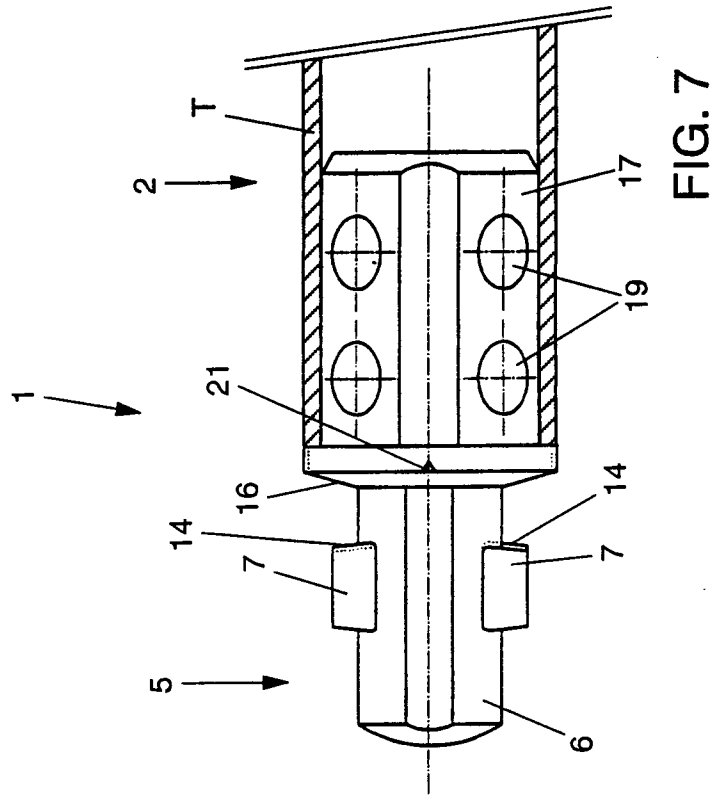


FIG. 6



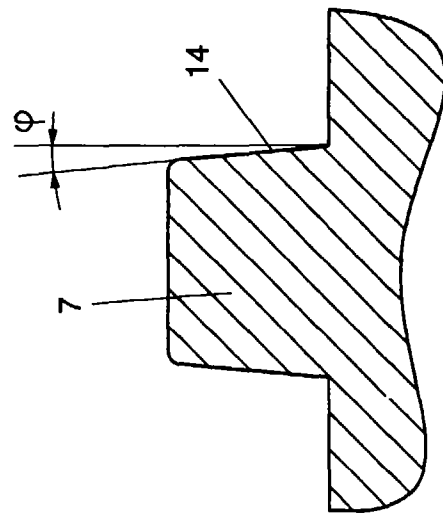


FIG. 10

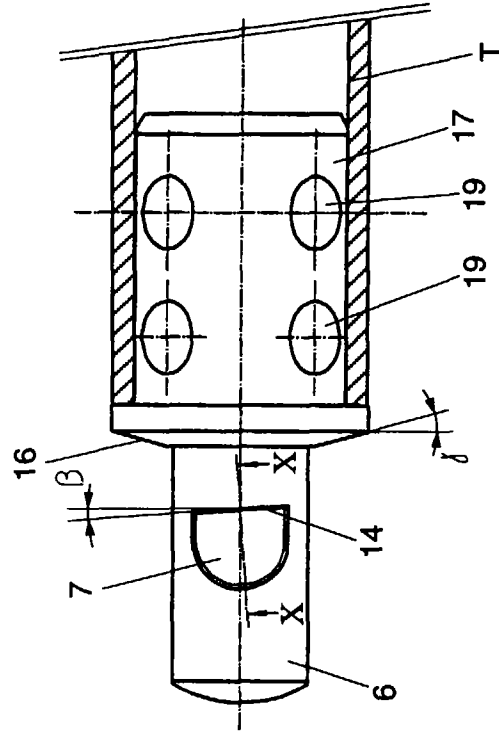


FIG. 9



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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 3120

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.6)
A	US 4 619 549 A (GILBRETH) 28 October 1986 * column 3, line 26 - column 5, line 47; figures *	1-3,5	E04G7/30
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A	FR 2 449 763 A (SOC. FR. DES ECHAFAUDAGES SELF-LOCK) 19 September 1980 * claims; figures *	1,10	
A	FR 895 091 A (ZENNARO) 15 January 1945		
A	GB 1 006 952 A (RAPID METAL DEVELOPMENTS) 6 October 1965		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E04G F16B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 9 January 1998	Examiner Vijverman, W
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