

(19)



(11)

EP 4 817 754 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.10.2026 Bulletin 2026/41

(51) International Patent Classification (IPC):
B21D 7/06 (2006.01)

(21) Application number: **26166135.9**

(52) Cooperative Patent Classification (CPC):
B21D 7/06

(22) Date of filing: **19.03.2026**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA
Designated Validation States:
GE KH LA MA MD TN

(71) Applicant: **C.B.C. S.r.l.**
42016 Guastalla (RE) (IT)

(72) Inventor: **VEZZANI, GIORGIO**
42016 Guastalla (RE) (IT)

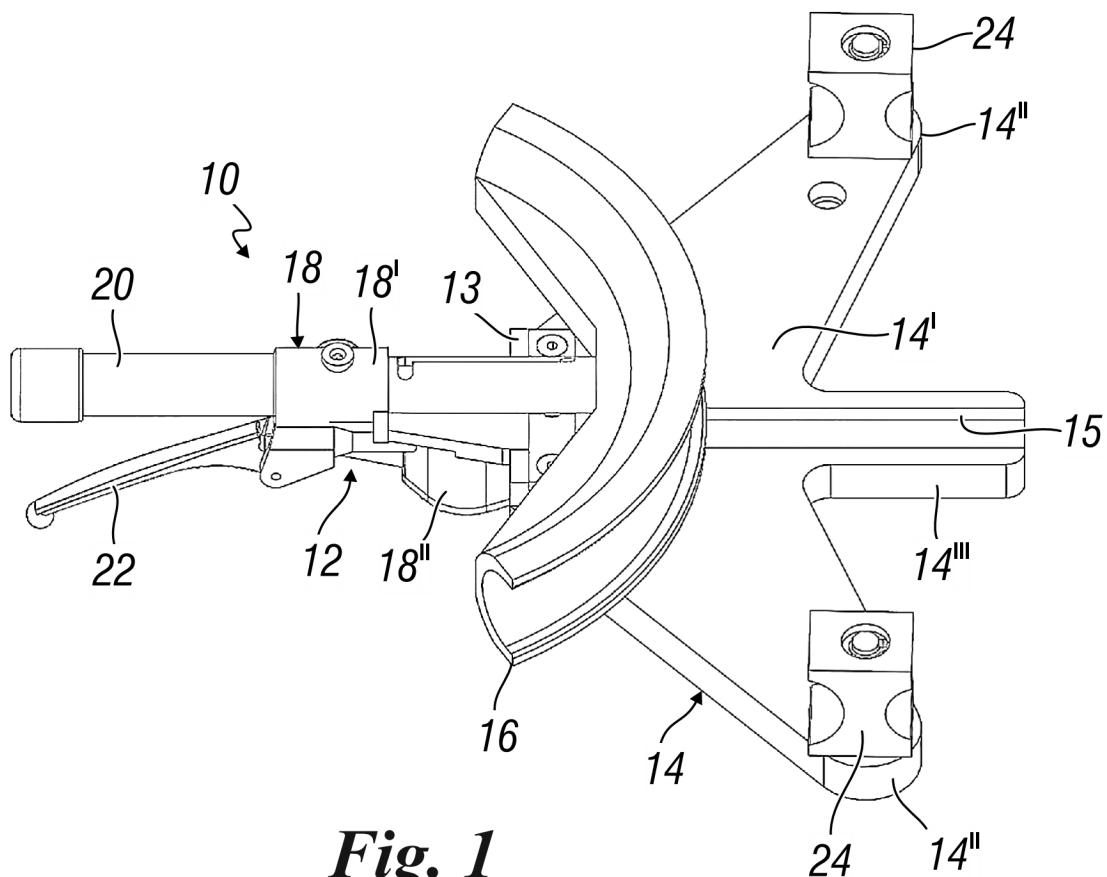
(74) Representative: **Ripamonti, Enrico et al**
Giambrocono & C. S.p.A.,
Via Rosolino Pilo, 19/B
20129 Milano (IT)

(30) Priority: **03.04.2025 IT 202500007125**

(54) HYDRAULIC TUBE BENDING DEVICE

(57) A hydraulically actuated tube bending device (10, 10') operable by one hand, manually or automatically and configured to perform cold bending of tubes, comprising a hydraulic drive assembly (12, 30) to which a

support fork (14) and a bending die (16) are connected, the hydraulic drive assembly (12, 30) comprising an actuator cylinder (20) coaxial with the axis of the bending die (16).

**Fig. 1**

Description

[0001] The present invention relates to a hydraulic tube bending device.

[0002] More specifically, the present invention relates to a hydraulic tube bending device operable with one hand and configured to perform cold bending of tubes without compromising the structure.

[0003] As is known, hydraulic tube benders exploit hydraulic force to push a piston that applies pressure to a tube through a curved die, with said tube being plastically deformed around the die without the use of heat.

[0004] The known tube benders can operate according to different bending systems defined by a thrust system (the tube is pushed against the die), a roller (the tube is dragged around a roller with control of the bending force), a mandrel system (an internal mandrel is used to prevent crushing and maintain the cross-section of the tube); in the case covered by the present invention, reference will be made to the tube benders that operate according to the principle of the thrust system.

[0005] Considering the tube benders of the push-type system of the tube against the die, they operate with the tube to be bent which is rested on a pair of fixed supports (said back-up blocks) and with a hydraulic piston which exerts a direct thrust on the tube, pressing it against a central die (or "former") which bends it gradually (the hydraulic piston generates the force necessary to push the tube against the die); said die guides the tube along a predefined radius, determining the angle and quality of the bending.

[0006] Typically, the die may be interchangeable to allow bending of tubes with different radii of curvature and the supports (or back-up blocks) may be interchangeable to accommodate tubes of different diameters.

[0007] These tube benders can be manually or automatically operated by a battery.

[0008] The hydraulic tube benders, thanks to the hydraulic system, allow bending of thick-walled tubes and resistant materials, are characterized by a relatively simple and easy-to-use mechanism as the operator only needs to position the tube and activate the piston to perform the bending (manual or automatic activation) and, in addition, have an economical structure that does not require frequent maintenance.

[0009] However, these known and traditional types of tube benders have some significant drawbacks related to problems of ovalization of the tube during bending as the direct pushing action can cause a deformation of the cross section of the tube, making it less circular and this is particularly evident in thin-walled tubes.

[0010] A further drawback is represented by the position of the thrust piston which can cause an asymmetrical distribution of force on the tube and this can generate irregular stresses in the tube section, increasing the risk of ovalization or crushing.

[0011] A further drawback, as a result of the inconvenience related to the positioning of the thrust piston, is represented by a misalignment that can cause unwanted twisting or bending effects, leading to uneven curves or inaccurate bending radii and this is particularly problematic when high precision is required in machining.

[0012] A further drawback of traditional tube benders is represented by the fact that part of the force generated by the thrust piston is dispersed due to the position of the same, reducing the efficiency of the system and requiring greater hydraulic pressure to achieve the same result and this leads to higher energy consumption and/or greater operator fatigue.

[0013] A further drawback is represented by the fact that the position of the thrust piston entails a thrust not perfectly aligned with the geometric center of the curvature and, therefore, the tube may tend to move laterally, making it more difficult to obtain a precise and repeatable curvature.

[0014] The object of the present invention is to overcome the aforementioned drawbacks.

[0015] More particularly, the object of the present invention is to provide a hydraulic tube bending device that guarantees a reduction of lateral loads with an improvement in the distribution of pressure on the tube.

[0016] A further object of the present invention is to provide a hydraulic tube bending device adapted to maintain the circular shape of the tube during bending, limiting crushing and/or ovalizations.

[0017] A further object of the present invention is to provide a hydraulic tube bending device adapted to guarantee modularity, manageability, transportability and possibility of installation on a stand.

[0018] A further object of the present invention is to provide users with a hydraulic tube bending device which ensures high reliability and durability over time and which can be implemented easily and cost-effectively.

[0019] These and other objects are achieved by the invention having the characteristics referred to in claim 1.

[0020] According to the invention there is provided a single-handed, manually or automatically operable, hydraulically actuated tube bending device configured to perform cold bending of tubes comprising a hydraulic drive assembly to which a support fork and a bending die are connected, the hydraulic drive assembly comprising an actuator cylinder coaxial with the axis of the bending die.

[0021] Advantageous embodiments of the invention arise from the dependent claims.

[0022] The constructive and functional characteristics of the hydraulic tube bending device of the present invention can be better understood from the detailed description that follows, in which reference will be made to the attached drawing sheets that represent an embodiment given as an illustrative and non-limiting example only and wherein:

Figure 1 schematically illustrates an axonometric

view of a manually operated hydraulic tube bending device in a rest configuration;

Figure 2 schematically illustrates an axonometric view of a manually operated hydraulic tube bending device in operating configuration;

Figure 3 schematically illustrates an axonometric view of an automatic battery-powered hydraulic tube bending device in a rest configuration;

Figure 4 schematically illustrates an axonometric view of an automatic battery-powered hydraulic tube bending device in operating configuration.

[0023] With reference to Figures 1 and 2, a hydraulic tube bending device in accordance with the invention is illustrated, indicated overall with 10, with manual operation and in a non-operating or rest configuration (Figure 1) and in an operating or bending configuration (Figure 2).

[0024] The tube bending device 10 comprises a hydraulic drive assembly 12 to which a support fork 14 and a bending die 16 are connected.

[0025] The hydraulic drive assembly 12 comprises a body 18 consisting of an upper portion 18' that supports and constrains an actuator cylinder 20 and a lower portion 18'' that is integrally formed with the upper portion and that comprises a reservoir for the oil for the actuation of the actuator cylinder 20 and to which an actuation means of said actuator cylinder defined by a manual actuation lever 22 is connected.

[0026] The bending die 16, having a profiled curved shape to guide the tube during bending and whose geometry determines the bending radius and the final result, is constrained to one end of an extendable push rod 20' of the actuator cylinder 20; in particular, the axis of the bending die 16 is aligned (or coaxial) with the axis of the push rod 20' of the actuator cylinder 20.

[0027] The support fork 14, which has the function of keeping the tube to be bent in position and ensuring stability during bending, is rigidly stabilized to the lower portion 18'' of the body 18 by means of a locking block 13 and comprises a plate-shaped element 14' with a substantially "T" shape comprising a pair of opposing and symmetrical arms 14'' and a projecting appendix 14''' extending in the axial direction of the actuator cylinder 20 in the opposite direction to the latter.

[0028] At the free ends of each of the arms 14'' there is a fixed counter block 24 provided with a concave surface with a profile corresponding to that of the bending die 16 and so as to uniformly distribute the forces exerted during bending, reducing the risk of unwanted deformations or displacements of the tube during bending and ensuring that the tube is always perfectly aligned with respect to the bending die, improving the precision of the curvature and avoiding twisting or irregular bends.

[0029] The projecting appendix 14''' comprises a longitudinal groove 15 that defines a guide for the sliding of the bending die 16 keeping it aligned during the process of bending a tube.

[0030] A hook 19 is secured and pivoted with respect to

the support fork 14 with the purpose of locking/unlocking the hydraulic drive assembly 12 with respect to the support fork 14.

[0031] The tube bending device of the invention, moreover, is configured for workbench use or for use on a special three-legged stand.

[0032] With reference to figures 3 and 4, the hydraulic tube bending device of the invention is illustrated, indicated overall with 10', with automatic battery operation (the details similar to the device referred to in figures 1 and 2 will not be described further and will be identified with the same numerical references).

[0033] The tube bending device comprises a hydraulic drive assembly 30 to which a support fork 14 and a bending die 16 are connected.

[0034] The support fork 14 is rigidly stabilized to the lower portion 18'' of the body 18 by means of a locking block 13. The hydraulic drive assembly 30 comprises a body 32 consisting of an upper portion 32' that supports and constrains an actuator cylinder 20 and a lower portion 32'' that is integrally formed with the upper portion and that comprises a reservoir for the oil for the actuation of the actuator cylinder 20 and to which an actuation means of said actuator cylinder defined by a motor unit 34 and the support fork 14 is connected.

[0035] Also with reference to this embodiment, a hook 19 is secured and pivoted with respect to the support fork 14 with the purpose of locking/unlocking the hydraulic drive assembly 30 with respect to the support fork 14.

[0036] In this configuration it is possible to rotate the hydraulic drive assembly 30 with respect to the support fork 14 by 360 degrees, keeping the bending die 16 coaxial with the thrust cylinder 20.

[0037] As can be seen from the foregoing, the advantages achieved by the hydraulic tube bending device of the present invention, whether manually or automatically operated, are evident.

[0038] The hydraulic tube bending device of the present invention, by virtue of the fact that the axis of the bending die is aligned (or coaxial) with the axis of the push rod of the actuator cylinder, advantageously enables direct transmission of the hydraulic force without deviations or lateral components and this eliminates any undesired bending moments that could generate abnormal deformations in the structural components.

[0039] A further advantage, as a consequence of the above, is represented by a greater bending precision, taking into account the fact that a correct alignment reduces the geometric errors in the bending of the tube and minimizes the risk of inclinations or transverse movements of the bending die, which could lead to irregular bends for the tube.

[0040] A further advantage is represented by an increased efficiency by virtue of the fact that the thrust of the actuator cylinder is applied exactly in the useful direction without energy losses due to structural components that must compensate for lateral or torsional thrusts.

[0041] A further advantage lies in the availability of a

tube bending device with a more compact structure.

[0042] A further advantage is represented by the fact that the push rod of the hydraulic actuator of the extendable type makes it possible to fully perform the bending of tubes with both 40mm and 50mm diameter with the same equipment.

[0043] Although the invention has been described with particular regard to its embodiments, given solely by way of non-limiting example, numerous modifications and variations will be apparent to a person skilled in the art, in light of the above description. The present invention is therefore intended to embrace all modifications and variations falling within the scope of the following claims.

Claims

1. A hydraulic tube bending device (10, 10') operable with one hand, manually or automatically and configured to perform cold bending of tubes, comprising a hydraulic drive assembly (12, 30) to which a support fork (14) and a bending die (16) are connected, the hydraulic drive assembly (12, 30) comprising an actuator cylinder (20) coaxial with the axis of the bending die (16), **characterized in that** the support fork (14) is rigidly stabilized to the hydraulic drive assembly (12, 30) and comprises guide means for sliding the bending die (16) and maintaining the alignment thereof during the bending process of a tube.
2. The tube bending device (10) according to claim 1, **characterized in that** the hydraulic drive assembly (12) comprises a body (18) consisting of an upper portion (18') that supports and constrains the actuator cylinder (20) and a lower portion (18'') that is integrally formed with the upper portion and that comprises a reservoir for the oil for the actuation of the actuator cylinder (20) provided with an extendable push rod (20') and to which an actuation means of said actuator cylinder defined by a manually operated lever (22) is connected.
3. The tube bending device (10') according to claim 1, **characterized in that** the hydraulic drive assembly (30) comprises a body (32) consisting of an upper portion (32') that supports and constrains the actuator cylinder (20) provided with a push rod (20') and a lower portion (32'') that is integrally formed with the upper portion and that comprises a reservoir for the oil for the actuation of the actuator cylinder (20) and to which an actuation means of said actuator cylinder defined by a motor unit (34) is connected.
4. The tube bending device (10, 10') according to the preceding claims, **characterized in that** the support fork (14) is rigidly stabilized to the lower portion (18'', 32'') of the body (18, 32) and comprises a plate-

shaped element (14') with a substantially "T" shape comprising a pair of opposing and symmetrical arms (14'') and a projecting appendix (14''') extending in the axial direction of the actuator cylinder (20) in the opposite direction thereto.

5. The tube bending device (10, 10') according to claim 4, **characterized in that** the support fork (14) is rigidly stabilized to the lower portion (18'') of the body (18) by means of a locking block (13) and a hook (19).
6. The tube bending device (10, 10') according to claim 4, **characterized in that** the projecting appendix (14''') comprises a longitudinal groove (15) defining guide for sliding the bending die (16) and maintaining the alignment thereof during the bending process of a tube.
7. The tube bending device (10, 10') according to claim 4, **characterized in that** at the free ends of each of the arms (14'') a counter block (24) is secured having a concave surface with a profile corresponding to that of the bending die (16).
8. The tube bending device (10, 10') according to claim 5, **characterized in that** the fixed hook (19) is pivoted with respect to the support fork (14) with the purpose of locking/unlocking the hydraulic drive assembly (12, 30) with respect to the support fork (14).
9. The tube bending device (10') according to the preceding claims, **characterized in that** the hydraulic drive assembly (30) can be rotated 360 degrees with respect to the support fork (14) keeping the bending die (16) coaxial with the thrust cylinder (20).
10. The tube bending device (10, 10') according to the preceding claims, **characterized in that** it is secured on a workbench or on a three-legged stand.

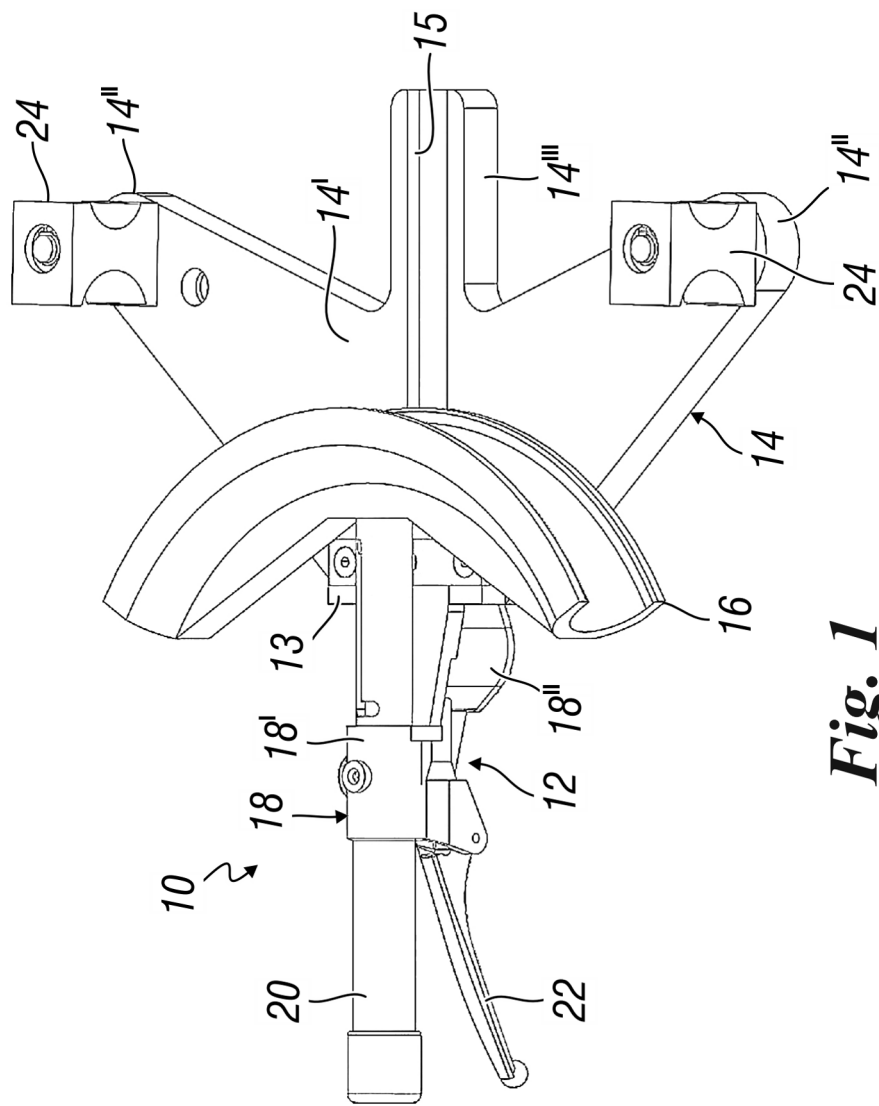


Fig. 1

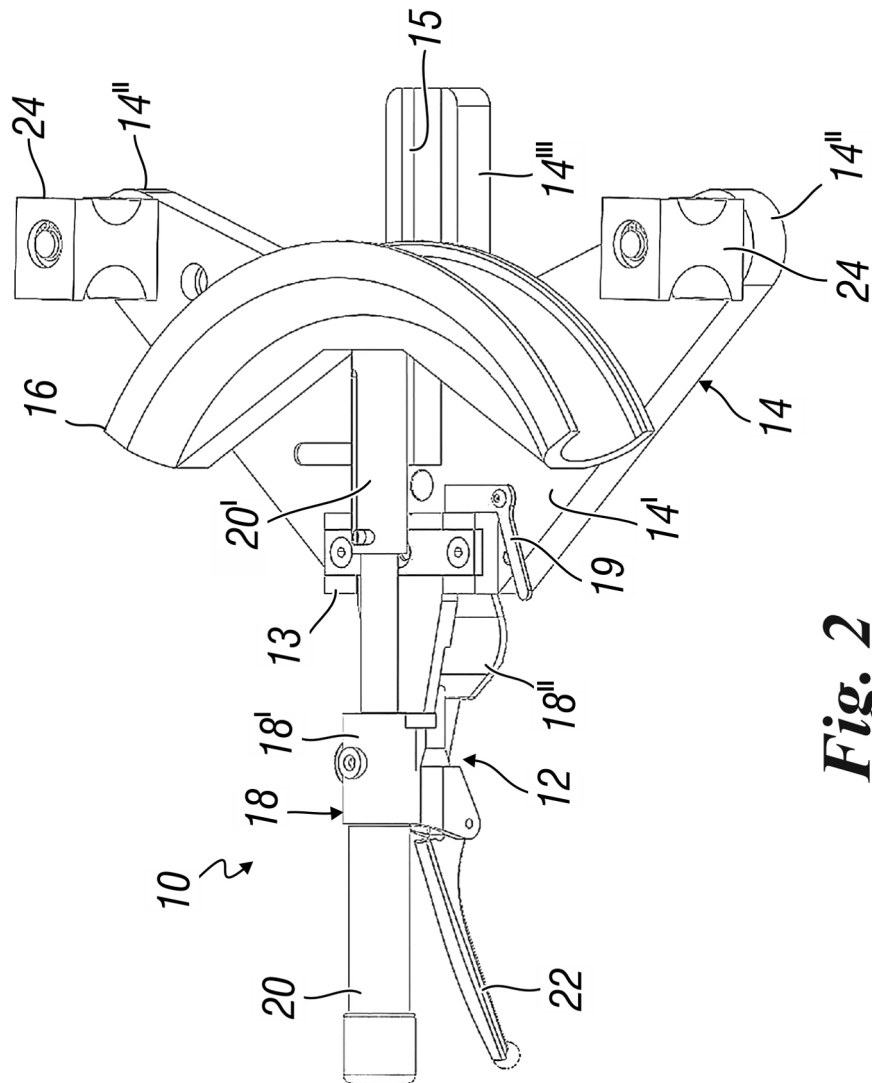


Fig. 2

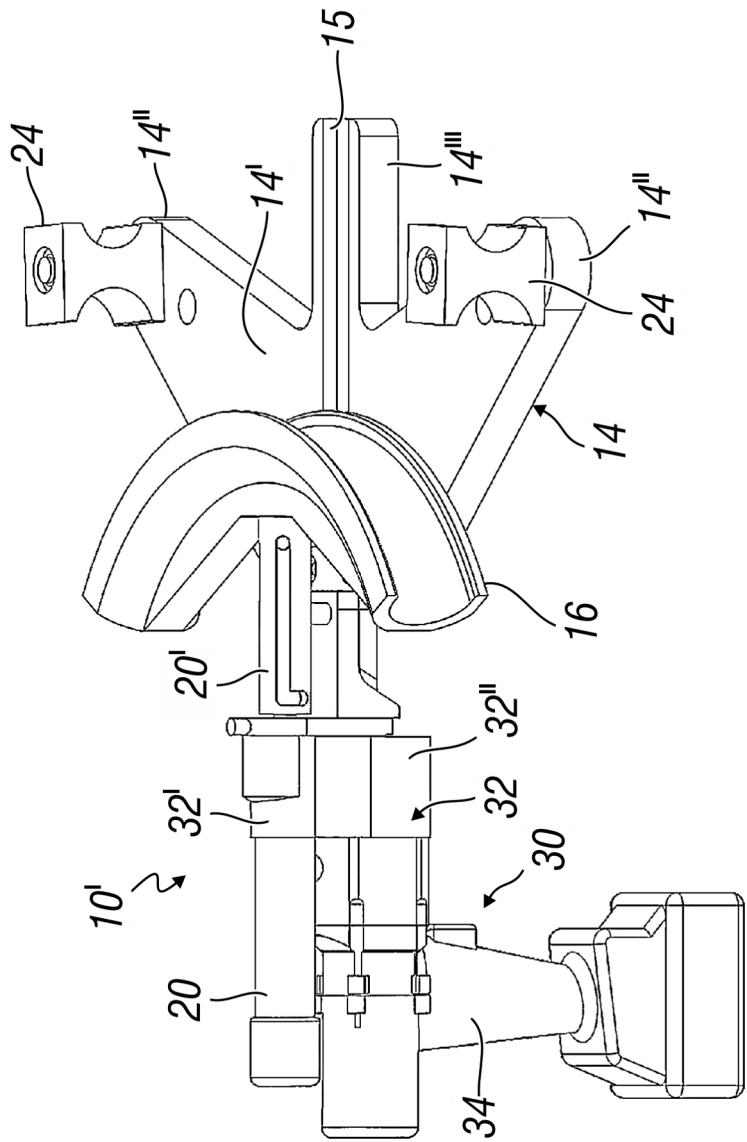


Fig. 3

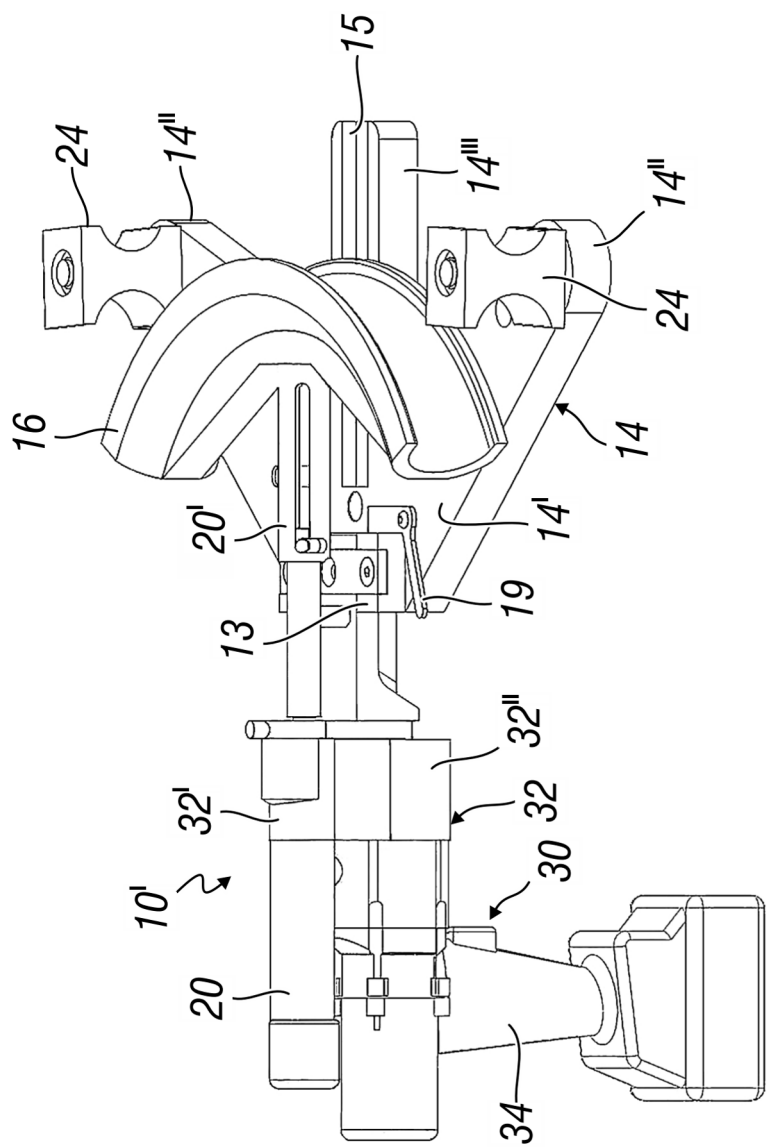


Fig. 4



EUROPEAN SEARCH REPORT

Application Number

EP 26 16 6135

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 10 2011 118654 A1 (FOELL REMSWERK [DE]) 16 May 2013 (2013-05-16) * figures *	1-10	INV. B21D7/06
X	EP 0 220 639 A2 (CBC SPA [IT]) 6 May 1987 (1987-05-06) * page 2, column 1, lines 9-11,16-18; figure 1 * * page 3, column 2, lines 11-17 *	1-10	
X	DE 28 24 074 A1 (BELOTTI FLLI) 22 March 1979 (1979-03-22) * page 6, paragraph 1; figures 1,4 *	1-10	
X	DE 101 28 738 A1 (TRANSFLUID MASCHB GMBH [DE]) 2 January 2003 (2003-01-02) * paragraphs [0018], [0019]; figure 1 *	1-10	
X	DE 29 13 816 A1 (LIRI COSTRUZIONI MECC) 11 October 1979 (1979-10-11) * claim 1; figures 1-4 *	1-10	TECHNICAL FIELDS SEARCHED (IPC)
X	US 4 254 651 A (KELLY WILLIAM R) 10 March 1981 (1981-03-10) * column 2, lines 41-49; figures *	1-10	B21D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		23 July 2026	Knecht, Frank
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			

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 26 16 6135

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-07-2026

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102011118654 A1	16-05-2013	NONE	

EP 0220639 A2	06-05-1987	AT E54585 T1	15-08-1990
		EP 0220639 A2	06-05-1987
		ES 2016792 B3	01-12-1990
		IT 207711 Z2	08-02-1988

DE 2824074 A1	22-03-1979	NONE	

DE 10128738 A1	02-01-2003	NONE	

DE 2913816 A1	11-10-1979	DE 2913816 A1	11-10-1979
		ES 479385 A1	16-12-1979
		FR 2421690 A1	02-11-1979
		GB 2020586 A	21-11-1979
		IT 1156153 B	28-01-1987
		JP S5561325 A	09-05-1980
		NL 7902595 A	09-10-1979
		US 4232542 A	11-11-1980

US 4254651 A	10-03-1981	NONE	

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82