



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.10.2017 Bulletin 2017/40

(51) Int Cl.:
B65H 67/08 (2006.01)

(21) Application number: **17161658.4**

(22) Date of filing: **17.03.2017**

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(72) Inventors:
• **BADIALI, Roberto**
I-33170 PORDENONE (IT)
• **GUARDA, Luca**
I-33170 PORDENONE (IT)
• **QUERENGHI, Mauro**
I-33170 PORDENONE (IT)

(30) Priority: **30.03.2016 IT UA20162101**

(74) Representative: **Fioravanti, Corrado**
Jacobacci & Partners S.p.A.
Via Berchet, 98
35131 Padova (IT)

(71) Applicant: **Savio Macchine Tessili S.p.A.**
33170 Pordenone (IT)

(54) **APPARATUS FOR CAPTURING THE YARN END OF A BOBBIN**

(57) A telescopic suction pipe (20) comprises an upper stationary pipe (21) and a vertically slidable lower pipe (22). The upper stationary pipe is provided with a yarn cutting device (25) and with a photocell (24) for detecting the presence of a yarn inside the suction pipe. A mechanical yarn gripping device (28) is mounted in the lower pipe (22). A linear actuator (30) causes the lower pipe (22) to slide telescopically along the upper stationary pipe (21).

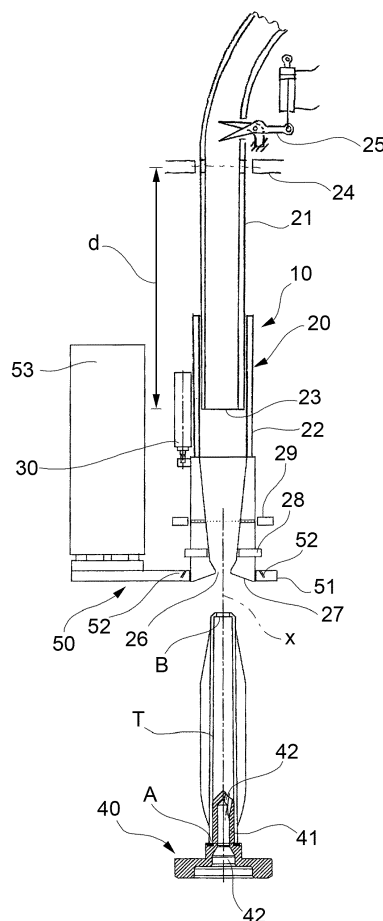


FIG.1

Description

Technical field

[0001] The present invention relates to a device for capturing the yarn end of a bobbin, in particular, but not exclusively, the yarn end of a spun whose unraveling is difficult, as, for example, wet flax.

Background art

[0002] As known, with bobbins coming from wet flax manual spinning wheels, it is difficult to detach the yarn end from the surface of the bobbin. This is due to the wet spinning cycle, whereby the wet cellulose, of a slimy and sticky consistency, which is released from vegetable fibers such as flax and cotton, once dried, tends to stick the coils one another, and makes the yarn stiff. Once detached, the yarn is difficult to unravel because it remains adherent to the underlying coils, again due to the stuck cellulose.

[0003] Usually the bobbins end with highly inclined binding windings, and finally with a number of binding windings (or "underwinding") at the bottom of the tube.

[0004] In order to prepare the bobbin for the next coiling, it is required to:

- capture the yarn end with conventional separation means, such as a metal leg for detaching the yarn end, a wrinkled pad for separating very tight yarn ends;
- separate the yarn end from the bobbin, unraveling the yarn end with bellows and sucking it with an associated suction pipe;
- unwind the yarn end to such an extent so that it has a length sufficient to be introduced inside the tube; and
- insert the yarn end into the tube by means of suction by means of the plate and the tube.

[0005] To make the feeding of the bobbins following the coiling units faster, it is necessary that

- the bobbin has at most two binding windings;
- the bobbin does not have an underwinding;
- the tube has a top hole with a diameter of at least 12 mm;
- the yarn has a moisture content of at least 7%-9% to make the yarn flexible.

[0006] Special arrangements are also required at the head or yarn end searching station. The yarn end separation station is usually equipped with two legs which are brought into contact with the surface of the bobbin to detach the yarn end. To effectively operate on different types of bobbins, two legs are generally provided for, a metal hook-shaped one that is needed for breaking and separating the yarn end on the cylindrical surface of the

bobbin and a pad one in a rubbery material with a rough surface, or a pad one with metal serration, which is needed for separating the underwinding yarn end at the base of the tube, if present. One or more nozzles are also used to lift the detached yarn end upwards, as well as a vertically movable pipe for the suction of the yarn end.

[0007] Generally, a photocell is provided inside the suction pipe for detecting the presence of the yarn, i.e. that the yarn has been captured. A cutting device, mounted in the suction pipe, provides for cutting the yarn after a length thereof has been extracted from the bobbin sufficient to drive it back, by means of suction and/or blowing, inside the tube by means of the top thereof and make it remain stably therein until the moment when it is required that the yarn is fed from the bobbin to a winding machine.

Summary of the invention

[0008] It is an object of the present invention to effectively capture the yarn end, in particular for spuns of the type discussed in the introduction, to extract a sufficiently long portion thereof from the bobbin so that it may be neatly inserted into the top of the tube so as to proceed with subsequent processes.

[0009] According to the invention, the aforesaid purpose and other advantages are achieved by an apparatus having the features defined in the appended claims.

[0010] In summary, the yarn end is unwound from the bobbin thanks to the fact that the yarn is grasped by a gripping device mounted inside a telescopically movable part of the suction pipe. The gripping device mechanically clasps the yarn detached from the bobbin and pulls it to a certain length. In this way, a yarn portion is forcibly unwound from the bobbin having a length which allows the pipe suction to unwind a further yarn portion. When the unwound yarn has reached the length required to be stably inserted into the tube, the yarn is cut and inserted inside the tube.

Brief description of the drawings

[0011] The structural and functional features of a few preferred embodiments of an apparatus according to the invention, but not limited thereto, will now be described. Reference is made to the accompanying drawings, in which:

Figures 1-8 are schematic elevation views, partially sectioned, showing a sequence of operating steps in an apparatus according to one embodiment of the invention;

Figures 9 and 10 respectively are a vertical view in vertical section and a horizontal sectional view showing a mechanical yarn gripping device; and

Figure 11 is a schematic top view of an alternative embodiment of a mechanical yarn gripping device.

Detailed description

[0012] With reference to the drawings, the entirety of an apparatus for the capture of the yarn end P of a yarn F from a bobbin S is indicated with reference number 10.

[0013] The apparatus comprises a telescopic suction pipe 20 which a bellow-holder group 50 is associated thereto. The bobbin S is supported by a conventional support plate 40.

[0014] Some of the elements represented in the Figures are to be considered generally known. Consequently, in the following of the present description, only the elements of specific importance and interest for the purposes of the implementation of the present invention will be described in detail. For the constructional and functional features of the parts and elements not shown in detail, reference may therefore be made to any yarn end search and capturing system of a known type.

[0015] The telescopic suction pipe 20 comprises an upper stationary pipe 21, connectable to a suction source (not shown), and a lower pipe 22 vertically slidable along a lower end portion of the stationary pipe 21.

[0016] The stationary pipe 21 has a lower end 23 and is associated with a first photocell 24 placed at a determined distance d above the lower end 23. The photocell 24 is needed for detecting the presence of the yarn end P inside the stationary pipe 21 at the distance d from the lower end 23.

[0017] A yarn cutting device 25, schematically shown, is mounted adjacent to the first photocell 24, in this example immediately above the first photocell 24.

[0018] The lower pipe 22 has a bottom mouth 26 with an inlet surface 27 tapering upwards and towards the center of the pipe. In this example, the tapering inlet surface 27 is a conical surface.

[0019] A mechanical yarn gripping device 28 is arranged in the lower pipe 22, preferably adjacent to the bottom mouth 26.

[0020] The lower pipe 22 may have a second photocell 29 preferably placed adjacent to the gripping device 28, thereabove. The second photocell 29, optional, may be needed for detecting the presence of the yarn end B P inside the lower pipe 22.

[0021] A linear actuator 30 is arranged to cause the lower pipe 22 to telescopically slide along the upper stationary pipe 21.

[0022] The telescopic suction pipe 20 defines a central and vertical geometric axis x, along which the bobbin S is aligned, below the pipe 20.

[0023] The plate 40 for the support of the bobbin has a central vertical pin 41, aligned with the axis x, which is inserted into the lower end A of the tube T of the bobbin. The plate 40 has an inner channel 42 connectable to a lower suction device 34 (Figure 7), which is needed to draw by suction the yarn end into the upper end B of the tube. An example of a support and suction plate is given in patent publication IT 1 270 010 B.

[0024] The bellow-holder group 50 may comprise a

bellow-holder ring 51 having a plurality of nozzles 52 distributed about the axis x and facing upwards and towards the central vertical axis to facilitate the separation of the yarn end from the windings of the bobbin. The bellow-holder ring 51 is vertically movable along the axis x by means of a linear actuator 53. An example of a bellow-holder ring may be found in patent publication JP H07133071 A.

[0025] Preliminarily, in a first processing station (not shown), the bobbin may be treated in a known manner by one or more yarn end mechanical separation elements, for example by means of slidable elements on the surface of the bobbin in rotation which cause the separation/break of the binding windings, as for example known from patent publication EP 1 932 793 B1. A wrinkled pad may also be used for separating the underwinding yarn end.

[0026] The bobbin S, mounted on the support plate 40 thereof, reaches a yarn end capturing and insertion station, where the apparatus 10 (Figure 1) is provided.

[0027] The bellow-holder ring 51 is lowered around the bobbin S (Figure 2) and the nozzles 52 blow upwards separating the yarn end P which is sucked into the suction pipe 20. The tapering inlet surface 27 guides the insertion of the yarn end towards the center of the pipe 20 and optimizes the suction, reducing losses. The linear actuator 30 may be extended to bring the lower pipe 22 close to the bobbin.

[0028] If the yarn end has been separated from the bobbin, the photocell 29 detects it (Figure 3). Optionally, the lower pipe 22 may be further lowered to even further near the suction pipe to the bobbin.

[0029] Subsequently, the mechanical gripping device 28 closes on the yarn and captures the yarn end (Figure 4), by grasping it mechanically.

[0030] The telescopic movements of the suction pipe, as well as the opening and the closing of the gripping device, and the activation of the cutting device 25, are produced as a result of commands imparted by a processing unit - for example a Programmable Logic Controller (PLC) or a Central Processing Unit (CPU). The processing unit receives response signals from the photocells 24 and 29 and oversees the operation of the apparatus 10 in its entirety, thus also the operation of all other engine/actuating parts herein described.

[0031] Once the yarn end is clamped by means of the gripping device 28, the lower pipe 22 is raised, forcibly further separating the yarn end from the bobbin (Figure 5).

[0032] In this situation, the suction in the upper pipe 21 is sufficient to pull a further yarn portion out of the bobbin. The mechanical gripping device 28 therefore opens (Figure 6) and allows the pipe suction 20 to extract another yarn portion from the bobbin.

[0033] Optionally, a palette 44 may be brought into contact with the bobbin in order to prevent the suction of an excessive length of yarn.

[0034] When the upper photocell 24 detects the pres-

ence of the yarn in the upper pipe 21, the cutting device 25 cuts the yarn end (Figure 6). The suction by means of the pipe 20 is interrupted.

[0035] Once the yarn end is cut, the lower pipe 22 may be optionally lowered almost getting in contact with the tube of the bobbin (Figure 7). The palette, if provided for, may be left in contact with the surface of the bobbin, holding the yarn thereagainst. Once the suction from the top by means of the pipe 20 ceases, a suction from below is activated, by means of the support plate 40 (Figure 7). With 34 a suction sleeve is schematically indicated. Consequently, the yarn end is sucked inside the tube by means of the upper end B thereof. The surface tapering shape 27 facilitates the introduction of the yarn end in the top of the tube.

[0036] According to one embodiment, to more effectively insert the yarn end into the tube, the suction from below by means of the tube is associated with the activation of one or more nozzles 33 (Figure 7) mounted in the lower pipe 22. The nozzles 33, optional, blow one or more compressed air jets downwards, inside the lower pipe 22, thus assisting the suction action by means of the plate 40.

[0037] According to a variation not shown, the nozzles 33 may be mounted on lower or outer part of the lower pipe 22, for directing one or more jets downwards.

[0038] Once the yarn end is inserted in the tube, the bellow-holder ring and the suction pipe are lifted, freeing the bobbin (Figure 8).

[0039] Experimental tests carried out by the Applicant have shown that satisfactory results are obtained even in the absence of a second photocell 29 provided for in the lower pipe 22. The mechanical gripping device 28 may also intervene in the absence of a signal (given by the second photocell 29) indicating the presence of the yarn in the lower pipe 22.

[0040] If provided, the second photocell 29 may be placed about 30-40 mm above the bottom mouth 26 of the lower pipe 22.

[0041] The upper photocell 24 may be positioned a dozen centimeters (for example 15 cm) away from the lower end 23 of the stationary pipe 21. After the cutting, the yarn extracted from the bobbin must have a length sufficient so as to be introduced in the bobbin and remain there; indicatively (Figure 8), the yarn portion to be re-introduced into the tube may have a length comparable to the length of the tube.

[0042] The gripping device 28 may be configured in different ways so as to effectively grasp the yarn end and be able to pull it and unwind it from the bobbin. For example (Figures 9 and 10), the gripping device may comprise two or more jaws or movable shutter elements 28, for example in the form of blocks, acting inside the lower pipe 22 and controlled by two actuators 35, mounted on the lower pipe 22. The actuators 35 may be electrically or pneumatically operated, preferably operated by a single valve (not shown), which controls both the closing and the opening of the movable elements 28. The mov-

able shutter elements may assume different shapes, for example crescent shapes or opposite V-shapes.

[0043] The movable shutter elements 28 may slide radially in grooves or guides 36 integral with the lower pipe 22.

[0044] Figure 11 shows a further example of a gripping device in which the movable elements comprise a plurality of radially arranged cooperating blades, as in an optical diaphragm.

[0045] During the yarn end P capturing step (Figure 3), the tapering inlet surface 27 guides the insertion of the yarn end towards the center of the pipe 20 and, if neared to the top of the tube B, it optimizes the suction, reducing losses. In the step of inserting the yarn into the tube (Figure 7), the tapering inlet surface 27 almost in contact with the upper end B of the tube guides the yarn end to insert it in the top of the tube.

[0046] Various aspects and embodiments of the apparatus have been described. It is understood that each embodiment may be combined with any other embodiment. The invention, moreover, is not limited to the described embodiments, but may be varied within the scope defined by the appended claims.

Claims

1. Apparatus for capturing the yarn end of a bobbin, comprising:

- a suction pipe (20), connectable to a suction source;
- at least a first photocell (24) associated to the suction pipe (20) for detecting the presence of a yarn inside the suction pipe at a determined distance (d) from a lower end (23) of the suction pipe;
- a yarn cutting device (25) mounted in the suction pipe (20) adjacent the first photocell (24);

characterized in that the suction pipe (20) is a telescopic suction pipe which includes:

- a stationary upper pipe (21), to which the cutting device (25) and the first photocell (24) are associated;
- a lower pipe (22) vertically slidable along a lower end portion of the upper stationary pipe (21);
- a mechanical yarn gripping device (28) mounted in the lower pipe (22);
- a linear actuator (30) causing the lower pipe (22) to slide telescopically along the stationary upper pipe (21).

2. Apparatus according to claim 1, **characterized in that** the lower pipe (22) has a bottom mouth (26) with an inlet surface (27) tapering upwards and towards the center of the pipe.

3. Apparatus according to claim 1 or 2, **characterized in that** the lower pipe of the mechanical yarn gripping device (28) is arranged adjacent to a bottom mouth (26) of the lower pipe (22).
5
4. Apparatus according to claim 1 or 2 or 3, **characterized in that** the lower pipe (22) is provided with a second photocell (29) for detecting the presence of a yarn within the lower pipe (22).
10
5. Apparatus according to claim 4, **characterized in that** the second photocell (29) is mounted on the lower pipe (22) adjacent to the mechanical yarn gripping device (28).
15
6. Apparatus according to claim 5, **characterized in that** the second photocell (29) is mounted on the lower pipe (22) above the mechanical yarn gripping device (28).
20
7. Apparatus according to any one of the preceding claims, **characterized in that** the lower pipe (22) is equipped with one or more nozzles (33) adapted to blow one or more pressurized air jets downward.
25
8. Apparatus according to any one of the preceding claims, **characterized in that** the lower pipe (22) is equipped with one or more nozzles (33) adapted to blow one or more jets of pressurized air inside the lower pipe (22), downward and toward the center of the lower pipe.
30
9. Apparatus according to claim 7 or 8, associated to a support (40) for a bobbin, said support having a pin (41) adapted to be engaged in a lower end (A) of a tube (T) of the spool, and an inner channel (42) connectable to a lower suction device (34) for sucking air from an upper end (B) of the tube (T), and wherein the bobbin support (40) is arranged below the suction pipe (20) and is axially aligned therewith along a vertical geometric axis (x) defined by the lower pipe (22).
35
40
10. Apparatus according to any one of the preceding claims, **characterized in that** the mechanical yarn gripping device (28) comprises two or more mobile shutter elements (28) acting inside the lower pipe (22).
45
11. Apparatus according to claim 10, **characterized in that** the mobile shutter elements comprise two opposite movable elements (28), associated with one or more pneumatically or electrically controlled actuators (35).
50
55
12. Apparatus according to claim 10, **characterized in that** the mobile shutter elements comprise a plurality of radially arranged cooperating blades (28), as in

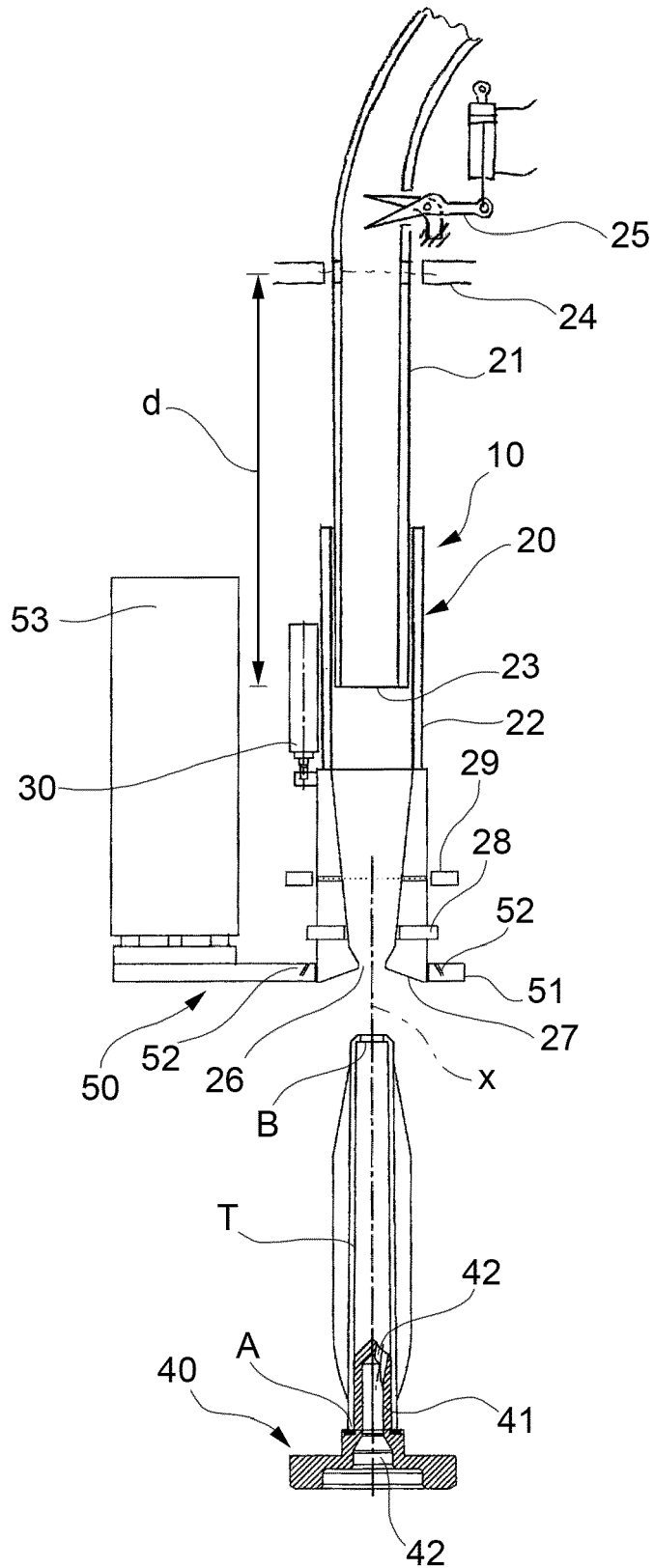


FIG.1

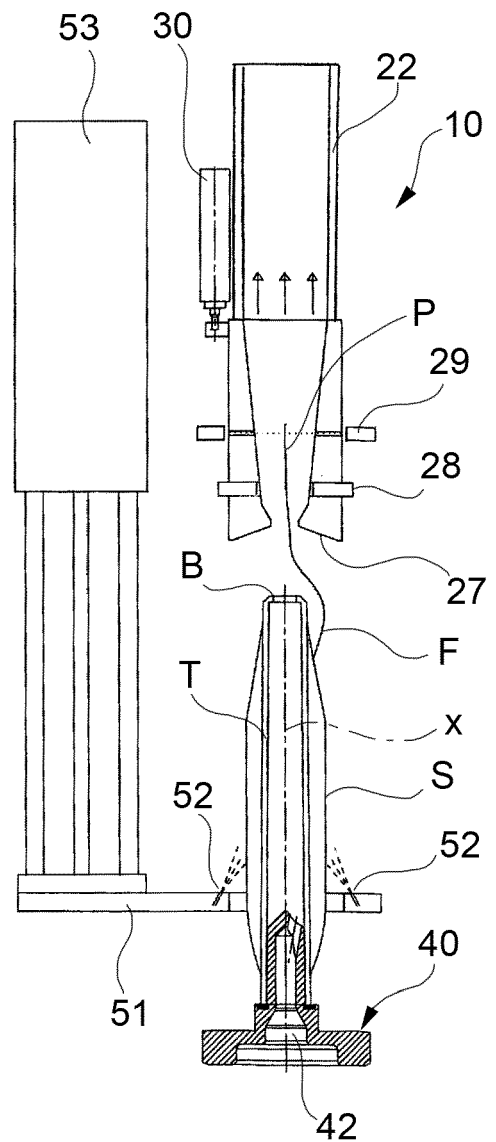


FIG.2

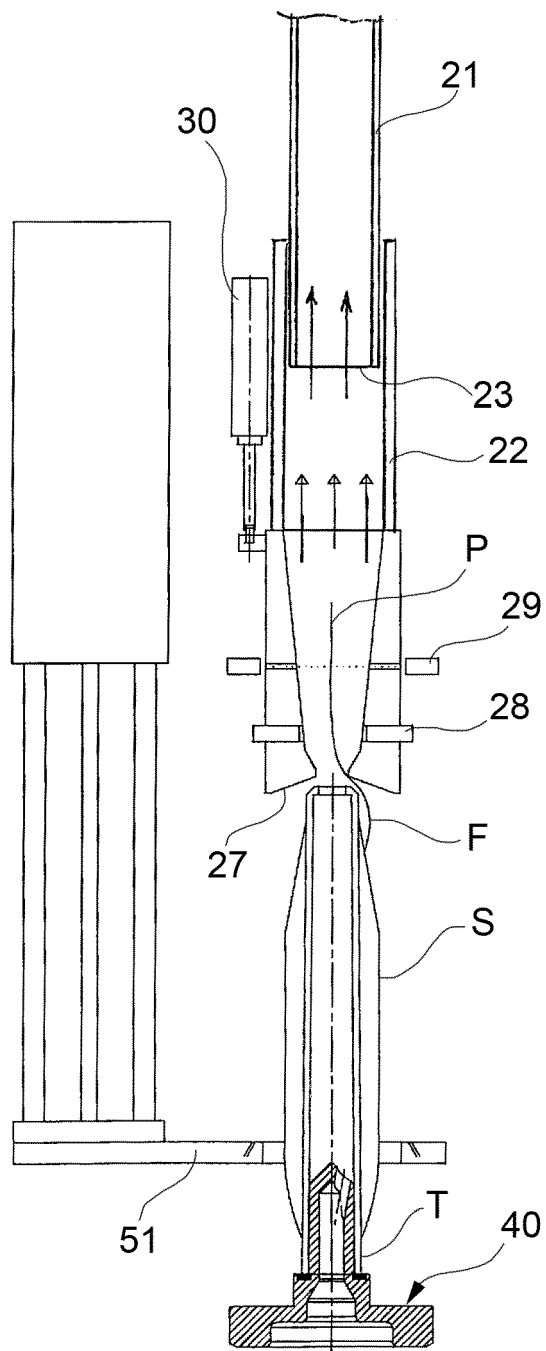


FIG.3

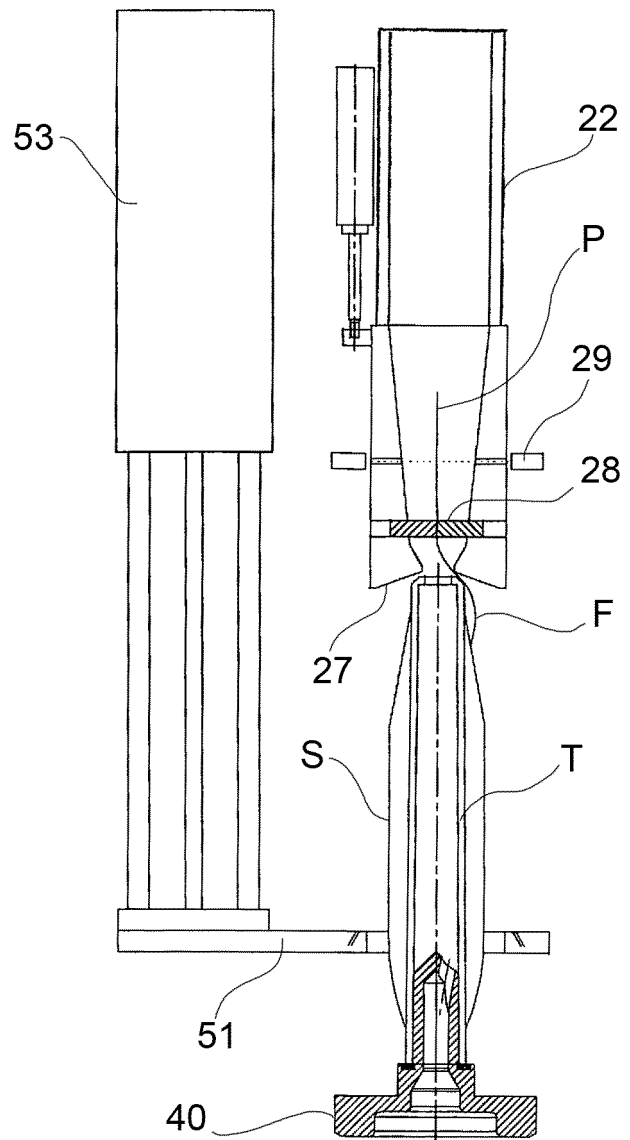


FIG.4

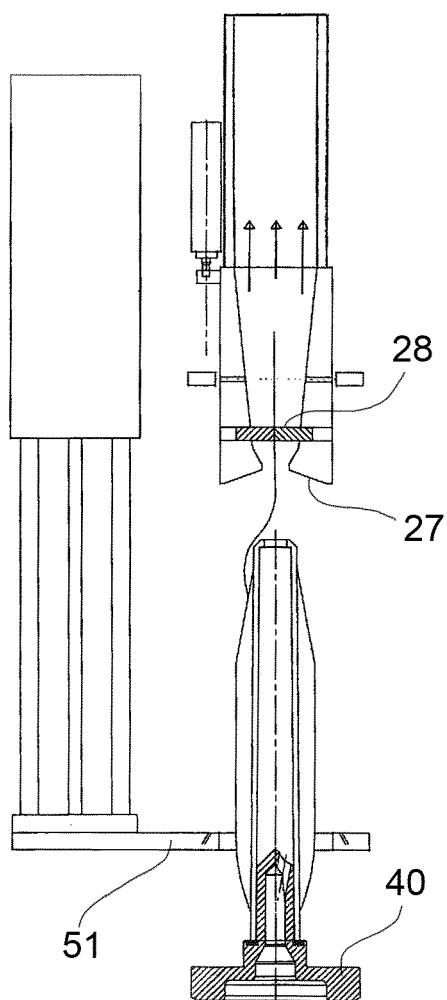


FIG. 5

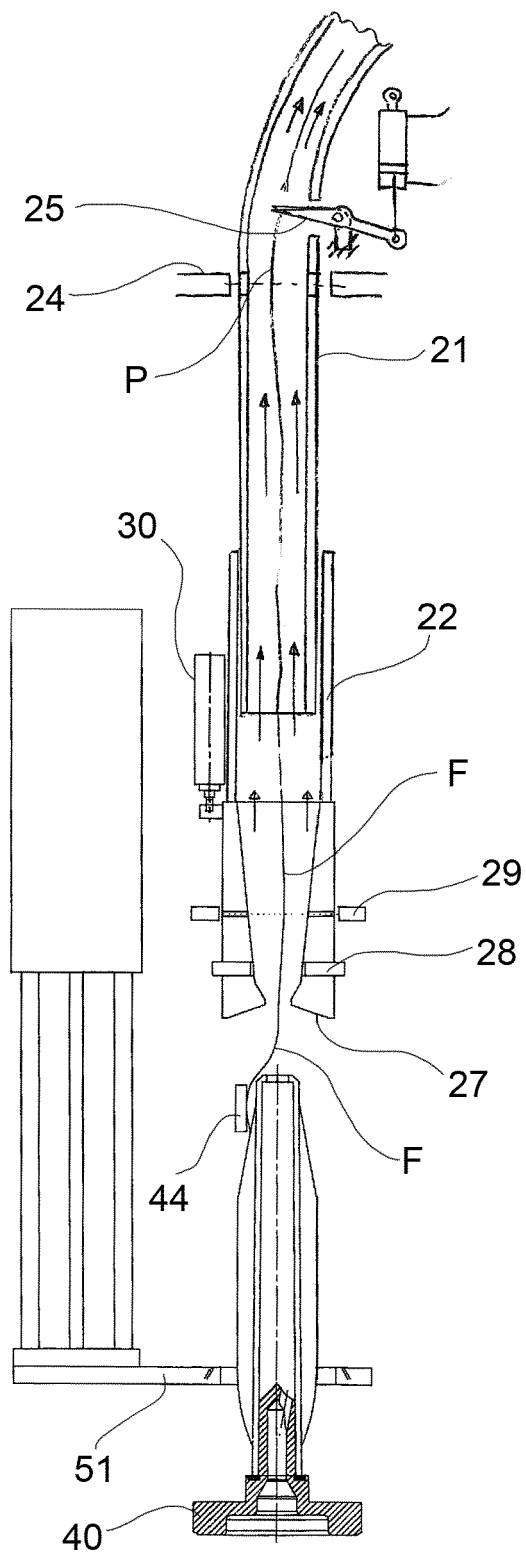


FIG. 6

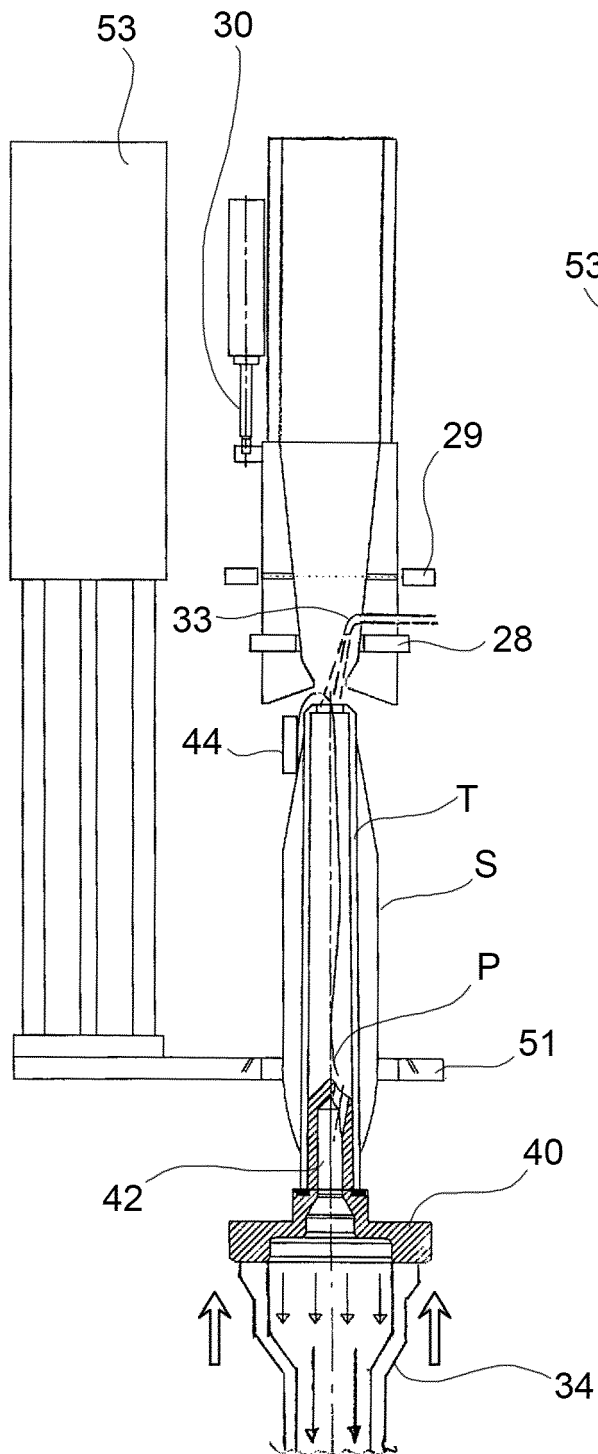


FIG.7

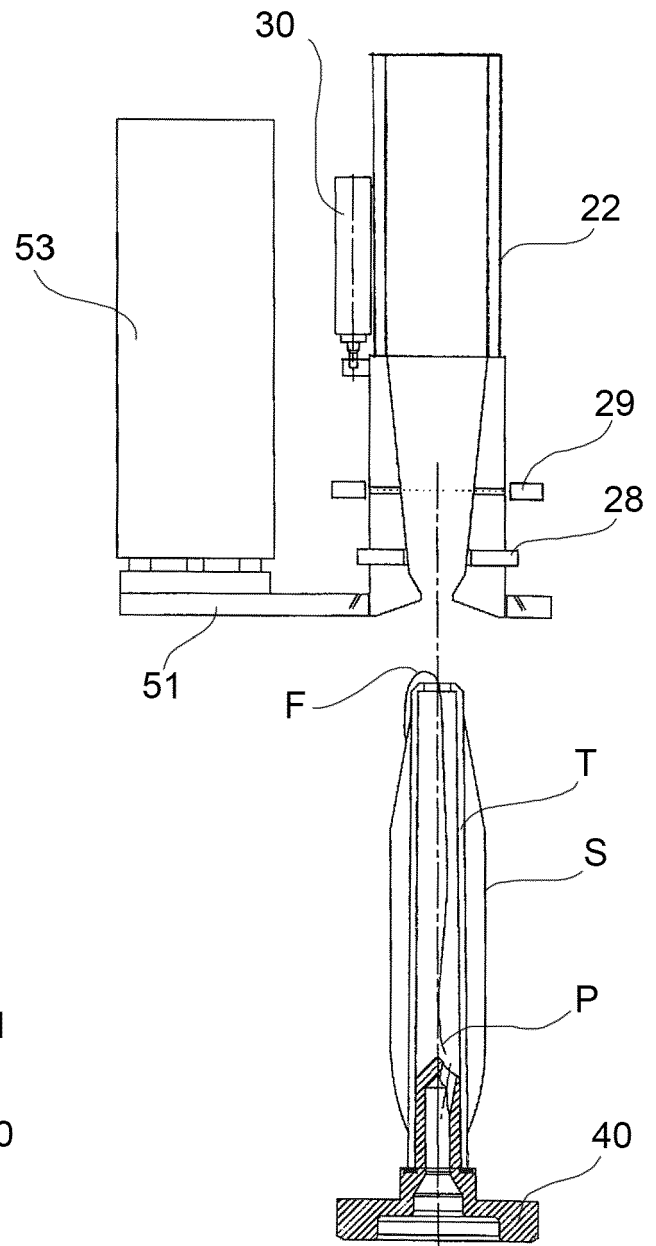
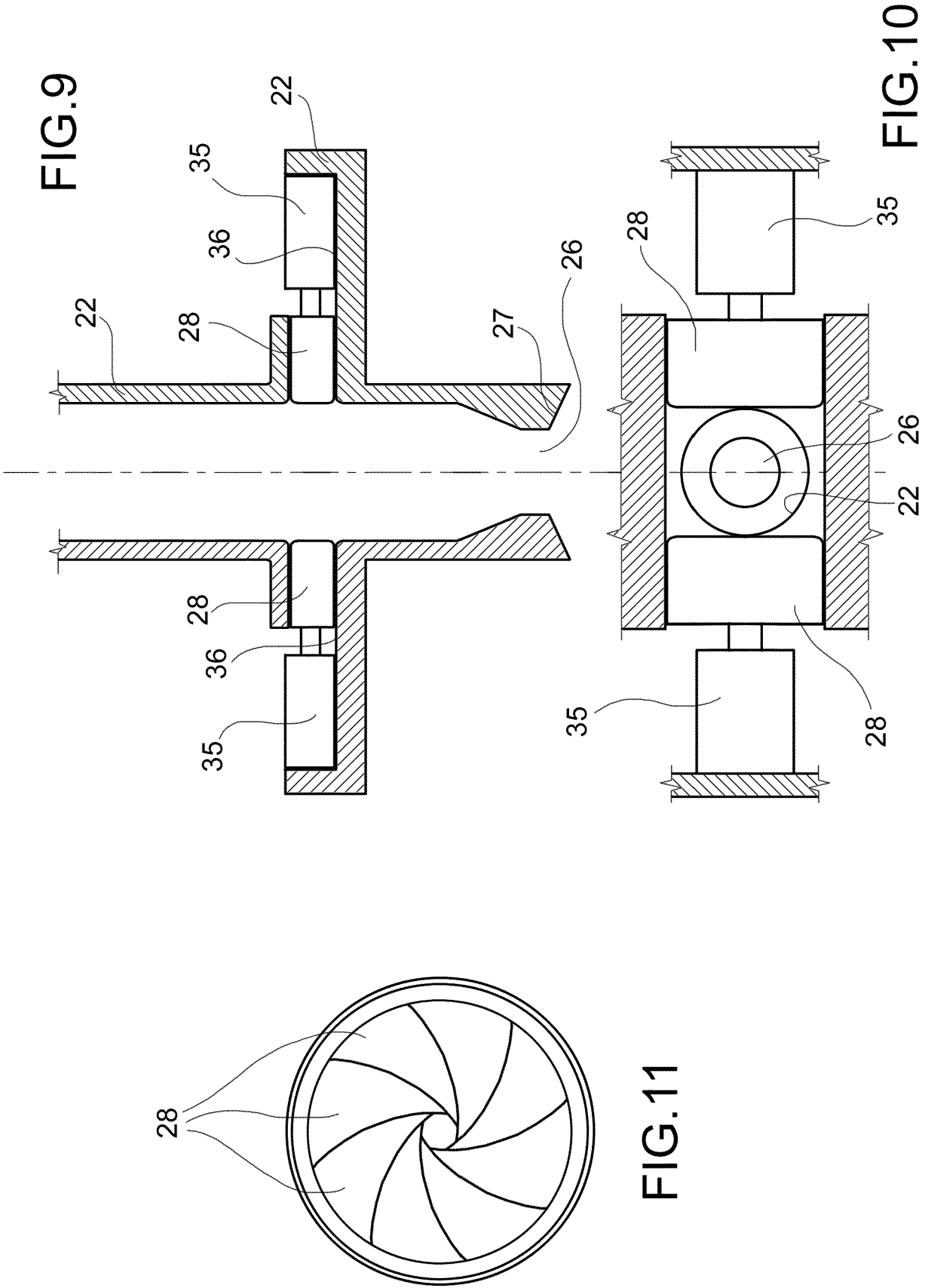


FIG.8





EUROPEAN SEARCH REPORT

Application Number
EP 17 16 1658

5

10

15

20

25

30

35

40

45

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 34 44 821 A1 (SCHLAFHORST & CO W [DE]) 12 June 1986 (1986-06-12)	1,3,9	INV. B65H67/08
Y	* page 10, lines 1-14,21-22 * * page 11, line 25 - page 12, line 11 * * page 14, lines 3-26 * * page 15, line 15 - page 16, line 7; figures *	2,4-8, 10-12	
Y	DE 37 26 338 A1 (MAYER FA KARL [DE]) 16 February 1989 (1989-02-16) * column 3, lines 13-19 * * column 4, lines 11-24 * * column 5, lines 41-53 * * column 6, lines 5-7; figures *	2,7,8	
Y	US 4 619 416 A (MATSUI ISAMU [JP] ET AL) 28 October 1986 (1986-10-28) * column 4, lines 14-35 * * column 5, lines 55-57 * * column 6, line 50 - column 7, line 4 * * column 7, lines 36-49 * * column 9, lines 6-23, 55-64; figures *	4-6, 10-12	
A	DE 44 34 304 A1 (MURATA MACHINERY LTD [JP]) 30 March 1995 (1995-03-30) * column 4, lines 18-22; figures *	1	
A	EP 0 805 118 A1 (SCHLAFHORST & CO W [DE]) 5 November 1997 (1997-11-05) * column 9, lines 53-55; figures *	1	TECHNICAL FIELDS SEARCHED (IPC)
A	DE 195 36 758 A1 (SCHLAFHORST & CO W [DE]) 3 April 1997 (1997-04-03) * column 4, lines 33-42; figures *	1	B65H
A	EP 2 105 401 A2 (MURATA MACHINERY LTD [JP]) 30 September 2009 (2009-09-30) * paragraph [0021]; figures *	1	
		-/--	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 July 2017	Examiner Lemmen, René
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			

EPO FORM 1503 03.82 (P04C01)

50

55



EUROPEAN SEARCH REPORT

Application Number
EP 17 16 1658

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	JP S59 108668 A (MURATA MACHINERY LTD) 23 June 1984 (1984-06-23) * abstract; figures * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 July 2017	Examiner Lemmen, René
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			

EPO FORM 1503 03.82 (P04C01)

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

EP 17 16 1658

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.

26-07-2017

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3444821 A1	12-06-1986	CH 668958 A5 DE 3444821 A1 IT 1186234 B JP S61140474 A US 4634065 A	15-02-1989 12-06-1986 18-11-1987 27-06-1986 06-01-1987
DE 3726338 A1	16-02-1989	DE 3726338 A1 JP 2636012 B2 JP S6448786 A US 4901931 A	16-02-1989 30-07-1997 23-02-1989 20-02-1990
US 4619416 A	28-10-1986	CH 664751 A5 DE 3426655 A1 FR 2549457 A1 IT 1177908 B JP S6023260 A US 4619416 A	31-03-1988 07-02-1985 25-01-1985 26-08-1987 05-02-1985 28-10-1986
DE 4434304 A1	30-03-1995	DE 4434304 A1 IT MI941942 A1 US 5590845 A	30-03-1995 24-03-1995 07-01-1997
EP 0805118 A1	05-11-1997	EP 0805118 A1 IN 191469 B JP H1045333 A TR 9700337 A2 US 5871168 A	05-11-1997 06-12-2003 17-02-1998 21-11-1997 16-02-1999
DE 19536758 A1	03-04-1997	CN 1154336 A DE 19536758 A1 JP H09142737 A	16-07-1997 03-04-1997 03-06-1997
EP 2105401 A2	30-09-2009	CN 101544326 A EP 2105401 A2 JP 2009242027 A	30-09-2009 30-09-2009 22-10-2009
JP S59108668 A	23-06-1984	NONE	

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- IT 1270010 B [0023]
- JP H07133071 A [0024]
- EP 1932793 B1 [0025]