(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 022 366 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
**13.08.2008 Bulletin 2008/33**

(51) Int Cl.:
***D02J 1/08*** *(2006.01)* ***D02G 1/16*** *(2006.01)*

(21) Application number: **99104643.4**

(22) Date of filing: **09.03.1999**

(54) **Fluid processing method of yarn and compression fluid processing nozzle used therefor**

Verfahren zur Flüssigkeitsbehandlung von Garnen und Druckflüssigkeitsdüse dafür

Procédé de traitement de fils par liquide et buse de compression par fluide pour sa mise en oeuvre

(84) Designated Contracting States:
**CH DE ES FR IT LI**

(30) Priority: **20.01.1999 JP 4872999**

(43) Date of publication of application:
**26.07.2000 Bulletin 2000/30**

(73) Proprietor: **AIKI RIOTECH CORPORATION**
**Inazawa**
**Aichi 492-8162 (JP)**

(72) Inventors:
- **Okada, Teiji,**
  **C/O Aiki Seisakusyo Ltd.**
  **Inasawa-shi,**
  **Aichi-ken (JP)**
- **Mizomata, Akio,**
  **C/O Aiki Seisakusyo Ltd.**
  **Inasawa-shi,**
  **Aichi-ken (JP)**

(74) Representative: **Schmitz, Hans-Werner**
**Hoefer & Partner**
**Patentanwälte**
**Pilgersheimer Strasse 20**
**81543 München (DE)**

(56) References cited:
**US-A- 4 535 516** **US-A- 4 845 932**

- **PATENT ABSTRACTS OF JAPAN vol. 1996, no. 08, 30 August 1996 (1996-08-30) & JP 08 100338 A (MURATA MACH LTD;KURABO IND LTD), 16 April 1996 (1996-04-16)**



EP 1 022 366 B1

Printed by Jouve, 75001 PARIS (FR)

## Description

**[0001]** The present invention relates to a fluid processing method of a yarn and a compression fluid processing nozzle used therefor which subject a yarn to a compression fluid process, and can obtain a bulky yarn having a uniform loop, interlace and slack (sag) in a longitudinal direction of the yarn.

**[0002]** Conventionally, there have been publicly known a method of applying a liquid, that is, water to a filament yarn by means of a liquid applying means as the necessity arises, and subjecting the filament yarn to a compression fluid process by means of a compression fluid processing nozzle, and thus, obtaining a bulky yarn having a continuously uniform loop, interlace and slack in a longitudinal direction of the yarn, and a compression fluid processing nozzle used in the above method. The aforesaid method and compression fluid processing nozzle have been disclosed in Japanese Patent Publication (Kokoku) No. 34-8969 and Japanese Patent Publication (Kokoku) No. 35-6684, respectively.

**[0003]** By the way, according to the aforesaid conventional water applying means for obtaining a bulky yarn, a raw fiber oiling agent applied to a filament yarn, raw fiber monomer and oligomer, calcium salt, magnesium salt in applying water and the like, heap up inside a jet core constituting a compression fluid processing nozzle, in particular, in the vicinity of an inlet and outlet of the jet core. As a result, a running tension of the filament yarn, which is subjected to a compression fluid process in a relax state, gradually lowers, and then, uneven loop or uneven interlace is caused in a longitudinal direction of the bulky yarn, and therefore, process stability and yarn quality lower. For this reason, there is a need of detaching the aforesaid nozzle from an apparatus at a rate of one time per 1 to 1.5 day, and washing the jet core in particular, and therefore, this causes a problem that an improvement of productivity is not achieved.

**[0004]** The apparatus for spinning yarn described in US 4,845,932 discloses a hollow disc-like nozzle body which is fixed to a housing. The nozzle body is provided with nozzles through which air current can be jetted to a fiber bundle. The nozzle body is fixedly installed in the housing. Furthermore, there is provided a revolving pipe which is rotatably supported.

**[0005]** An object of the present invention is to provide a fluid processing method of a yarn and a compression fluid processing nozzle therefor which can prevent dirt from adhering to an inner wall of a nozzle core portion constituting a part of a compression fluid processing nozzle during a compression fluid process of a yarn so as to make long a washing cycle of the compression fluid processing nozzle as compared with a conventional case, and can achieve an improvement of productivity.

**[0006]** According to the invention, the object is solved by the features of the independent claims. The respective sub-claims contain further preferred developments of the invention.

**[0007]** To achieve the above object, according to a first aspect, there is provided a compression fluid processing nozzle for a fluid processing method of a yarn, comprising: a nozzle core to process a supplied yarn by an introduced compression fluid, the nozzle core being rotatably arranged.

**[0008]** For the compression fluid, air, vapor or water is used.

**[0009]** Preferably, there is further comprised drive means for rotating the nozzle core.

**[0010]** Preferably, there is further comprised a housing which is provided to the nozzle core and is to be rotated integrally with the nozzle core.

**[0011]** Preferably, there is further comprised drive means to rotate the housing.

**[0012]** Preferably, the drive means has a driven transmission member provided to the nozzle core or the housing, and a drive transmission member to transmit a driving force to the driven transmission member.

**[0013]** Further preferably, there is further comprised a first pipe which is to supply the compression fluid to the nozzle core, and a second pipe which is detachably connected with the first pipe. The drive means has a first driving shaft provided to the driven transmission member and a second driving shaft detachably connected with the first driving shaft.

**[0014]** Preferably, the nozzle core is detachaby provided to the housing.

**[0015]** Preferably, the driven transmission member is a worm wheel, and the drive transmission member is a worm.

**[0016]** According to a second aspect, there is provided a fluid processing method of a yarn, which comprising supplying a yarn to a nozzle core of a compression fluid processing nozzle; introducing a compression fluid to a nozzle core; and processing the yarn while rotating the nozzle core.

**[0017]** Preferably, the nozzle core is rotated together with a housing provided to the nozzle core.

**[0018]** With the above construction, a yarn to be processed is supplied into the nozzle core of the compression fluid processing nozzle which is composed of a housing and a nozzle core for example. When a compression fluid is supplied to the nozzle core, a uniform loop, interlace, slack and the like are formed in a longitudinal direction of the yarn, and thus, a bulky yarn is obtained. At this time, the housing is rotated while the yarn being subjected to a compression fluid process, and thereby, the nozzle core is rotated. Therefore, the yarn is not fixed on an inlet side inner wall of the nozzle core, and is always relatively moved along the inner wall of the nozzle core. Then, the yarn is moved without being fixed on the inner wall of the nozzle core, so that dirt can be eliminated by the yarn always running even if it adheres to the inner wall of the nozzle core. Therefore, a washing cycle of the compression fluid processing nozzle becomes longer than the conventional case, and it is possible to achieve an improvement of productivity and to stabilize a yarn

quality.

**[0019]** Moreover, the nozzle core or housing is provided with the driven transmission member, and the drive transmission member for transmitting a rotation to the driven transmission member. Thus, it is possible to simply carry out a maintenance for the compression fluid processing nozzle itself, and operability, treating performance and yarn hooking operability are excellent. In addition, it is possible to simplify the whole structure of the compression fluid processing nozzle.

**[0020]** Further, when the rotation of the second driving shaft is transmitted to the drive transmission member by the first driving shaft, the housing is rotated by the driven transmission member, so that the nozzle core can be rotated. Further, when a compression fluid is supplied to the second pipe, the compression fluid is jetted into the nozzle core through the first pipe, and then, uniform loop, interlace, slack and the like are formed in the longitudinal direction of the yarn; and thus, a bulky yarn can be obtained.

**[0021]** Further, the second driving shaft and the second pipe are detachably connected to the first driving shaft and the first pipe, respectively; therefore, it is possible to readily detach the nozzle core and the housing.

**[0022]** Further, the nozzle core is readily detached from the housing, so that the nozzle core can be readily replaced for processing various kinds of yarn.

**[0023]** Further, the driven transmission member and the drive transmission member are a worm wheel and a worm, respectively, so that a rotation can be readily transmitted to the housing with a simple mechanism.

## BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

**[0024]**

FIG. 1 is a perspective view showing principal parts of a fluid processing apparatus according to a first embodiment of the present invention;

FIG. 2 is a left side sectional view of a compression fluid processing nozzle;

FIG. 3 is a front sectional view of the compression fluid processing nozzle shown in FIG. 2;

FIG. 4 is a view to explain an operation of the first embodiment shown in FIG. 1;

FIG. 5 is a perspective view showing principal parts of a fluid processing apparatus according to a second embodiment of the present invention;

FIG. 6 is a side sectional view of a compression fluid processing nozzle shown in FIG. 5;

FIG. 7 is a perspective view showing principal parts of a fluid processing apparatus according to a third embodiment of the present invention; and

FIG. 8 is a side sectional view of a compression fluid processing nozzle shown in FIG. 7.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0025]** The preferred embodiments of the present invention will be described below in detail with reference to the accompanying drawings.

(Embodiment 1)

**[0026]** Referring now to FIG. 1, FIG. 2 and FIG. 3, a fluid processing apparatus 1 includes a jet box 3. The jet box 3 is provided with a support member 5 which is fixed on a rear portion of the jet box 3. The support member 5 is provided with a compression fluid processing nozzle 7 which subjects a filament yarn used as a yarn to a compression fluid process so as to be detachable.

**[0027]** Further, the jet box 3 is provided with a water applying nozzle 15 and a water applying section 17 which function as a liquid applying means at an upper part in the jet box 3, namely at a lower position from an upper wall 3U of the box 3. The upper wall 3U of the jet box 3 is provided with yarn guides 19 and 21, and a front wall 3U thereof is provided with a yarn guide 23. Yarn guides 25 and 27 are provided on a right side wall 3R in the jet box 3.

**[0028]** The water applying nozzle 15 is connected to one end of a pipe 29 for supplying a liquid, that is, water, and the other end of the pipe 29 is connected to a tank (not shown) which is a liquid supply source.

**[0029]** Feed rollers 45 and 47 for supplying a core filament yarn C1 and an entanglement filament yarn E1 to the compression fluid processing nozzle 7 are provided above the jet box 3. Also, a feed roller (relax roller) 49 for feeding a processed bulky yarn (fluid processed yarn) Y1 to a winder roller (not shown) is provided below the jet box 3.

**[0030]** One driving shaft 55 as a first driving shaft, is detachably connected to a driving shaft 61 as a second driving shaft provided in the support member 5, by a coupling 59. A rear end of the driving shaft 61 is mounted with a pulley 63 which is provided at a backside of the jet box 3. A belt 67 made of a rubber is wound around the pulley 63 and another drive pulley 65. The drive pulley 65 is connected with a driving motor 71 by a driving shaft 69.

**[0031]** As shown in FIG. 2 and FIG. 3, the compression fluid processing nozzle 7 is mainly composed of the main body 9, a housing 11 and a jet core 13. The jet core 13 is detachably provided in the housing 11. The housing 11 is provided in the main body 9 so as to be rotatable. Namely, bearings 76 is provided between the main body 9 and the housing 11. For a bearing 76, a ball bearing or a sliding bearing may be used. The jet core 13 of the compression fluid processing nozzle 7 is provided with a plurality of fluid jet holes 31 for jetting a compressed air as a compression fluid at a proper interval in a circumferential direction.

**[0032]** The housing 11 is provided with a compression

fluid chamber 33 in which the jet core 13 is built. The compression fluid chamber 33 communicates with each jet holes. The housing 11 is provided with an fluid supply hole 35 which is formed as a compression fluid passage, and communicates with the compression fluid chamber 33. Moreover, the main body 9 is provided with a compression fluid processing pipe 37 as a first pipe communicating with the supply hole 35. The pipe 37 is connected with a male part 39 of a quick disconnect coupling. Seal members 91 are provided between the housing 11 and the main body 9 and seal members are provided between the housing 11 and the jet core 13.

**[0033]** As shown in FIG. 1, the support member 5 is provided with a compression fluid processing pipe 41 as a second pipe. The one end of the pipe 41 is connected to an air supply source (not shown) and the other end of the pipe 41 is connected with a female part 43 of the quick disconnect coupling. The male part 39 of the quick disconnect coupling disposed on the pipe 37 is provided in the female part 43 so as to be detachable with one touch. When one driving shaft 55 is connected to the other driving shaft 61 and the pipe 37 is connected to the pipe 41, the coupling 59 and quick disconnect couplings 39 and 43 support the main body 9, and thus, perform a function of preventing the main body 9 from being rotated.

**[0034]** As shown in FIG. 2 and FIG. 3, the housing 11 is mounted with a worm wheel 51 which functions as one example of the driven transmission member. The worm wheel 51 is engaged with the worm 53as a drive transmission member provided in the main body 9. One driving shaft 55, which extends in a horizontal direction in FIG. 2, is provided to the worm 53 and is rotatably supported by a bearing 57 in the main body 9. In FIG. 3, on a right side of the worm wheel 51, a cover 75 is mounted to a rear portion of the main body 7 by means of plural bolts 77 (shown in Fig. 1) with a collar 73. Also, the worm wheel 51 and the worm 53 are preferably made of rustless materials such as stainless, brass or the like.

**[0035]** Next, the following is a description on a fluid processing method by the fluid processing apparatus 1.

**[0036]** In FIG. 1, the core yarn C1 and the entanglement yarn E1 are respectively pulled out from a supply package (not shown), and then, are fed by means of the feed rollers 45 and 47. The core yarn C1 passes through the yarn guide 19 and 25 by way of the water applying nozzle 15, and is fed to the jet core 13 of the compression fluid processing nozzle 7. The entanglement yarn E1 passes through the yarn guides 21 and 27 and is fed to the jet core 13.

**[0037]** On the other hand, a liquid, for example, water is discharged from the fluid supply source (not shown), that is, a pump, and then, is supplied from the pipe 29 to the water applying nozzle 15. When the core yarn C1 is fed to the water applying nozzle 15, a water heated in the water applying section 17 of the water applying nozzle 15 is applied to the core yarn C1.

**[0038]** Moreover, when a compressed air is discharged from the compressed air supply source (not shown), the compressed air passes through the pipes 41 and 37, the supply holes 35 , the compression fluid chamber 33 and further, is supplied to the jet hole 31 in the jet core 13 of the compression fluid processing nozzle 7.

**[0039]** Then, when a compression air as a compression fluid is supplied from the pipe 41 to the compression fluid chamber 33 through the pipe 37 and the supply holes 35, the compression air is jetted from the plurality of jet holes 31 into a yarn guide hole 13H in the jet core 13. The core yarn C1 and the entanglement yarn E1 supplied into the yarn guide hole 13H in the core 13 are processed by the compression air, and thus, it is possible to obtain a bulky yarn Y1 which has uniform loop, interlace and slack in the longitudinal direction. The bulky yarn Y1 is fed by the feed roller (relax roller) 49 and is wound around a winder roller (not shown) .

**[0040]** In this case, when the motor 71 is driven, the pulley 65 is rotated by the driving shaft 69. The pulley 65 is rotated, and thereby, the driving shafts 61 and 55 are rotated by the belt 69 and the pulley 63, and further, the housing 11 is rotated by the worm 53 and the worm wheel 51. As shown by an arrow of FIG. 4, the jet core 13 is rotated together with the housing 11 because it is provided in the housing 11.

**[0041]** At this time, the core yarn C1 and the entanglement yarn E1 introduced from the yarn guide hole 13H are not running in a state of being situated on a fixed place on the inner wall of the jet core 13, and are always running along an inner periphery of the inner wall in the jet core 13 in a state of contacting therewith.

**[0042]** More specifically, in the case where dirt such as raw yarn oligomer of the core yarn C1 and the entanglement yarn E1 adheres to the inner wall defining the yarn guide hole 13H in the jet core 13, the core yarn C1 and the entanglement yarn E1 are not always situated on a fixed place of the jet core 13, and are moving along an inner periphery of the inner wall at the yarn guide hole 13H in the jet core 13. Therefore, even if dirt adheres to the inner wall at the yarn guide hole 13H in the jet core 13, when the core yarn C1 and the entanglement yarn E1 again pass the dirt adhered place, it is possible to remove the dirt from the inner wall at the yarn guide hole 13H. Whereby dirt does not adhere to the inner wall at the yarn guide hole 13H in the jet core 13, so that a washing cycle of the nozzle 7 can be made longer than the conventional case, and also, an improvement of productivity can be achieved. Further, the dirt does not adhere to the inner wall of the yarn guide hole 13H in the jet core 13, so that a fluctuation in running tension of the core yarn C1 and the entanglement yarn E1 becomes small as compared with the conventional case. Therefore, it is possible to carry out a stable yarn process, and to obtain a preferable bulky yarn having a stable yarn quality.

**[0043]** Moreover, the worm wheel 51 is mounted onto the housing 11, and the worm 53 for transmitting a rotation to the worm wheel 51 is provided in the main body 9. Thus, it is possible to simply carry out a maintenance for the compression fluid processing nozzle 7 itself, and

operability, treating performance and yarn hooking operability are excellent. Further, it is possible to simplify the whole structure of the compression fluid processing nozzle.

**[0044]** Further, the rotation of the other driving shaft 61 provided on the support member 5 is transmitted to the worm 53 by one driving shaft 55 provided in the main body 9, and the housing 11 is rotated by the worm wheel 51, so that the jet core 13 can be rotated. Also, when the compression air is supplied to the other pipe 41 provided on the support member 5, the compression air is fed to the fluid supply hole 35 functioning as the compression fluid passage through one pipe 37, and then, is jetted from the jet holes 31 into the jet core 13.

**[0045]** Further, the other driving shaft 61 and the pipe 41 are respectively connected to one driving shaft 55 and the pipe 37 so as to be almost simultaneously detachable, so that the main body 9 can be detached from the support member 5 with one touch.

**[0046]** The jet core 13 is readily detached from the housing 11, so that the nozzle core can be readily replaced for processing various kinds of yarn.

**[0047]** Further, the aforesaid driven transmission member and drive transmission member are the worm wheel 51 and the worm 53, respectively, so that a rotation can be readily transmitted to the housing 11 with a simple mechanism.

**[0048]** In order to rotate the housing 11, as the rotating means, the worm wheel 51 is mounted to the housing 11, and the worm 53 is rotated with the use of the pulleys 63 and 65, the belt 67 and the driving motor 71. The worm 53 may be rotated with the use of a sprocket chain and a driving motor. Further, a gear may be used in place of the worm wheel 51 and the worm 53. The housing may be rotated in not only one direction but also the other rotation, and further, may makes a forward and reverse rotation. Also, even if the fluid processing apparatus does not include the liquid applying means, a good bulky yarn is obtained. The fluid processing apparatus and the fluid processing method of the present embodiment may be applied to another kinds of yarn processing apparatuses and may be used for them.

**[0049]** A nylon drawing yarn and a synthetic fiber such as polyester fiber are applicable as the yarn used in this embodiment, and a semi-stretching yarn and a non-drawing yarn may be used. Moreover, this embodiment is applicable to a single yarn process without using both core yarn and entanglement yarn as the yarn.

(Embodiment 2)

**[0050]** FIG. 5 and FIG. 6 show another embodiment 2 in place of FIG. 1 to FIG. 3. In these FIGs. 5 and 6, like reference characters are used to designate the same components as FIG. 1 to FIG. 3, and an overlapping explanation is omitted, and further, different points will be described below.

**[0051]** The main body 9 is fixed in the jet box 3 without using the support member 5. Moreover, a gear 79 is mounted onto an outer periphery of the housing 11 as a driven member. The gear 79 is engaged with another gear 81 which functions as a driving member. The gear 81 is mounted to one end of a rotary shaft 83 which extends to a horizontal direction in FIG. 6, and the other end of the rotary shaft 83 (left side of FIG. 6) is mounted to the pulley 63. A belt 67 made of a rubber is wound around the pulley 63 and another driving pulley 65. The pulley 65 is connected with the driving motor 71 by a driving shaft 69.

**[0052]** As shown in FIG. 6, the nozzle 7 is mainly composed of the housing 11 and the core 13. The gear 79 is mounted to a rear end side (right side in FIG. 6) of the housing 11.

**[0053]** With the above construction, when the driving motor is driven, the pulley 65 is rotated by the driving shaft 69. The pulley 65 is rotated, and thereby, the rotary shaft 83 is rotated by the belt 67 and the pulley 63, and further, the housing 11 is rotated by the gears 81 and 79. Then, the core 13 is rotated together with the housing 11 because it is provided in the housing 11.

(Embodiment 3)

**[0054]** FIG. 7 and FIG. 8 show another embodiment 3. In these FIGs. 7 and 8, like reference characters are used to designate the same components as FIG. 1 to FIG. 3 and FIGs. 5 and 6, and an overlapping explanation is omitted, and further, different points will be described below.

**[0055]** The feature of this embodiment lies in that the housing 11 is not rotated, but the jet core 13 is directly rotated. The core 13 is mounted with a gear 85, and the gear 85 is engaged with another gear 87. The gear 87 is mounted with one end of a rotary shaft 89 which extends to a horizontal direction in FIG. 8, and the other end of the rotary shaft 89 (right end in FIG. 8)is mounted with the pulley 63. A belt 67 made of a rubber is wound around the pulley 63 and another driving pulley 65. The pulley 65 is connected with the driving motor 71 by a driving shaft 69.

**[0056]** As shown in FIG. 8, the nozzle 7 is mainly composed of the nozzle housing 11 and the jet core 13. The jet core 13 projects outwardly from the housing 11 at a rear end side (right side in FIG. 8). The projected core 13 is mounted with the gear 85., and the gear 85 is engaged with another gear 87.

**[0057]** With the above construction, when the driving motor 71 is driven, the pulley 65 is rotated by the rotary shaft 69. The pulley 65 is rotated, and thereby, the rotary shaft 89 is rotated by the belt 67 and the pulley 63, and further, the core 13 is rotated by the gears 87 and 85.

**[0058]** The housing 11 or core 13 is not always continuously rotated to one or the other direction, but may be rotated so as to be reciprocated with the use of a rack and a pinion or the like. Further, the housing 11 or core 13 is not continuously rotated or reciprocated, but may

be temporarily stopped and intermittently rotated. The housing 11 or core 13 is not in a fixed state, but includes various rotating means. A worm wheel may be used in place of the gear 85, and a worm may be used in place of the gear 87.

(Example)

**[0059]** Nylon 6 FDY70D-24F was used as each of the core yarn C1 and the entanglement yarn El, and was subjected to a compression fluid process with the use of the fluid processing apparatus 1 shown in FIG. 1 under the following conditions:

Yarn speed: 400 m/min
Over feed of core yarn C1: +35%
One rotation of housing 11: 30 seconds

**[0060]** As a result, nozzle washing has been conventionally carried out at a rate of one time per 1 to 1.5 days; however, according to this embodiment, the replacement of the compression fluid processing nozzle may be carried out at a rate of one time per 4 to 5 days. Namely, it is possible to delay a washing period three to four times as much as the conventional case. Therefore, it is possible to greatly improve productivity as compared with the conventional case. Further, a process stability and yarn quality are unchanged, and a uniform bulky yarn can be obtained.

**[0061]** The present invention is not limited to the aforesaid embodiments, and proper modifications are possible. Whereby the present invention can be carried out according to other embodiments. In this embodiment, a water has been applied to the core yarn C1 by means of the water applying nozzle 15 which functions as a liquid applying means. It is possible to carry out the present invention without using the water applying nozzle 15. Further, in this embodiment, core process has been described with the use of the core yarn C1 and the entanglement yarn E1. It is possible to carry out a single process with the use of only core yarn C1.

## Claims

**1.** A yarn fluid texturing nozzle (7), comprising:

a jet core member (13) rotatable for texturing a yarn (C1; E1) with jets of fluid;
a yarn guide hole (13H) formed through the jet core member (13); and
a fluid jet hole (31) formed in the jet core member (13) for supplying jets of fluid into the yarn guide hole (13H).

**2.** A yarn fluid texturing nozzle (7) according to claim 1, further comprising:

drive means (51; 53; 55; 57; 59; 61; 63; 65; 67; 69; 71) for rotating the jet core member (13).

**3.** A yarn fluid texturing nozzle (7) according to claim 1 or 2, further comprising:

a housing (11) rotatable integrally with the jet core member (13).

**4.** A yarn fluid texturing nozzle (7) according to claim 3, further comprising:

drive means (51; 53; 55; 57; 59; 61; 63; 65; 67; 69; 71) to rotate the housing (11).

**5.** A yarn fluid texturing nozzle (7) according to one of claims 2 to 4,
wherein the drive means comprises:

a driven transmission member (51) provided to the jet core member (13) or the housing (11); and
a drive transmission member (53) for transmitting a driving force to the driven transmission member.

**6.** A yarn fluid texturing nozzle (7) according to claim 5, further comprising:

a first pipe (37) for supplying the fluid to the jet core member (13); and
a second pipe (41) detachably connected to the first pipe, wherein the drive means comprises:

a first driving shaft (55) provided to the drive transmission member (53); and
a second driving shaft (61) detachably connected to the first driving shaft (55).

**7.** A yarn fluid texturing nozzle (7) according to one of claims 3 to 6,
wherein the jet core member (13) is detachably provided to the housing (11).

**8.** A yarn fluid texturing nozzle (7) according to one of claims 5 to 7,
wherein the driven transmission member is a worm wheel (51) and the drive transmission member is a worm (53).

**9.** A method of fluid texturing a yarn, comprising:

feeding a yarn (C1; E1) into a yarn guide hole (13H) of a jet core member (13) of a yarn fluid texturing nozzle (7); and
supplying jets of fluid into the yarn guide hole (13H), rotating the jet core member (13) having the yarn in the yarn guide hole (13H), texturing the yarn with the jets of fluid.

**10.** A method of fluid texturing a yarn according to claim 9,
wherein the jet core member(13) is rotated together with a housing (11) provided to the jet core member (13).

**Patentansprüche**

**1.** Garn-Flüssigkeitstexturierungsdüse (7), die aufweist:

ein rotierbares Strahlkernelement (13) zur Texturierung eines Garns (C1; E1) mit Flüssigkeitsstrahlen;
eine Garn-Führungsöffnung (13H), die durch das Strahlkernelement (13) ausgebildet ist; und
eine Flüssigkeitsstrahlöffnung (31), die im Strahlkernelement (13) ausgebildet ist, um Flüssigkeitsstrahlen in die Garn-Führungsöffnung (13H) zuzuführen.

**2.** Garn-Flüssigkeitstexturierungsdüse (7) nach Anspruch 1, die ferner aufweist:

eine Antriebseinrichtung (51; 53; 55; 57; 59; 61; 63; 65; 67; 69; 71), um das Strahlkernelement (13) in Rotation zu versetzen.

**3.** Garn-Flüssigkeitstexturierungsdüse (7) nach Anspruch 1 oder 2, die ferner aufweist:

ein Gehäuse (11), das einstückig mit dem Strahlkernelement (13) rotierbar ist.

**4.** Garn-Flüssigkeitstexturierungsdüse (7) nach Anspruch 3, die ferner aufweist:

eine Antriebseinrichtung (51; 53; 55; 57; 59; 61; 63; 65; 67; 69; 71), um das Gehäuse (11) in Rotation zu versetzen.

**5.** Garn-Flüssigkeitstexturierungsdüse (7) nach einem der Ansprüche 2 bis 4,
wobei die Antriebseinrichtung aufweist:

ein angetriebenes Übertragungselement (51), das am Strahlkernelement (13) oder am Gehäuse (11) vorgesehen ist; und
ein Antriebsübertragungselement (53), um eine Antriebskraft auf das angetriebene Übertragungselement (51) zu übertragen.

**6.** Garn-Flüssigkeitstexturierungsdüse (7) nach Anspruch 5, die ferner aufweist:

eine erste Rohrleitung (37), um die Flüssigkeit dem Strahlkernelement (13) zuzuführen; und
eine zweite Rohrleitung (41), die abnehmbar an der ersten Rohrleitung (37) angeschlossen ist,
wobei die Antriebseinrichtung aufweist:

eine erste Antriebswelle (55), die zum Antrieb des Übertragungselements (53) vorgesehen ist; und
eine zweite Antriebswelle (61), die abnehmbar mit der ersten Antriebswelle (55) verbunden ist.

**7.** Garn-Flüssigkeitstexturierungsdüse (7) nach einem der Ansprüche 3 bis 6,
wobei das Strahlkernelement (13) abnehmbar am Gehäuse (11) vorgesehen ist.

**8.** Garn-Flüssigkeitstexturierungsdüse (7) nach einem der Ansprüche 5 bis 7,
wobei das angetriebene Übertragungselement ein Schneckenrad (51) ist und das Antriebsübertragungselement eine Schnecke (53) ist.

**9.** Verfahren zur Flüssigkeitstexturierung eines Garns, das folgende Schritte aufweist:

Einführen eines Garns (C1; E1) in eine Garn-Führungsöffnung (13H) eines Strahlkernelements (13) einer Garn-Flüssigkeitstexturierungsdüse (7); und
Zuführen von Flüssigkeitsstrahlen in die Garn-Führungsöffnung (13H), wobei das Strahlkernelement (13) mit dem Garn in der Garn-Führungsöffnung (13H) in Rotation versetzt wird, um das Garn mit den Flüssigkeitsstrahlen zu texturieren.

**10.** Verfahren zur Flüssigkeitstexturierung eines Garns nach Anspruch 9,
wobei das Strahlkernelement (13) zusammen mit einem Gehäuse (11), das am Strahlkernelement (13) vorgesehen ist, in Rotation versetzt wird.

**Revendications**

**1.** Buse de texturation de fil par fluide (7) comprenant :

un élément central de jet (13) rotatif pour texturer un fil (C1 ; E1) avec des jets de fluide ;
un trou de guidage de fil (13H) formé à travers l'élément central de jet (13) ; et
un trou de jet de fluide (31) formé dans l'élément central de jet (13) pour alimenter des jets de fluide dans le trou de guidage de fil (13H).

**2.** Buse de texturation de fil par fluide (7) selon la revendication 1, comprenant en outre :

des moyens d'entraînement (51 ; 53 ; 55 ; 57 ; 59 ; 61 ; 63 ; 65 ; 67 ; 69 ; 71) pour entraîner en rotation l'élément central de jet (13).

**3.** Buse de texturation de fil par fluide (7) selon la revendication 1 ou 2, comprenant en outre :

un boîtier (11) rotatif intégré avec l'élément central de jet (13).

**4.** Buse de texturation de fil par fluide (7) selon la revendication 3, comprenant en outre :

des moyens d'entraînement (51 ; 53 ; 55 ; 57 ; 59 ; 61 ; 63 ; 65 ; 67 ; 69 ; 71) pour entraîner en rotation le boîtier (11).

**5.** Buse de texturation de fil par fluide (7) selon l'une quelconque des revendications 2 à 4, dans laquelle les moyens d'entraînement comprennent :

un élément de transmission entraîné (51) prévu sur l'élément central de jet (13) ou le boîtier (11) ; et
un élément de transmission d'entraînement (53) pour transmettre une force d'entraînement à l'élément de transmission entraîné.

**6.** Buse de texturation de fil par fluide (7) selon la revendication 5, comprenant en outre :

un premier tuyau (37) pour alimenter en fluide l'élément central de jet (13) ; et
un second tuyau (41) raccordé de manière détachable au premier tuyau, dans lequel les moyens d'entraînement comprennent :

un premier arbre d'entraînement (55) prévu sur l'élément de transmission d'entraînement (53) ;
un second arbre d'entraînement (61) fixé de manière détachable au premier arbre d'entraînement (55).

**7.** Buse de texturation de fil par fluide (7) selon l'une quelconque des revendications 3 à 6, dans lequel l'élément central de jet (13) est prévu de manière détachable dans le boîtier (11).

**8.** Elément de texturation de fil par fluide (7) selon l'une quelconque des revendications 5 à 7, dans lequel l'élément de transmission entraîné est une roue à vis sans fin (51) et l'élément de transmission d'entraînement est une vis sans fin (53).

**9.** Procédé pour texturer un fil par fluide, comprenant les étapes consistant à :

alimenter un fil (C1 ; E1) dans un trou de guidage de fil (13H) d'un élément central de jet (13) d'une buse de texturation de fil par fluide (7) ; et
alimenter des jets de fluide dans le trou de guidage de fil (13H), faire tourner l'élément central de jet (13) ayant le fil dans le trou de guidage de fil (13H), texturer le fil avec les jets de fluide.

**10.** Procédé pour texturer un fil par fluide selon la revendication 9, dans lequel l'élément central de jet (13) est entraîné en rotation conjointement à un boîtier (11) prévu sur l'élément central de jet (13).

FIG.1

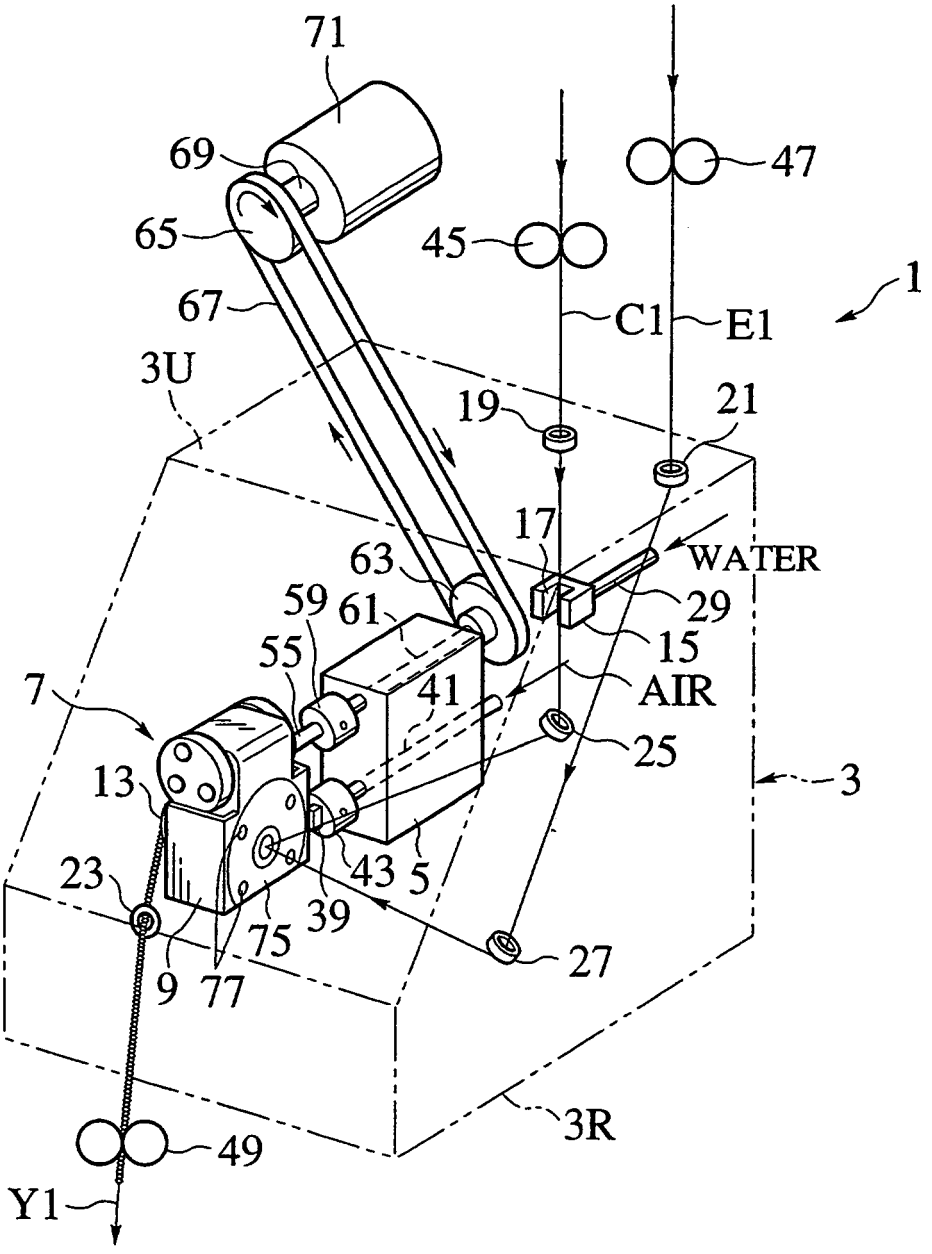

71
69
65
67
3U
45
47
C1
E1
1
19
21
17
WATER
63
59
61
29
15
55
41
AIR
7
25
13
3
23
43
5
39
75
27
9
77
3R
49
Y1

FIG.2

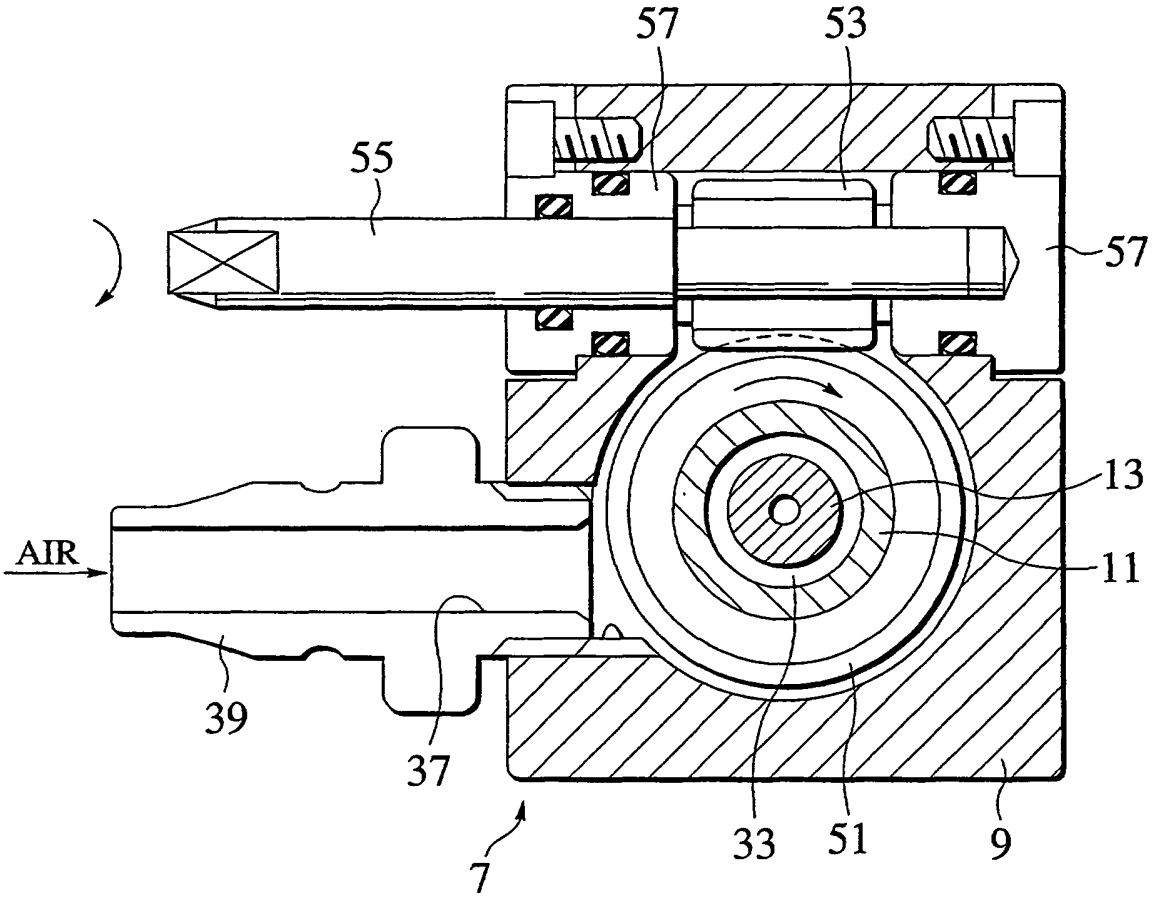


FIG.3

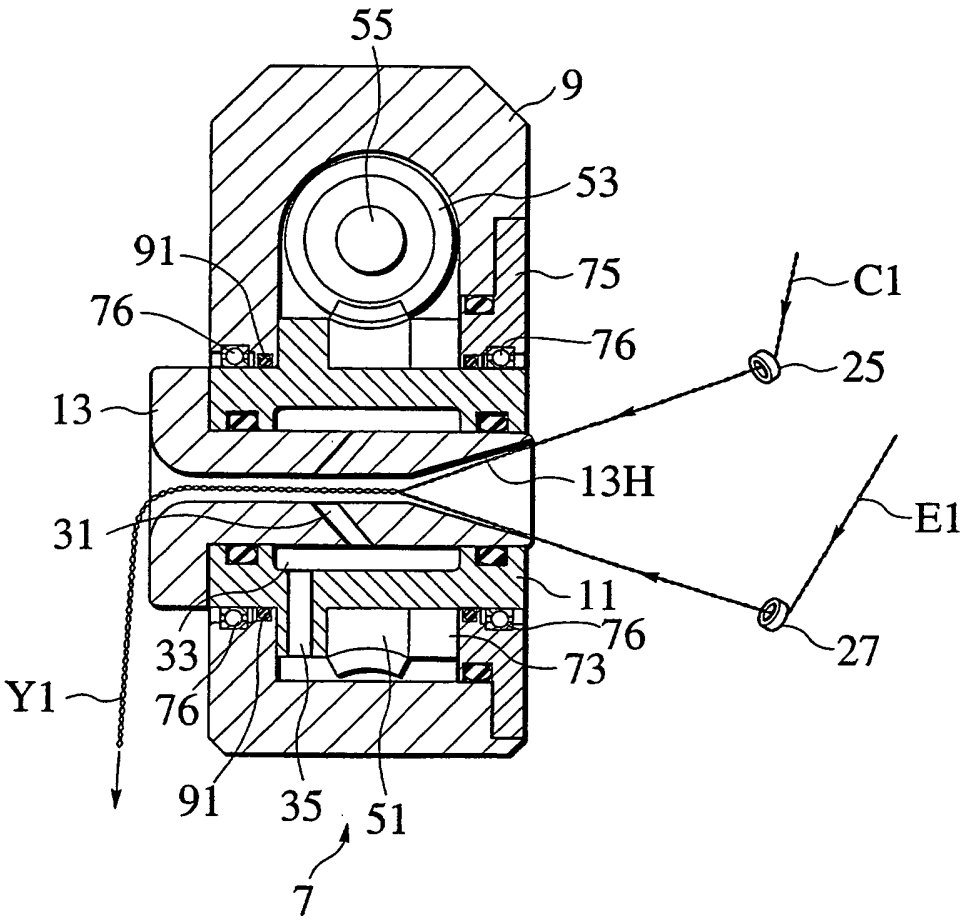


FIG.4

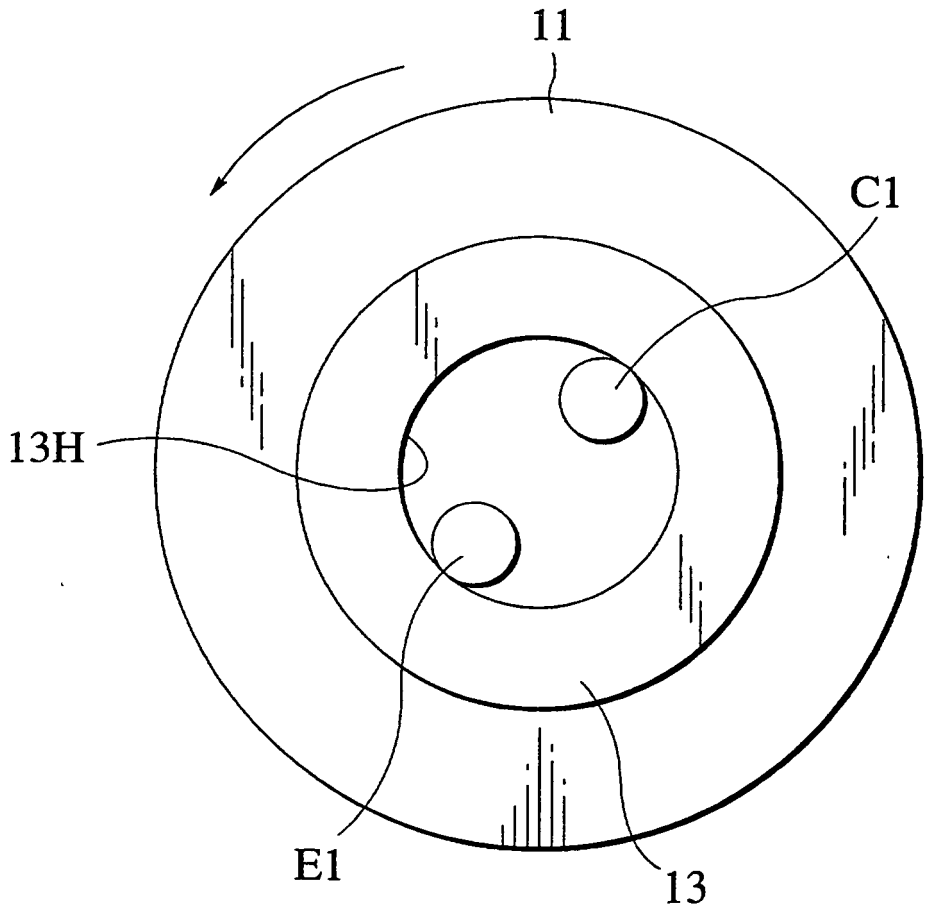


FIG.5

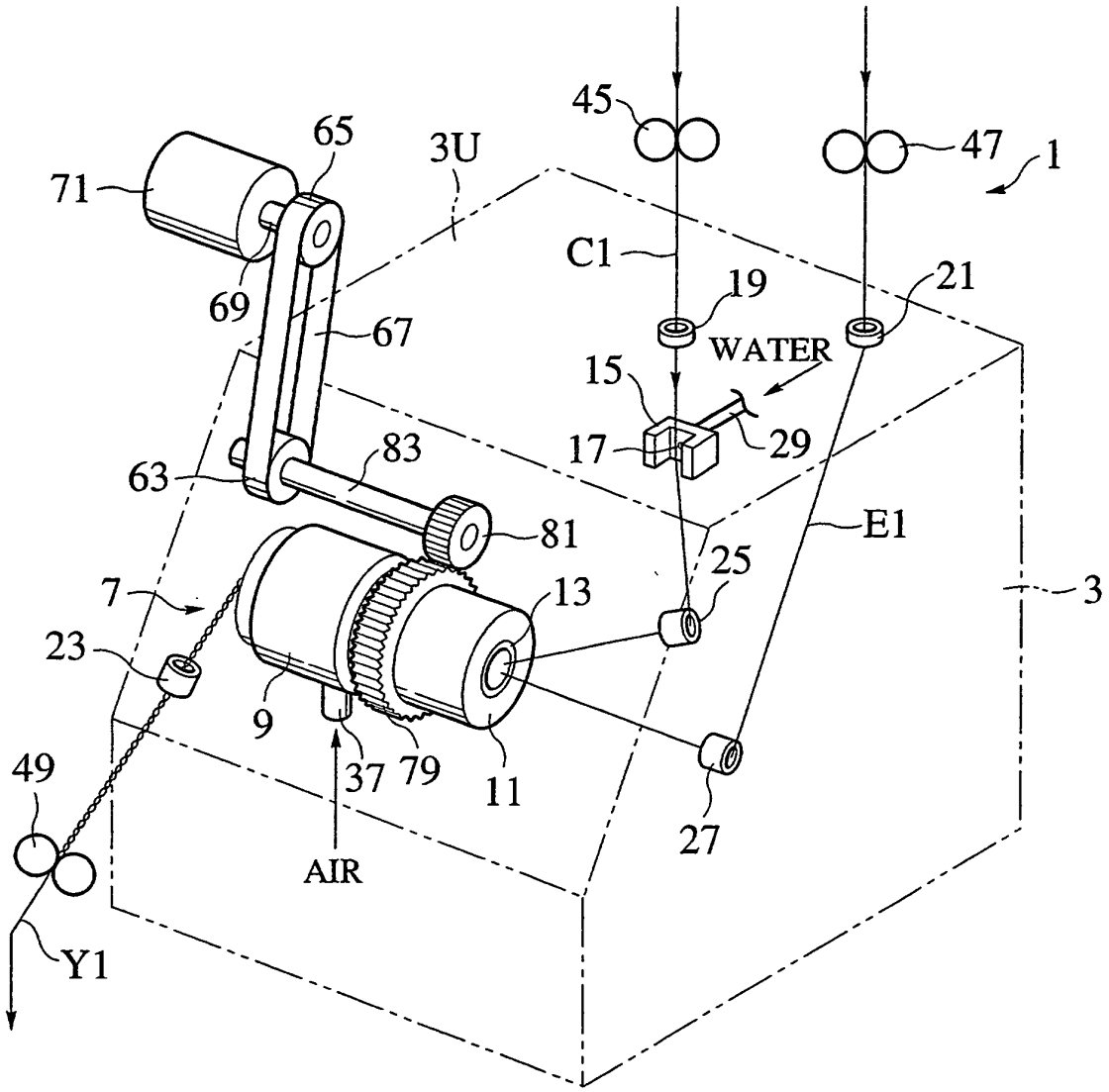

45
47
1
65
3U
71
C1
19
21
69
67
WATER
15
17
29
63
83
81
E1
25
7
13
3
23
9
37
79
11
27
49
AIR
Y1

FIG.6

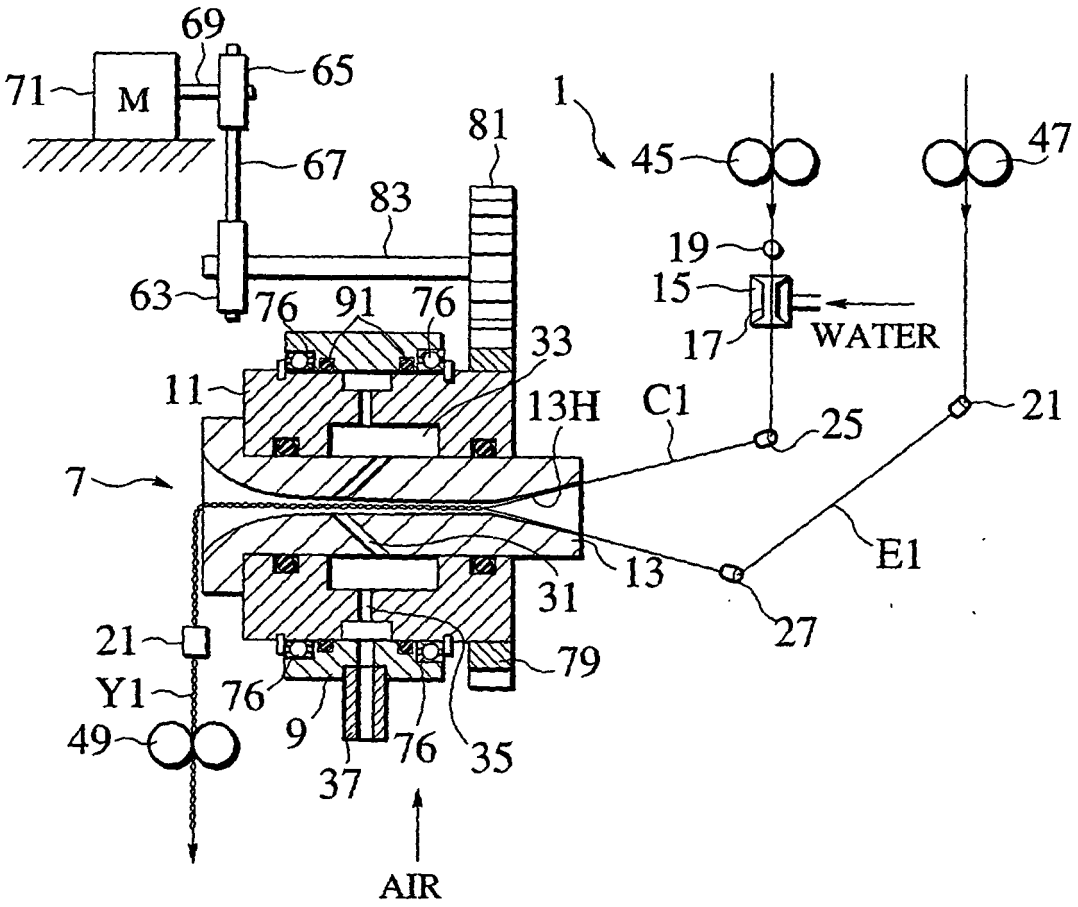

69
71
M
65
67
81
83
63
76
91
76
33
11
13H
C1
25
21
7
13
E1
31
27
21
Y1
76
79
49
9
76
35
37
AIR
1
45
47
19
15
17
WATER

FIG.7

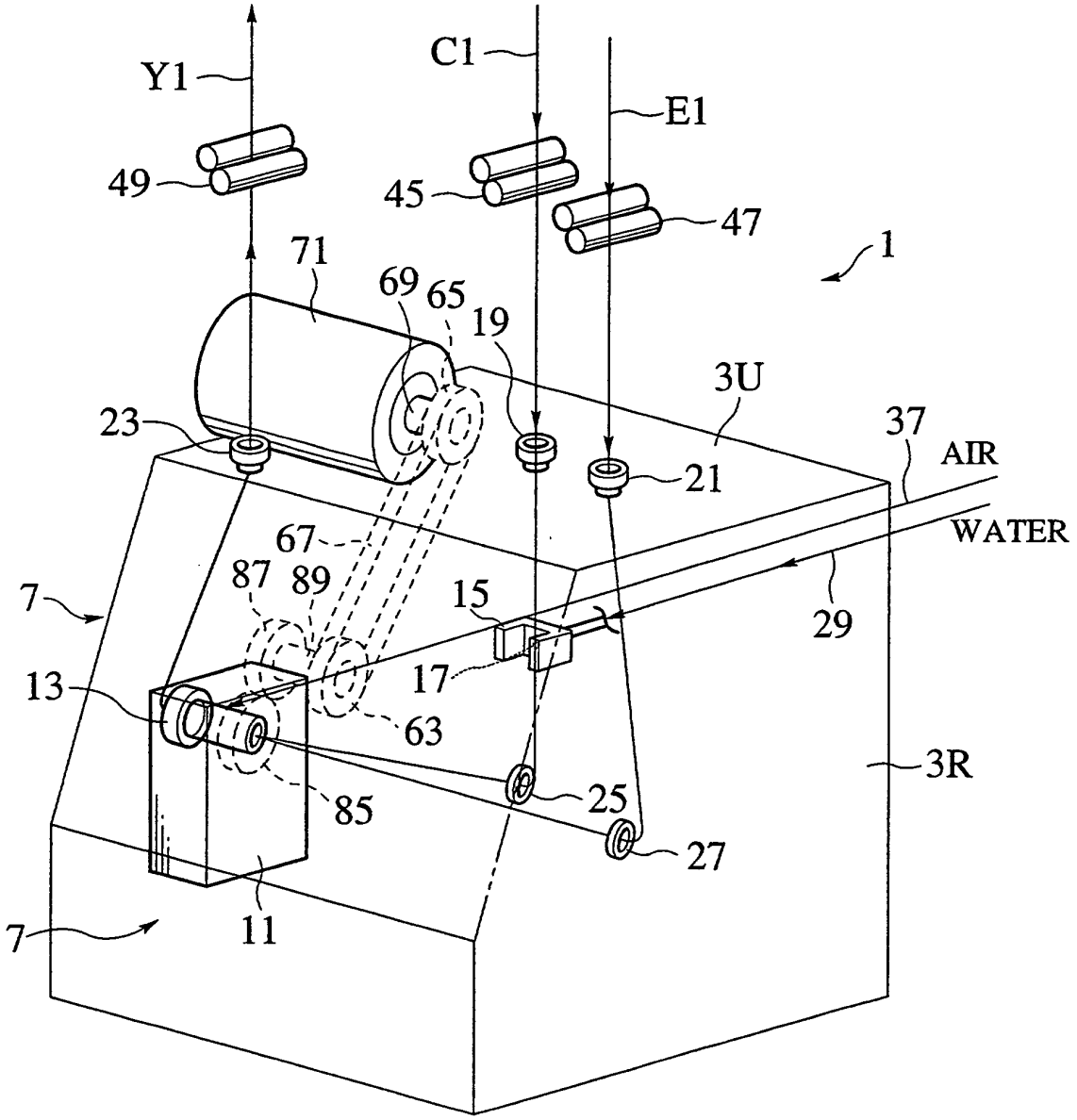
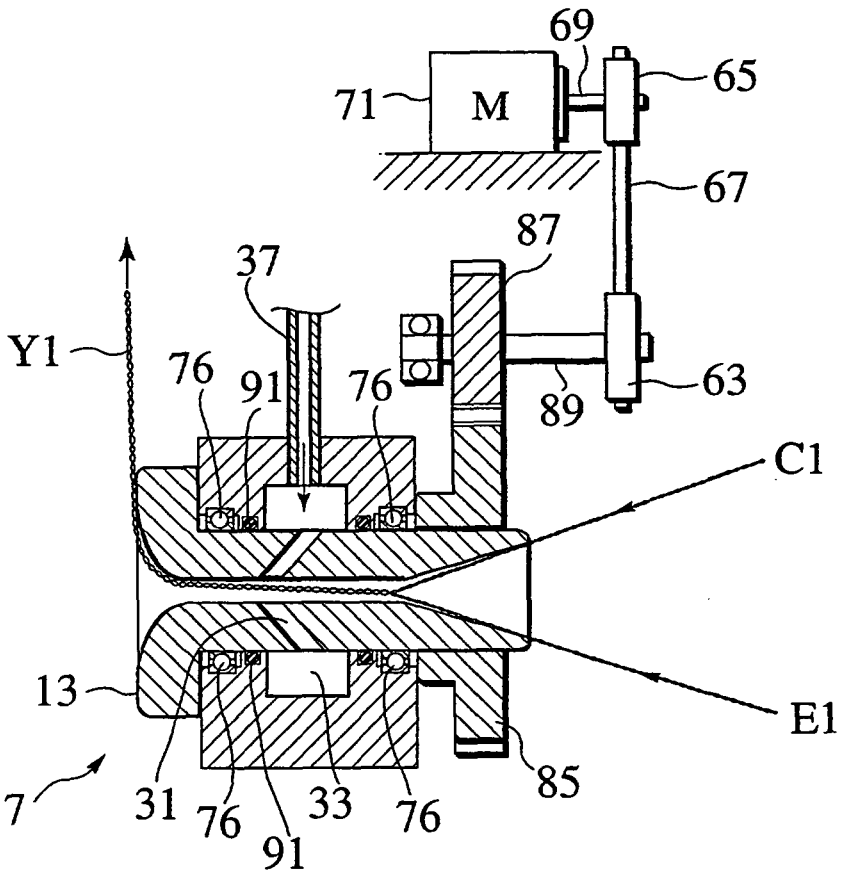

Y1
C1
E1
49
45
47
1
71
69
65
19
3U
23
37
AIR
21
WATER
67
87
89
7
15
29
13
17
63
3R
85
25
27
7
11

FIG.8



## 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


- JP 348969 A **[0002]**
- JP 356684 A **[0002]**
- US 4845932 A **[0004]**