



(11)

EP 2 117 013 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

05.04.2017 Bulletin 2017/14

(51) Int Cl.:

H01B 17/02 ^(2006.01) **H01B 17/06** ^(2006.01)

(86) International application number:

PCT/CN2007/003271

(21) Application number: **07845658.9**

(22) Date of filing: **20.11.2007**

(87) International publication number:

WO 2008/061446 (29.05.2008 Gazette 2008/22)

(54) **A HANG-TYPE COMPOSITE INSULATOR**

VERBUNDISOLATOR DES HÄNGETyps

ISOLATEUR COMPOSITE DE TYPE SUSPENDU

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE
SI SK TR**

(30) Priority: **24.11.2006 CN 200610123727**

(43) Date of publication of application:

11.11.2009 Bulletin 2009/46

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Description

[0001] The invention relates to a composite insulator for use in electrical lines or electrified railways, in particular, to a hang-type composite insulator.

[0002] CN 1 239 803 A teaches a hang-type composite insulator, comprising a mandrel, an umbrella-skirt sheath disposed outside the mandrel and an end assembly disposed at one end of the mandrel, the mandrel has the form of a rod stock; the end assembly comprises a sleeve with a tapered aperture, a flared conical body for inserting into any end of the mandrel, a locking nut and a connection member, wherein the flared conical body is generally cone-shaped, the sleeve is a tubular member, an inner aperture of the small diameter end of the sleeve corresponds to the diameter of the mandrel, an inner aperture of the large diameter end of the sleeve is configured into a horn shape.

[0003] EP 38 475 A discloses an insulator having a glass fiber reinforced plastic rod to which an end cap is attached. The end cap is pressed onto the rod after which and end piece is screwed on to it.

[0004] An insulator is typically made of insulator material with extremely high electrical resistance. The insulator serves to space out conductors having different electrical potentials apart and allows no electrical current flowing therebetween so that the electric current will circulate in a certain direction. Currently, hang-type insulators at home and abroad can be divided into ceramic insulators, glass insulators and composite insulators. Ceramic and glass insulators are fragile and susceptible to contamination, tending to cause accidents such as high voltage flashover and exploding bottle cracks. The mandrel of common rod-shaped composite insulators exhibit poor flexibility in resisting bending and are fragile as well. Today, insulators made of organic composite materials, i.e. composite insulators, are widely used at home and abroad.

[0005] End attachments of an insulator are used to connect and fix the insulator to electricity transmission lines and telegraph poles. These end attachments not only sustain various external forces inside the system and pressure produced by transmission wires themselves, but also sustain wind forces from uncertain directions and pressure resulted from accumulated snow during a long term use. Therefore, the connecting quality between end attachments and the mandrel is a significant symbol which directly affects the safety and reliability of product operation. A commonly used connecting technique is to connect a mandrel with end attachments by press-fit assembly process. However, such process tends to induce cracking, loosening and aging and leads to poor stability, thus becoming a potential safety hazard. Currently, it is still a big problem to improve the connecting quality in the field of composite insulators both at home and abroad.

[0006] The object of the invention is to, addressing the above existing problems and shortcomings, provide a

hang-type composite insulator which has good flexibility, contamination and cracking resistance. In addition, such hang-type composite insulator can generate a connection which is safe and has high strength, good stability, durability and anti-aging capability.

[0007] This object is solved by the insulator according to claim 1. The technical solution of the invention is achieved as follows.

[0008] This hang-type composite insulator comprises among others a mandrel (1), an umbrella-skirt sheath (2) disposed outside the mandrel (1) and end assemblies (3) disposed at both ends of the mandrel (1), the orientated glass fiber is used as reinforced body material for mandrel and is then formed into a rod stock by using soft dielectric rubber material or flexible plastic as an adhesive.

[0009] In order to enhance pressure and contamination resistant capabilities, the umbrella-skirt sheath is made of dielectric polymer material such as silicon rubber, ethylene propylene diene rubber, or soft plastic etc. The umbrella-skirt sheath can be integrally molded on the mandrel or sheath-covered to the mandrel.

[0010] The end assemblies comprise a sleeve with a tapered aperture, a flared conical body for inserting into any end of the mandrel, a locking nut and a connection member, wherein: the flared conical body is generally cone-shaped, the head of which is provided with chamfered edges preventing disengagement thereof; the sleeve is a tubular member, an inner aperture of the small diameter end of the sleeve corresponds to the diameter of the mandrel or interference-fits with the mandrel, an inner aperture of the large diameter end of the sleeve is configured into a horn shape, the inner wall of the horn shaped aperture is formed with inner teeth, an outer circumference of the large diameter end of the sleeve is provided with a protruding step; one end of the locking nut is provided with an internal thread, and a recessed step is provided inside the locking nut which engages with the protruding step; one end of the connection member is provided with an external thread which engages the internal thread, the other end of the connection member is configured into a ball-head shape, a ball-socket shape, or a flying ring shape to facilitate connection and fixation; an equalizer ring is further provided on end assemblies to make the connection between end assemblies and the mandrel more stable.

[0011] Orientated glass fiber is used as reinforced body material for the mandrel of the invention, and the rod stock is formed by using soft dielectric rubber material or flexible plastic as an adhesive. Therefore, the insulator will exhibit flexibility and reliable connection strength as well as favorable contamination resistance and portability. The insulator will not bend to crack or fatigue to fracture due to wind swinging during transportation and usage, thus effectively avoiding accidents of high voltage flashover or exploding bottle cracks as well as improving life span of products. In addition, the invention has the above structure of the end assemblies, such flared con-

ical body connection technique makes the connection strength between the end assembly and the mandrel higher than that of the conventional press-fit technique. During usage of the insulator, the mandrel will not easily disengage from the end assembly. Cracks due to stress fatigue or processing defects and fatigued fracture caused by wind swinging will not happen. The size of the diameter of the flexible mandrel in accordance with the invention can be determined by tension load of the product. The length of the composite hang-type insulator, the number and shape of the umbrella-skirt sheath as well as the type of end assembly are determined by the level of contamination resistance and characteristics of the application. The invention can meet the using requirements of various insulation levels and strength levels. The invention is also superior to existing string-type insulator or rod type composite insulator in terms of life span, safety and reliability.

[0012] Hereinafter, the invention will be further described with reference to the accompanied drawings.

Figure 1 is a schematic structure view of an umbrella-skirt sheath being socket-coupled to the mandrel in accordance with the invention;

Figure 2 is a schematic structure view of an umbrella-skirt sheath being integrally molded to the mandrel in accordance with the invention;

Figure 3 is a partially sectional view of the insulator in accordance with the invention;

Figure 4 is a schematic exploded view of the invention;

Figure 5 is a partially sectional view of the invention provided with an equalizer ring; and

Figure 6 is a schematic exploded view of the invention provided with an equalizer ring.

[0013] As shown in the Figures, a hang-type composite insulator comprises a mandrel 1, an umbrella-skirt sheath 2 disposed outside the mandrel 1 and assemblies 3 disposed at both ends of the mandrel 1. The mandrel 1 uses orientated glass fiber as the primary reinforcing material and is then formed into a rod stock by using soft dielectric rubber material or flexible plastic as an adhesive.

[0014] The umbrella-skirt sheath 2 is made of dielectric polymer material such as silicon rubber, ethylene propylene diene rubber, or soft plastic etc. The umbrella-skirt sheath 2 serves to protect the mandrel, increase the creepage distance and prevent contamination and can be formed into various shapes according to pressure resistant level and contamination resistant level. The umbrella-skirt sheath 2 can be sheath-covered on the mandrel 1, as shown in Fig.1, or can be integrally molded on the mandrel 1, as shown in Fig.2.

[0015] As shown in Figs. 3 and 4, a sleeve 4 with a tapered aperture, a flared conical body 5, a locking nut 6 and a connection member 7 constitute an end assembly 3, wherein the sleeve 4 is a tubular member, an inner aperture of the small diameter end of the sleeve 4e corresponds to the diameter of the mandrel 1 or interference-fits with the mandrel 1, an inner aperture of the large diameter end of the conical-opening sleeve is configured into a horn shape, the inner wall of the horn shaped aperture is formed with inner teeth, an outer circumference of the large diameter end is provided with a protruding step 41; the inner aperture of the locking nut 6 is provided with a recessed step 61, and one end of the inner-aperture of the locking nut 6 is provided with an internal thread 62; the connection member 7 is provided with an external thread 71 which engages the internal thread 62.

[0016] When assembling, firstly, the sleeve 4 is passed through the locking nut 6 so that the protruding step 41 of the sleeve 4 abuts against the recessed step 61 of the locking nut 6. Then, the mandrel 1 covered with the umbrella-skirt sheath 2 is passed through the small diameter end of the sleeve 4 until the mandrel 1 exceeds a certain distance. After that, the flared conical body 5 is inserted into the mandrel 1 along the axial direction of the mandrel 1 so that the mandrel 1 is expanded. Next, the mandrel 1 is pulled in the reverse direction so that the expanded portion of the mandrel 1 presses against the inner wall of the horn shaped aperture. The inner teeth provided on the inner wall of the horn shaped aperture can effectively increase the friction coefficient. Finally, the connection member 7 is screwed into the locking nut 6 to provide a further pressure on it.

[0017] The connection member 7 can be of various shapes for the sake of its connection with electricity transmission lines and telegraph poles. As shown in Fig.1, the end portion of the connection member 7 is of a ball-head shape. As shown in Fig.2, the end portion is of a ball-socket shape. As shown in Fig.5, the end portion is of a flying ring shape.

[0018] In order that the connection between the end assembly 3 and the mandrel 1 is more stable, an equalizer ring 8 is further provided outside the end assembly 3, as shown in Figs.5 and 6.

Claims

1. A hang-type composite insulator, comprising a mandrel (1), an umbrella-skirt sheath (2) disposed outside the mandrel (1) and end assemblies (3) disposed at both ends of the mandrel (1), **characterized in that** the mandrel (1) comprises orientated glass fiber as reinforced body material for the mandrel (1), the mandrel (1) has the form of a rod stock and comprises soft dielectric rubber material or flexible plastic as an adhesive; the end assemblies (3) comprise a sleeve (4) with a tapered aperture, a flared conical body (5) for inserting into any end of

the mandrel (1), a locking nut (6) and a connection member (7), wherein:

the flared conical body (5) is generally cone-shaped, the head of which is provided with chamfered edges for preventing disengagement thereof;

the sleeve (4) is a tubular member, an inner aperture of the small diameter end of the sleeve (4) corresponds to the diameter of the mandrel (1) or interference-fits with the mandrel (1), an inner aperture of the large diameter end of the sleeve (4) is configured into a horn shape, the inner wall of the horn shaped aperture is formed with inner teeth, an outer circumference of the large diameter end of the sleeve (4) is provided with a protruding step (41);

one end of the inner aperture of the locking nut (6) is provided with an internal thread (62), and a recessed step (61) is provided inside the aperture which engages with the protruding step (41);

one end of the connection member (7) is provided with an external thread (71) which engages the internal thread (62).

2. A hang-type composite insulator according to Claim 1, **characterized in that**, an end equalizer ring (8) is provided on the outer circumference of the small diameter end of the sleeve (4).
3. A hang-type composite insulator according to Claim 1 or 2, **characterized in that**, the other end of the connection member (7) is configured into a ball-head shape, a ball-socket shape, or a flying ring shape.
4. A hang-type composite insulator according to Claim 1 or 2, **characterized in that**, the umbrella-skirt sheath (2) is made of dielectric polymer material.
5. A hang-type composite insulator according to Claim 4, **characterized in that**, the umbrella-skirt sheath (2) is integrally injection-molded to the mandrel (1).
6. A hang-type composite insulator according to Claim 4, **characterized in that**, the umbrella-skirt sheath (2) is sheath-covered to the mandrel (1).

Patentansprüche

1. Verbundisolator des Hängetyps, der einen Dorn (1), einen außerhalb des Dorns (1) angeordneten Schirmmantel (2) und an beiden Enden des Dorns (1) angebrachte Endanordnungen (3) aufweist, **dadurch gekennzeichnet, dass** der Dorn (1) orientierte Glasfaser als verstärkendes Körpermaterial für den Dorn (1) aufweist, wobei der Dorn (1) die Form

eines Stabmaterials aufweist und weiches, dielektrisches Gummimaterial oder flexiblen Kunststoff als einen Klebstoff aufweist; wobei die Endanordnungen (3) eine Hülse (4) mit einer konischen Öffnung, einen konisch erweiterten konischen Körper (5) zum Einstecken in ein beliebiges Ende des Dorns (1), eine Sicherungsmutter (6) und ein Verbindungsteil (7) aufweisen, wobei:

der konisch erweiterte konische Körper (5) allgemein kegelförmig ist, wobei sein Kopf mit abgeschrägten Kanten versehen ist, um ein Freikommen desselben zu verhindern;

die Hülse (4) ein rohrförmiges Element ist, wobei eine innere Öffnung des Endes mit kleinerem Durchmesser der Hülse (4) dem Durchmesser des Dorns (1) entspricht oder mit dem Dorn (1) einen Festsitz bildet, eine innere Öffnung des Endes mit größerem Durchmesser der Hülse (4) zu einer Hornform ausgebildet ist, wobei die Innenwand der hornförmigen Öffnung mit einer Innenverzahnung ausgebildet ist, wobei ein Außenumfang des Endes mit größerem Durchmesser der Hülse (4) mit einer vorstehenden Stufe (41) versehen ist;

wobei ein Ende der inneren Öffnung der Sicherungsmutter (6) mit einem Innengewinde (62) versehen ist, und eine Vertiefungsstufe (61) innerhalb der Öffnung vorgesehen ist, die in die vorstehende Stufe (41) eingreift;

ein Ende des Verbindungsteils (7) ist mit einem Außengewinde (71) versehen, das mit dem Innengewinde (62) in Eingriff steht.

2. Ein Verbundisolator des Hängetyps nach Anspruch 1, **dadurch gekennzeichnet, dass** am Außenumfang des Endes mit kleinerem Durchmesser der Hülse (4) ein Endausgleichsring (8) vorgesehen ist.
3. Ein Verbundisolator des Hängetyps nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** das andere Ende des Verbindungsteils (7) geformt ist in die Form eines Kugelkopfes, die Form einer Kugelpfanne, oder die Form eines fliegenden Rings.
4. Ein Verbundisolator des Hängetyps nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Schirmmantel (2) aus dielektrischem Polymermaterial besteht.
5. Ein Verbundisolator des Hängetyps nach Anspruch 4, **dadurch gekennzeichnet, dass** der Schirmmantel (2) einstückig an den Dorn (1) im Spritzgussverfahren angebracht ist.
6. Ein Verbundisolator des Hängetyps nach Anspruch 4, **dadurch gekennzeichnet, dass** der Schirmmantel (2) den Dorn (1) hüllenartig ummantelt.

Revendications

1. Isolateur composite de type suspendu, comprenant un mandrin (1), une gaine à contour de type parapluie (2) disposée à l'extérieure du mandrin (1) et des assemblages terminaux (3) disposés sur les deux bout du mandrin (1), **caractérisé en ce que** le mandrin (1) comprend la fibre de verre orientée en tant que matériau de corps renforcé pour le mandrin (1), le mandrin (1) a la forme d'un matériau de barre et comprend du matériau diélectrique de caoutchouc ou de matière plastique en tant qu'un adhésive; les assemblages terminaux (3) comprennent un manchon (4) avec une ouverture effilée, un corps conique dilaté (5) afin d'insérer dans un des bouts du mandrin (1), un écrou de verrouillage (6) et un membre de connexion (7), dans lequel :

le corps conique dilaté (5) généralement est en forme de cône, dont la tête est agencée de chanfreins afin d'empêcher le désengagement de celui-ci ;

le manchon (4) est un membre tubulaire, une ouverture intérieure du bout de petit diamètre du manchon (4) correspond au diamètre du mandrin (1) ou est en ajustement serré avec le mandrin (1), une ouverture intérieure du bout de grand diamètre du manchon (4) est configurée en forme de corne, la paroi intérieure de l'ouverture en forme de corne est formée avec des dents internes, une circonférence extérieure du bout de grand diamètre du manchon (4) est agencée avec un gradin saillant (41) ;

un bout de l'ouverture intérieure de l'écrou de verrouillage (6) est agencé avec un filetage intérieur (62) et un gradin renforcé (61) est agencé à l'intérieure de l'ouverture qui s'engage dans le gradin saillant (41) ;

un bout de membre de connexion (7) est agencé avec un filetage extérieur (71) qui s'engage dans le filetage intérieur (62).

2. Isolateur composite de type suspendu selon la revendication 1, **caractérisé en ce que** un anneau égaliseur de bout (8) est pourvu sur la circonférence extérieure du bout de petit diamètre du manchon (4).

3. Isolateur composite de type suspendu selon la revendication 1 or 2, **caractérisé en ce que** l'autre bout du membre de connexion (7) est configuré en forme de tête sphérique, en forme de coussinet sphérique, ou en forme d'anneau d'accouplement.

4. Isolateur composite de type suspendu selon la revendication 1 ou 2, **caractérisé en ce que** la gaine de type parapluie (2) est fait de matériau polymère diélectrique.

5. Isolateur composite de type suspendu selon la revendication 4, **caractérisé en ce que** la gaine de type parapluie (2) est moulée par injection solidaire avec le mandrin (1).

6. Isolateur composite de type suspendu selon la revendication 4, **caractérisé en ce que** la gaine de type parapluie (2) est couverte de gaine jusqu'au mandrin (1).

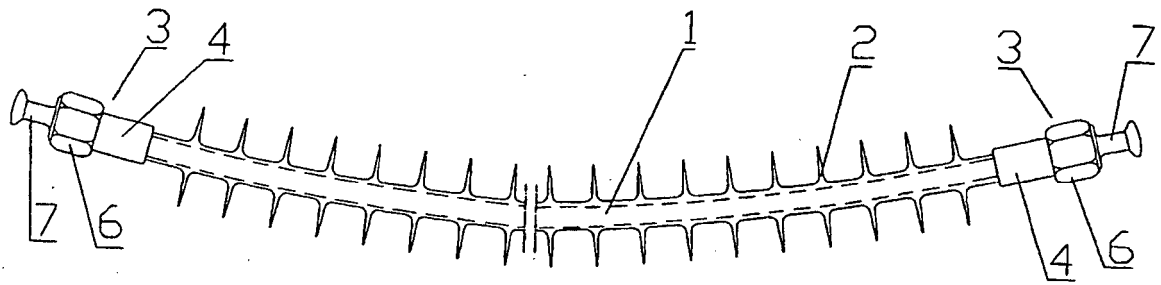


Fig. 1

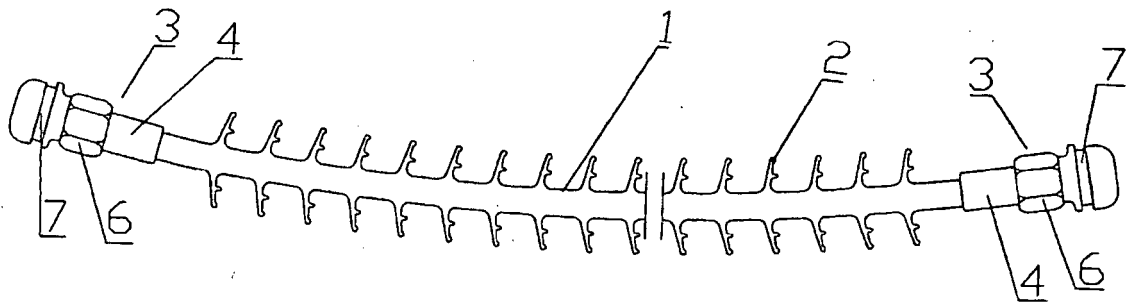


Fig. 2

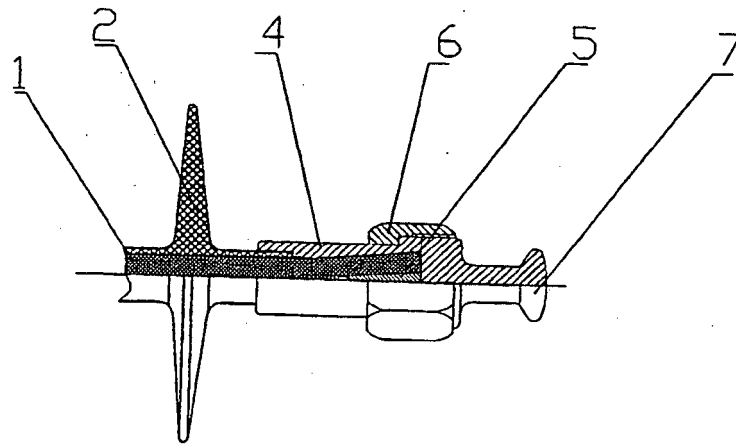


Fig.3

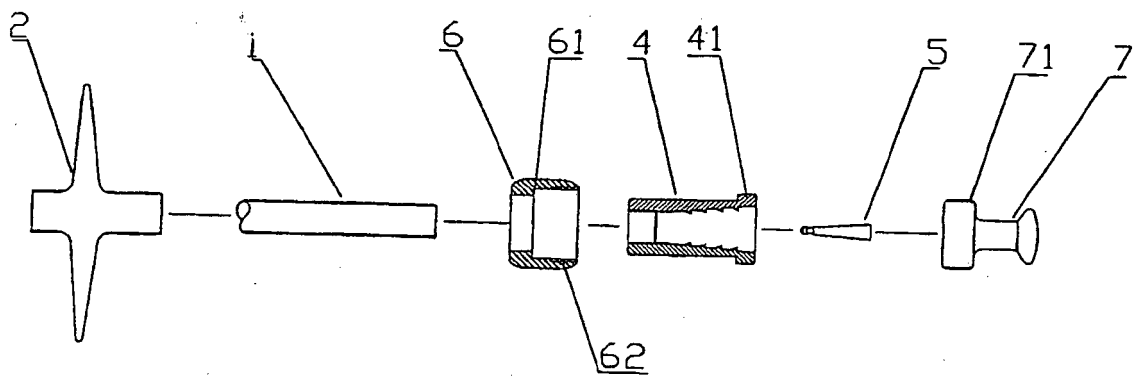


Fig.4

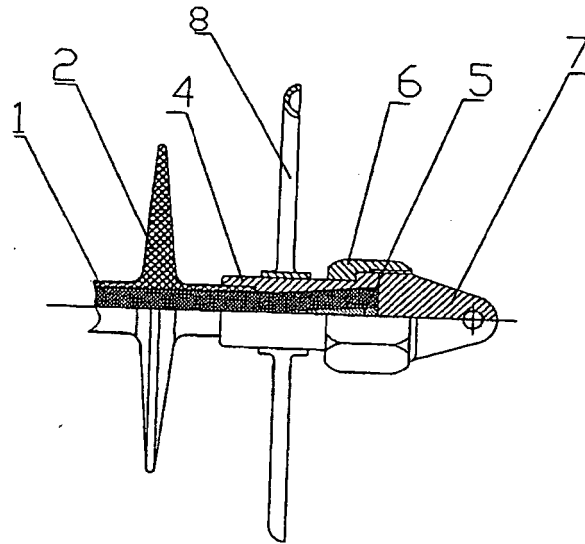


Fig. 5

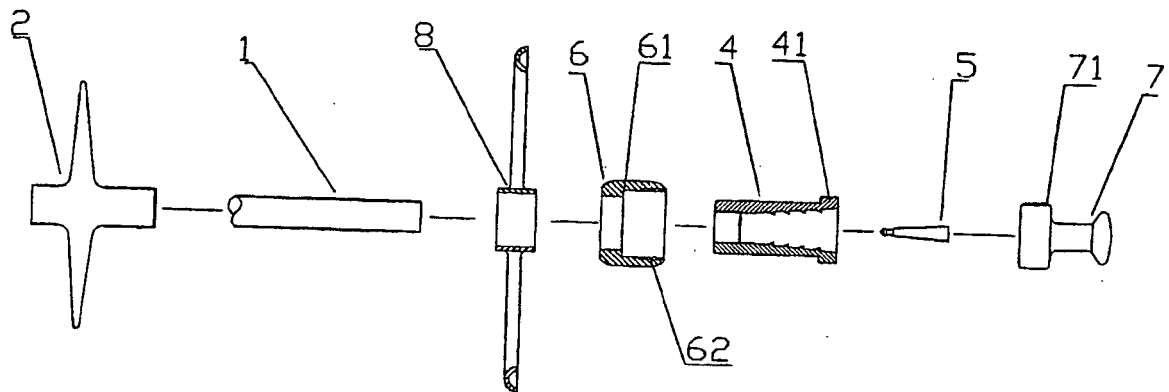


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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