

Description

This invention relates to fibre blowing.

Fibre blowing is a process in which lightweight transmission lines are advanced through installation ducts by the viscous drag of a fluid, usually compressed air. This process is described in our European patent specification 108590.

A known form of fibre blowing apparatus includes a transmission line package coiled into a sealed, pressurised container, the pressure within the container providing the propellant gas, thus eliminating the need for a compressor or other separate source of propellant. Such pressurised containers may be particularly useful for repair work.

A disadvantage of such an arrangement is that, once the pressure in the container is released to commence installation of a transmission line package into a duct, the propellant cannot be shut off without a substantial risk of that portion of the package which is already in the duct being damaged by closure of a valve to block the duct. This is particularly a problem where the package contains delicate transmission lines such as optical fibres. Also, the package travelling along the duct has a significant momentum, and, if abruptly halted, the tension induced at the halting point may be harmful.

A further problem that may be experienced in the pressurised container method of fibre blowing is that the initial pressure may be very much greater than that necessary to ensure that there is sufficient propellant to ensure that all the package in the container can be installed.

The aim of the invention is to provide apparatus for selectively inhibiting the flow of fluid from a pressured container of fibre package, and for inhibiting or retarding the advance of the fibre package.

The present invention provides apparatus for inhibiting fluid flow and fibre package motion in a fibre blowing operation, the apparatus comprising a passageway along which a fibre package and fluid flow can be passed, a first junction in said passageway at which the fibre package and a least part of the fluid flow can separate along, respectively, a fibre package passageway and a fluid flow passageway, a second junction at which the fibre package passageway and the fluid flow passageway recombine, a valve disposed in the fluid flow passageway between the first and second junctions for selectively blocking the fluid flow along the fluid flow passageway, for sealing against the fibre package to inhibit fluid flow along the fibre package passageway.

In a preferred embodiment, the fluid flow passageway is separated from the fibre passageway by an elastic, flexible membrane located between

the first and second junctions and preceding the valve, the arrangement being such that, upon closure of the valve, pressure in the fluid flow passageway expands the membrane into the fibre package passageway.

In the context of this specification, the term "fibre package" means any line or filament capable of installation by the fibre blowing technique, and is not necessarily restricted to optical fibres.

The invention will now be described in greater detail, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic diagram of a pressurised container containing a fibre package, a propellant and a fibre braking assembly, and shows the fibre package being propelled along a duct;

Figure 2 is a schematic diagram of the arrangement of Figure 1 with the propellant and fibre package flow inhibited;

Figures 3a to 3c are schematic diagrams of modified forms of the braking assembly of Figure 1, each showing the fibre package being propelled along a duct;

Figures 4a to 4c are schematic diagrams of the arrangements of Figures 3a to 3c with the propellant and fibre package flow inhibited; and

Figure 5 shows a further modified form of the braking assembly of Figure 1.

Referring to the drawings, Figure 1 shows a container 1 having a central annulus 2 about which a coil of fibre package 3 is wound. The fibre package 3 may comprise, for example, one or more optical fibres enclosed in a lightweight protective covering. The fibre package 3 is threaded through a funnel portion 4 on the container 1, and into a braking section 5. The braking section 5 is divided into a double passageway 7, 8 by a dividing wall 6. As shown in Figures 1 and 2, the fibre package 3 is diverted into the passageway 7, and the other passageway 8 is provided with a valve 9.

The container 1 is capable of being sealed and maintained under pressure by closing the brake valve 9 to operate a sealing mechanism described hereinafter. A separate port (not shown) for pressurising the container 1 may be provided. Alternatively, the container 1 may be pressurised through the braking section 5 with the valve 9 open, the valve 9 then being closed before the pressurising source is disconnected. During the pressurising process, and for transportation, the free end of the fibre package 3 may be taped or clipped to the outermost end of the braking section 5 to prevent unthreading.

An installation duct 10 is connected to the outermost end of the braking section 5. The outermost end of the braking section 5 would generally be cleared, prior to connection of the con-

container 1 to the installation duct 10, thereby eliminating any damage caused due to securing or exposure. After the container 1 is connected to the duct 10 in order to commence installation, the valve 9 is opened to the configuration shown in Figure 1. Pressurised gas then commences escaping from the container 1 along the passageways 7 and 8 and into the duct 10, the pressurised gas propelling the fibre package 3 along the duct. Various techniques may be employed to aid insertion of the free end of the fibre package 3 into the duct 10. Thus, a length of the fibre package 3 released from the container 1, prior to connection of the duct, may be manually inserted. Alternatively, the duct 10 (or a connection tube) may be vented a short distance away from the container 1, in order to create a high local flow and draw the free end of the fibre package 3 into the duct.

When it is desired to cease the installation process, the valve 9 is closed. At this point, there is still a route for propellant along the passageway 7, although this passageway is insufficient to provide a substantive alternative route for the air. A part of the wall 6 between the passageways 7 and 8 is made of a membrane 11 of flexible, elastic material such as a soft grade of rubber. As pressure builds up in the now closed off passageway 8, the membrane 11 balloons outwardly into the passageway 7, and commences pressing against the fibre package 3 and the walls of passageway 7. The sizes of the membrane 11 and the passageways 7 and 8 are such that, at the operating pressures of the container 1, the membrane 11 completely closes off the passageway 7. It should be noted that the passageway 7 is drawn on an enlarged scale for clarity: in fact it should only be sufficiently wide for the passage of the fibre package 3, and thus very little air flow is required to enable closure by the flexible membrane 11. The passageway 8 is much larger, thereby permitting a high air flow with little pressure differential.

Since the expansion of the membrane 11 into the passageway 7 takes a finite time, there is a period, after the closure of the valve 9, when the membrane bears against the fibre package 3 and the wall of the passageway 7, but not sufficiently firmly to stop all air flow through the passageway 7. During this period, the fibre package 3 is retarded, both by friction and reduced flow, which has the advantage of preventing sudden tensioning of the fibre package when it is finally stopped. In a similar way, successively opening and closing of the valve 9 may be used to slow down installation when the pressure in the container 1 is comparatively high (for example during the initial stages of discharge) without wasting propellant. After closure of the valve 9, installation can be recommenced by re-opening the valve. Alternatively, the installed length

of the fibre package 3 may be cut free, and the remaining unused portion of the fibre package used in another location.

The structure of the passageways 7 and 8 may comprise two side-by-side tubes with a common wall portion, the common wall portion having three longitudinally-spaced ports (not shown), the two end ports being for diversion of the fibre package 3, and the central port being for supporting the flexible membrane 11. The fibre diversion tube (the passageway 7) may be made smaller than the other tube (the passageway 8). An equivalent arrangement may be made by a single tube having an internal partition (see Figure 3a), by a branched structure (see Figure 3b), or by a diversion path for the propellant (see Figure 3c) leaving a straight, through-path for the fibre package 3. This last-mentioned arrangement is particularly preferable. In each case, the general structure is the same, namely two passageways with communicating entry and exit ports, and an intermediate port blocked by a membrane. The fibre package 3 passes along one route, the other route being blocked by the valve 9. Figures 4a, 4b and 4c show the same arrangements with the fibre package 3 braked. Another alternative to the embodiments shown in Figures 1 to 4 is to eliminate the port with the flexible membrane, and to locate a pressure-sensitive seal 12 (see Figure 5) around the entry port to the fibre passageway 7. Under flow conditions, the seal 12 lightly rests against the fibre package 3, but, as soon as pressure builds up above a predetermined level in the propellant passageway 8, the seal is urged tightly around the fibre package 3, preventing further movement or escape of propellant into the passageway 8. In this case, the restriction caused by the seal 12 results in the main flow of propellant being along the passageway 8, and the section of the fibre package 3 within the fibre passageway 7 is not subjected to viscous drag. However, the length of the fibre package 3 within the passageway 7 is not sufficient to influence the installation significantly.

Claims

1. Apparatus for inhibiting fluid flow and fibre package motion in a fibre blowing operation, the apparatus comprising a passageway along which a fibre package (3) and fluid flow can be passed, a first junction in said passageway at which the fibre package and at least part of the fluid flow can separate along, respectively, a fibre package passageway (7) and a fluid flow passageway (8), a second junction at which the fibre package passageway and the fluid flow passageway recombine, a valve (9) disposed in the fluid flow passageway between the first



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Claims

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and second junctions for selectively blocking the fluid flow along the fluid flow passageway and a flexible sealing member (11) for sealing against the fibre package (3) to inhibit fluid flow along the fibre package passageway (7).

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2. Apparatus as claimed in claim 1, wherein the fluid flow passageway (8) is separated from the fibre package passageway (7) by a wall, the wall including an elastic, flexible membrane (11) located between the first and second junctions and preceding the valve (9), the arrangement being such that, upon closure of the valve (9), pressure in the fluid flow passageway expands the membrane (11) into the fibre package passageway.

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3. Apparatus as claimed in claim 2, wherein the membrane constitutes the flexible sealing member (11).

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4. Apparatus as claimed in claim 2 or claim 3, wherein the membrane (11) is expandable to press the fibre package (3) progressively against the wall of the fibre passageway.

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5. Apparatus as claimed in claim 1, wherein the flexible sealing member (11) comprises a lip seal in the fibre passageway.

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6. A pressurised container of fibre package including apparatus as claimed in any one of claims 1 to 5.

7. A method of installing an optical fibre in an installation duct (10), the method comprising blowing the optical fibre through the fibre package passageway of an apparatus according to claim 1 and thence into and along the installation duct (10).

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Patentansprüche

1. Gerät zum Unterbinden einer Fluidströmung und einer Faserpackungsbewegung bei einer Fasertreiboperation, wobei das Gerät aufweist: einen Durchgang, durch den eine Faserpackung (3) und eine Fluidströmung geleitet werden können; eine erste Verzweigung im Durchgang, an der sich jeweils die Faserpackung und mindestens ein Teil der Fluidströmung durch einen Faserpackungsdurchgang (7) und einen Fluidströmungsdurchgang (8) trennen können; eine zweite Verzweigung, an der sich der Faserpackungsdurchgang und der Fluidströmungsdurchgang wieder vereinigen; ein Ventil (9) im Fluidströmungsdurchgang zwischen der ersten und der zweiten Verzweigung

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zum wahlweisen Sperren der Fluidströmung durch den Fluidströmungsdurchgang; und ein flexibles Dichtungsglied (11) zum Abdichten des Faserdurchgangs (3), um die Fluidströmung durch den Faserpackungsdurchgang (7) zu unterbinden.

2. Gerät nach Anspruch 1, bei dem der Fluidströmungsdurchgang (8) vom Faserpaketdurchgang (7) durch eine Wand getrennt ist, wobei die Wand eine elastische, flexible Membran (11) aufweist, die zwischen der ersten und der zweiten Verzweigung angeordnet ist und vor dem Ventil (9) liegt, wobei die Anordnung so getroffen ist, daß mit dem Schließen des Ventils (9) der Druck im Fluidströmungsdurchgang die Membran (11) in den Faserpaketdurchgang ausdehnt.

3. Gerät nach Anspruch 2, bei dem die Membran das flexible Dichtungsglied (11) bildet.

4. Gerät nach Anspruch 2 oder 3, bei der die Membran (11) dehnbar ist, um die Faserpackung (3) nach und nach gegen die Wand des Faserdurchgangs zu drücken.

5. Gerät nach Anspruch 1, bei der das flexible Dichtungsglied (11) eine Lippendichtung im Faserdurchgang umfaßt.

6. Unter Druck gesetzter Behälter der Faserpackung, der das in einem beliebigen Anspruch 1 bis 5 beanspruchte Gerät umfaßt.

7. Verfahren zum Verlegen einer Lichtleitfaser in einem Installationskanal (10), wobei das Verfahren das Treiben der Lichtleitfaser durch den Faserpackungsdurchgang eines Gerätes nach Anspruch 1, und von da ab in den Installationskanal (10) und entlang desselben umfaßt.

Revendications

1. Dispositif ou système pour empêcher un courant de fluide et le déplacement d'un paquet de fibres lors d'une opération d'injection pneumatique des fibres par soufflage, le dispositif comprenant un passage dans lequel un paquet de fibres (3) et un courant de fluide peuvent circuler, un premier embranchement dans ledit passage, dans lequel le paquet de fibres et, au moins, une partie du courant de fluide peuvent se séparer le long, respectivement, d'un passage de paquet de fibres (7) et d'un passage de courant de fluide (8), un second embranchement, dans lequel le passage de paquet de fibres et le passage de courant de fluide se



rejoignent, une valve (9) disposée dans le passage de courant de fluide, entre les premier et second embranchements, pour obstruer sélectivement le courant de fluide le long du passage de courant de fluide et un élément d'étanchéité souple (11) pour assurer l'étanchéité du paquet de fibres (3) pour empêcher le passage du courant de fluide dans le passage du paquet de fibres (7).

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2. Un dispositif selon la revendication 1, dans lequel le passage de courant de fluide (8) est séparé du passage de paquet de fibres (7) par une cloison, la cloison comprenant une membrane élastique souple (11) disposée entre les premier et second embranchements et en amont de la vanne (9), l'agencement étant réalisé de manière que lors de la fermeture de la vanne (9), la pression dans le passage de courant de fluide provoque le gonflement ou la déformation de la membrane (11) dans le passage de paquet de fibres.

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3. Un dispositif selon la revendication 2, dans lequel la membrane constitue l'élément d'étanchéité souple (11).

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4. Un dispositif selon la revendication 2 ou 3, dans lequel la membrane (11) est expansible pour comprimer progressivement le paquet de fibres (3) contre la cloison du passage de fibres.

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5. Un dispositif selon la revendication 1, dans lequel l'élément d'étanchéité souple (11) comprend un joint à lèvres dans le passage des fibres.

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6. Un récipient sous pression du paquet de fibres comprenant un dispositif selon l'une quelconque des revendications 1 à 5.

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7. Un procédé d'installation de fibres optiques dans une canalisation d'installation (10), le procédé comprenant le soufflage des fibres optiques dans le passage du paquet de fibres d'un dispositif selon la revendication 1 et, de là, dans et le long de la canalisation d'installation (10).

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