



US006879760B2

(12) **United States Patent**
Griffioen et al.

(10) **Patent No.:** **US 6,879,760 B2**
(45) **Date of Patent:** **Apr. 12, 2005**

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|---|---------------|---------|-----------------------|-----------|
| (54) INSTALLATION BUNDLE WITH SPACER | 4,850,569 A | 7/1989 | Griffioen et al. | 254/134.4 |
| | 4,934,662 A | 7/1990 | Griffioen et al. | 254/134.4 |
| (75) Inventors: Willem Griffioen, Ter Aar (NL); Arie Van Wingerden, Hendrik Ido Ambacht (NL); Cornelis Van 'T Hul, Den Hoorn (NL); Pieter Lock, 's-Gravenhage (NL); Willem Greven, Delfzijl (NL); Frans Robbert Bakker, Wagenborgen (NL) | 5,087,110 A * | 2/1992 | Inagaki et al. | 385/110 |
| | 5,197,715 A | 3/1993 | Griffioen | 254/134.4 |
| | 5,211,377 A | 5/1993 | Griffioen et al. | 254/134.4 |
| | 5,308,041 A | 5/1994 | Griffioen et al. | 254/134.4 |
| | 5,474,277 A | 12/1995 | Griffioen | 254/134.4 |
| | 5,491,766 A * | 2/1996 | Huynh et al. | 385/100 |
| | 5,598,500 A * | 1/1997 | Crespel et al. | 385/139 |
| (73) Assignee: NKF Kabel B.V., Gouda (NL) | 5,639,183 A | 6/1997 | Griffioen et al. | 405/154 |
| | 5,645,267 A | 7/1997 | Reeve et al. | 254/134.4 |
| (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days. | 5,761,361 A * | 6/1998 | Pfandl et al. | 385/100 |
| | 5,774,617 A * | 6/1998 | Stockman et al. | 385/134 |
| | 5,884,384 A | 3/1999 | Griffioen | 29/468 |
| | 5,897,103 A | 4/1999 | Griffioen et al. | 254/134.4 |
| | 5,902,958 A * | 5/1999 | Haxton | 174/47 |
| (21) Appl. No.: 10/692,449 | 6,074,954 A | 4/2000 | Griffioen | 254/134.4 |
| (22) Filed: Oct. 23, 2003 | 6,129,341 A | 10/2000 | Griffioen | 254/134.4 |

* cited by examiner

(65) **Prior Publication Data**

US 2004/0071429 A1 Apr. 15, 2004

Related U.S. Application Data

(62) Division of application No. 09/904,941, filed on Jul. 12, 2001, now Pat. No. 6,711,328.

(51) **Int. Cl.**⁷ **G02B 6/44**

(52) **U.S. Cl.** **385/100**

(58) **Field of Search** 385/100, 101-102, 385/139, 134-137, 109-114

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|---------------|---------|------------------------|-----------|
| 4,372,792 A * | 2/1983 | Dey et al. | 156/48 |
| 4,691,896 A | 9/1987 | Reeve et al. | 254/134.4 |
| 4,741,684 A * | 5/1988 | Cornelison et al. | 425/114 |
| 4,784,461 A * | 11/1988 | Abe et al. | 385/112 |
| 4,804,020 A * | 2/1989 | Bartholomew | 138/111 |

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(57) **ABSTRACT**

A filling body is inserted together with a loose bundle of guide tubes during installation into the passage space of a protective duct, thus enlarging the bundle diameter (which reduces the buckling risk) and making crossing of the guide tubes impossible. The guide tubes are positioned along the outside of the filling body, providing access to the guide tubes during post-installation branching. The filling body may include radially projecting spacer ribs that separate the guide tubes, thereby preventing crossing movement and helical stranding. The guide tubes are thus constrained and carried along with the filling body in alignment with the spacer ribs, so that buckling, helical stranding and three-dimensional restrictions or tangles cannot occur.

27 Claims, 4 Drawing Sheets

