

AN IMPROVED OPTICAL FIBRE RIBBON STRUCTURE

This invention relates to optical fibre ribbon structures for the transmission of the ultra-violet, visible and infra-red regions of the electromagnetic spectrum, which regions, for convenience, will

5 hereinafter all be included in the generic term "light" and especially, but not exclusively, to optical fibre ribbon structures for use in the communications field adapted for transmission of light having a wavelength within the range 0.8 to 1.9 micrometres.

10 The invention is particularly concerned with an optical fibre ribbon structure of the kind comprising a plurality of optical fibres arranged side by side and embedded in an elongate body of plastics material.

It is an object of the present invention to provide
15 an improved method of manufacturing an optical fibre ribbon structure of the aforesaid kind.

According to the invention, the improved method comprises causing a plurality of separate optical fibres to travel substantially side by side in the directions
20 of their lengths with their axes lying in a substantially common plane; applying to the advancing optical fibres an overall coating of a plastics material to form a plastics coated optical fibre array; feeding the plastics coated optical fibre array between a pair of

advancing tapes; subjecting the advancing taped plastics coated optical fibre array to a curing operation to cure the plastics material and cause it to bond both to the embedded optical fibres and lightly to the tapes; and
5 peeling the tapes away from the optical fibre array to form an optical fibre ribbon structure.

At least one flexible elongate reinforcing element may be caused to travel substantially side by side with the plurality of separate optical fibres in the directions
10 of their lengths with the axes of the optical fibres and of the reinforcing element or elements lying in a substantially common plane and the overall coating of plastics material is applied to the advancing optical fibres and to the reinforcing element or elements to form
15 a plastics coated reinforced optical fibre array.

The plastics material of the overall coating applied to the advancing optical fibres and, when present, reinforcing element or elements is preferably a plastics material that can be cured by ultra-violet radiation, e.g.
20 an acrylate or silicone rubber, and in this case each of the advancing tapes will be of a material that is transparent to the ultra-violet radiation employed to cure the plastics material of the overall coating.

Each tape applied to the advancing plastics coated unreinforced or reinforced optical fibre array is preferably made of oriented polyethylene terephthalate or of any other plastics or fibrous material that is 5 transparent to ultra-violet radiation.

Preferably, adjacent optical fibres are in continuous contact with each other and each separate optical fibre has an outermost coating of an acrylate. At least one of the optical fibres may have a coating differing in colour 10 from that of the other optical fibre or each of the other optical fibres of the ribbon structure to provide for ready identification of any optical fibre.

Where a reinforced optical fibre ribbon structure is required, preferably at least two flexible elongate 15 reinforcing elements are caused to travel substantially side by side with the plurality of separate optical fibres and, preferably also, the reinforcing elements are uniformly spaced across the width of the optical fibre array. In a preferred embodiment, the plurality 20 of separate optical fibres travel between two flexible elongate reinforcing elements.

The or each flexible elongate reinforcing element preferably is made of a metal or metal alloy, stainless steel being preferred, but in applications where the 25 presence of metal or metal alloy is not desirable, the or each reinforcing element may be made of a non-metal,

such as polyethylene terephthalate. The or each flexible elongate reinforcing element may have an overall diameter substantially equal to that of each of the optical fibres but, preferably, the or each
5 reinforcing element has a diameter substantially shorter than that of each of the optical fibres.

The tapes serve to maintain the positions of the embedded optical fibres, and when present of the embedded reinforcing element or elements, relative to
10 one another substantially constant prior to curing of the plastics material. Since each of the tapes is peeled from the optical fibre array after the plastics material of the overall coating has been cured, the tapes thereby forming no part of the final optical fibre ribbon structure, any deleterious thermal and/or
15 mechanical effects that the tapes may otherwise have had on the transmission properties of the optical fibres are eliminated. Moreover, each tape may be wider than the array of optical fibres because the necessity to cut or slit the tapes with the inherent risk of damage to the optical fibres no longer arises.

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The invention also includes an optical fibre ribbon structure made by the improved method hereinbefore described.

The invention is further illustrated by a description, by way of example, of the preferred method
25 of manufacturing an optical fibre ribbon structure with

reference to the accompanying drawing which shows a schematic representation of the preferred method.

Referring to the drawing, six separate optical fibres 1, each having an outer coating of an acrylate, are caused to travel from supply spools (not shown) substantially side by side in the directions of their lengths with their axes lying in a substantially common plane through a bath 2 where an overall coating 3 of an acrylate is applied to the advancing optical fibres to form an acrylate coated optical fibre array 4. Downstream of the bath 2, a pair of tapes 5 of oriented polyethylene terephthlate being drawn from supply spools 6 are fed, with the acrylate coated optical fibre array 4 between a pair of pinch rolls 7 which urge the tapes into contact with the opposite major faces of the acrylate coated optical fibre array. The advancing taped acrylate coated optical fibre array 8 then passes through an oven 9 where the acrylate in which the optical fibres are embedded is cured by ultra-violet radiation to cause the acrylate to bond both to the embedded acrylate coated optical fibres 1 and lightly to the tapes 5. Downstream of the oven 9, the tapes 5 are peeled away from the optical fibre array on to take-up spools 10 to form an optical fibre ribbon structure 11.

It will be noted that, because the tapes 5 form no part of the final optical fibre ribbon structure 11, each tape can be substantially wider than the array 4 of optical fibres because no cutting or slitting of the tapes is required during manufacture of the ribbon structure.

CLAIMS:

1. A method of manufacturing an optical fibre ribbon structure, which method comprises causing a plurality of separate optical fibres to travel substantially side by side in the directions of their lengths with their axes
5 lying in a substantially common plane; applying to the advancing optical fibres an overall coating of a plastics material to form a plastics coated optical fibre array; feeding the plastics coated optical fibre array between a pair of advancing tapes; subjecting the
10 advancing taped plastics coated optical fibre array to a curing operation to cure the plastics material and cause it to bond both to the embedded optical fibres and lightly to the tapes; and peeling the tapes away from the optical fibre array to form an optical fibre ribbon
15 structure.

2. A method of manufacturing an optical fibre ribbon structure, which method comprises causing a plurality of separate optical fibres and at least one flexible elongate reinforcing element to travel substantially
20 side by side in the directions of their lengths with their axes lying in a substantially common plane; applying to the advancing optical fibres and to the advancing reinforcing element or elements an overall coating of a plastics material to form a plastics coated
25 reinforced optical fibre array; feeding the plastics coated reinforced optical fibre array between a pair of advancing tapes; subjecting the advancing taped plastics



coated reinforced optical fibre array to a curing operation to cure the plastics material and cause it to bond both to the embedded optical fibres and reinforcing element or elements and lightly to the tapes; and
5 peeling the tapes away from the reinforced optical fibre array to form a reinforced optical fibre ribbon structure.

3. A method as claimed in Claim 2, wherein at least two flexible elongate reinforcing elements are caused to
10 travel substantially side by side with the plurality of separate optical fibres.

4. A method as claimed in Claim 3, wherein the reinforcing elements are uniformly spaced across the width of the optical fibre array.

15 5. A method as claimed in Claim 3 or 4, wherein the plurality of separate optical fibres travel between two flexible elongate reinforcing elements.

6. A method as claimed in any one of Claims 2 to 5, wherein the or each flexible elongate reinforcing
20 element is made of a metal or metal alloy.

7. A method as claimed in any one of Claims 2 to 5, wherein the or each flexible elongate reinforcing element is made of polyethylene terephthalate or other non-metallic reinforcing material.



8. A method as claimed in any one of Claims 2 to 7, wherein the or each reinforcing element has a diameter substantially shorter than that of each of the optical fibres.

5 9. A method as claimed in any one of the preceding Claims, wherein the plastics material of the overall coating is an acrylate, silicone rubber or any other plastics material that can be cured by ultra-violet radiation and wherein each of the advancing tapes is of
10 a material that is transparent to the ultra-violet radiation employed to cure the plastics material of the overall coating.

10. A method as claimed in Claim 9, wherein each tape is made of oriented polyethylene terephthalate.

15 11. A method as claimed in any one of the preceding Claims, wherein adjacent optical fibres are in continuous contact with each other and each separate optical fibre has an outermost coating of an acrylate.

12. A method as claimed in any one of the preceding
20 Claims, wherein at least one of the optical fibres has a coating differing in colour from that of the other optical fibre or each of the other optical fibres of the ribbon structure.



13. A method of manufacturing an optical fibre ribbon structure substantially as hereinbefore described with reference to the accompanying drawing.

14. An optical fibre ribbon structure made by the
5 method claimed in any one of the preceding Claims.
