Optical fiber
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"Total light" optical fibres

In a world that seems increasingly bridled by every kind of cable network, even light can be transported in specific channels, or optical ducts, by using thin wires or fibres made of glass or plastic material. The distances covered by these ducts are not very long, but science and technology have accustomed us to rapid evolutions and we can expect in a few years to realize projects that will revolutionize our way of living, such as the objective that is being pursued by lighting designers, of bringing the light of the sun and of the sky in all underground environments thus making them much more liveable.

But even today there are manifold applications of optical fibres, especially in places dedicated to shows and public entertainment. The main advantages offered by these lighting systems derive exactly by the prerogative of transporting light. In optical ducts only light radiations travel, there is neither electricity nor heat. By using cables of modest dimensions it is possible to bring substantial quantities of light even inside microspaces and in places that would otherwise be difficult, if not impossible, to illuminate with traditional devices, for instance in the water or among materials that are easily inflammable or altered by thermal energy.

The light produced by the lamp is channelled in many cables. In this way it is possible to use a great number of circular luminous spots, with diameters of millimetric dimensions (the smallest has a one-millimetre diameter), suitable for creating varied compositions, such as starry skies (with the reproduction of the vault of heaven and its constellations), animated figures, letters and words, brands and logos.

Another very interesting aspect is that, in a few words, it would be possible to define the creative management of light: it is possible to regulate its quantity, to colour it and make it dynamic (variation of colours in time) by acting on the source, inside the illuminator (the generator of the light system), with the result that the luminous points create effects that have a considerable scenic impact. In optical fibres systems, the illuminator is the heart of the system. It comes in a closed box which contains the lamp provided with the relevant concentrating optics. In the illuminator the bundle, i.e. the collector that collects all the heads of the ducts, is triggered. Each duct comprises a small bundle (sheathed in PVC or other protective fire-resistant materials) of thin filaments or fibres with diameters that are inferior to one mm in order to guarantee flexibility. A good illuminator must convey in the bundle as much light as it is produced by the lamp. The lamps that are used are usually 12V small halogen lamps with incorporated dichroic glass optics, with 35, 50 and 75W voltages or, in more powerful systems, 230V discharge lamps (metal halide vapour), with 70, 200, 250 and 450W voltages. Thanks to the optic phenomenon of total internal reflection, the light penetrated in the small cables remains inside them, bouncing repeatedly against their walls, and is transported despite a certain amount of absorption. With quality plastic glass

fibres it is possible to build ducts that reach approximately 10 metres. Beyond this limit, apart from a certain amount of absorption, chromatic changes, which alter the tone of the in-going light, take place.

Light effects are obtained by inserting filters in the illuminator, even circular filters comprising more sectors that are kept moving by a special motor, so that the outgoing light undergoes continuous change of colours according to the chosen variation speed. Moreover, each luminous point can be supplied with an optical terminal, i.e. a device that allows to modify the shape as well as the colour of the light beam distributed by the pure packet of fibres that are cut off and polished. The terminals can contain small lens to compact, reduce or enlarge the beam, to shape it, to project images, as well as filter holders to colour it, optic switches to send it in a direction perpendicular to the duct axis.

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We would like to mention another typology of optical fibre ducts that have the characteristic of diffusing light, produced by an illuminator, along their entire length; the so called "total light" fibres or, to use a more technical terminology, lateral emission fibres (axial emission, on the other hand, refers to the above-mentioned fibres). They look like long luminous snakes made of groups of adequately processed fibres contained in protective transparent sheaths. The curve of the ray, i.e. the bendability of the duct, varies according to the diameter of its section. With small diameters it is possible to make the ducts follow even very tortuous directions. Like the classic neon tube (the most commonly technology employed for luminous signs), but without electricity, the cables are used to compose any kind of shape, thus exploiting all the advantages of light management from the illuminator, as already mentioned.

In some public places, e.g. in discos, changes to the interior design or to the plant engineering are very frequent in order to refresh the image of the club for a public that is constantly looking for novelties. But even in these cases there are no problems. Optical fibre systems have a great degree of flexibility. The illuminator, the filters, the bundles of fibres can be used for an infinite number of compositions: it is only necessary to change the disposition of the light terminals. It is possible to use these fibres together with laser devices: the thin laser beam is entrapped in an easily-handled duct which can be brought everywhere without any danger, even in the water.

In short, the opportunities to employ optical fibres are manifold, both indoors and outdoors, and even the simplest installation often reveals new possibilities to the designer. You just have to use your fantasy and optical fibre systems will disclose unexpected qualities.