

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VANGUARD PRODUCTS GROUP, INC., D/B/A VANGUARD PROTEX
GLOBAL

Petitioner

v.

INVUE SECURITY PRODUCTS, INC.

Patent Owner

Case No.: IPR2020-00069
U.S. Patent No. 10,043,358

EXHIBIT 2013

WHAT ARE BEND INSENSITIVE FIBER OPTIC CABLES?



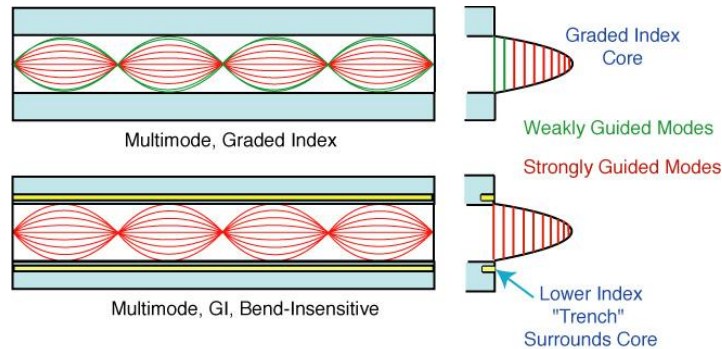
Educational

17.10.2018

Regular optical fiber is sensitive to stress, especially bending. In this case, light in the outer part of the core is no longer guided in the core of the fiber optics leading to significant losses. In 2007 the first single mode bend insensitive fiber (or also called bend improved, bend optimized or bend tolerant) were introduced to the market. Although bend insensitive fiber (BIF) has now been for more than 10 years on the market a lot of people are still skeptical.

HOW DOES IT WORK?

Bend-insensitive fiber adds a layer of glass around the core of the fiber which has a lower index of refraction. This layer is called “trench” and it reflects the weakly guided modes back into the core when stress normally causes them to be coupled into the cladding. This way BIF allows small bending radii without significant light loss, which makes working with fiber much easier.



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WHAT'S THE DIFFERENCE BETWEEN MACRO AND MICRO-BENDING?

A macro bend is a visible bend, hence are large enough to be seen by the human eye, in comparison to micro bends which are microscopic deviations along the fiber axis. Both types of bend can degrade the performance of the fiber.

BIF was introduced with the intention to reduce macro-bending loss so cables could be run around corners better. It's also helping micro-bending loss due to the careful attention to the fiber primary coating (or coatings, if applied in several layers) which protects the fiber from being bent in the first place.

HOW BEND INSENSITIVE IS OUR FIBER?

Since a lot of you guys asked us about the bend sensitivity of our fiber optics we decided to make a short uncut video to demonstrate our fibers stress level to macro bends. We did a relative power measurement of our PATCHBOX® Plus+ OM4 cables with an FHO5000 OTDR. Check out the change in the signal loss during the different stress scenarios. As you see you can bend it to very small radii with no significant loss, but of course, the fiber has its limits and can be destroyed as well.



Every single of our fiber optics (in Single Mode 50/125µm OS2 or Multimode 50/125µm OM4) are tested for Insertion Loss (IL) < 0.3dB and Return Loss (RL) >35dB.

If you want to read more about the basics of fiber optics you should head over to the FOA (the Fiber Optics Association): <http://www.thefoa.org/tech/ref/contents.html>



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