Low-Count Aerial Optical Fiber Cable Capable of Mid-Span Branching Requiring No Special Tools

1. INTRODUCTION

With the growing demand for optical communications in recent years, demand for installation of optical cables in subscribers' premises is increasing. In an access network, a low-count aerial cable containing eight to twelve fibers is used to connect a multi-count aerial cable, from which the low-count cable being branched off, with a subscriber drop cable. Conventional cables used for this purpose, however, raise problems such that dedicated tools are needed for making access to the fiber at intermediate points, and that loss increase is generated when the fibers are taken out.

Accordingly, we have recently developed a low-count aerial cable accommodating eight fibers that allows for mid-span branching at any intermediate points after cable installation using an off-the-shelf cutting nipper.

2. FEATURES

2.1 Mid-Span Branching Enabled Structure Requiring No Special Tools

In order to split the cable sheath without bending the cable so as not to cause loss increase, it is advantageous to split the sheath by making a longitudinal cut using a tool.

Furthermore, to assure damage-less separation of fibers at the time of sheath splitting, it is useful to provide a kind of additional filler between the sheath and the fiber that does not stick to either of these, and to give a cut against the filler.

Taking into consideration the above, a cable structure has been adopted such that two circular fillers are disposed oppositely at the both ends of the optical fiber array and these are sheathed in block together with two strength members. Figure 1 shows a cross section of the cable.

As for the tool for making a longitudinal cut on the cable, angular tooth cutting nipper was adopted considering its widespread availability and cost.

Figures 2 through 6 show every step of mid-span branching procedures for the cable.

2.2 Cable Excess Length

A slack structure has been adopted for the cable developed here, where the cable main body is intermittently joined with the suspension member to provide an excess length over the suspension member. Thus, at run-through electric poles, the cable can be easily fixed using hangers without resort to cutting the suspension member to fix the cable using insertion-type strain clamp fittings and the like.

3. CHARACTERISTICS

Table 1 shows the loss increase during the mid-span branching work. The maximum loss variation is 0.1 dB or less for any process, demonstrating superior characteristics.

Table 2 shows general characteristics including transmission, mechanical and temperature characteristics, exhibiting superior performance.

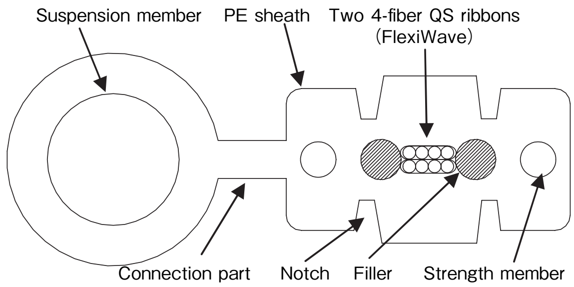

Figure 1 Cable cross section.

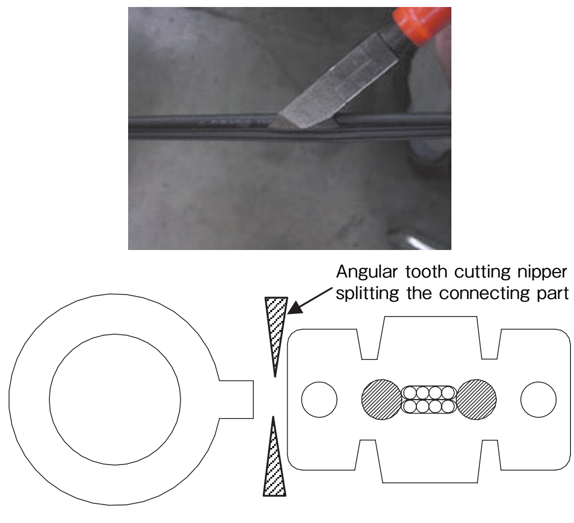

Figure 2 Cutting the connection part using a cutting nipper.

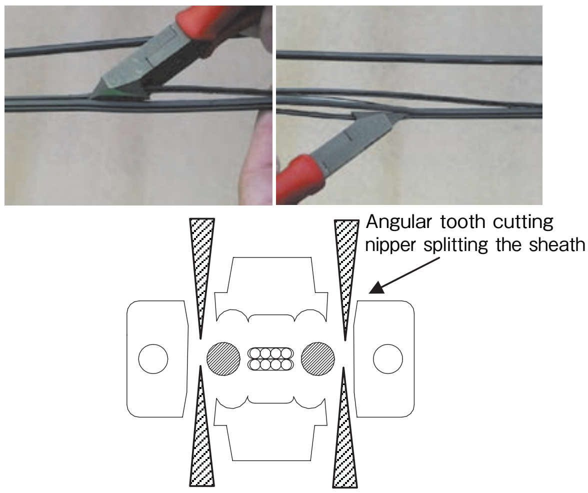

Figure 3 **Separating the sheath along the notch using a cutting nipper to make an initial cut approx. 50 mm in length.**

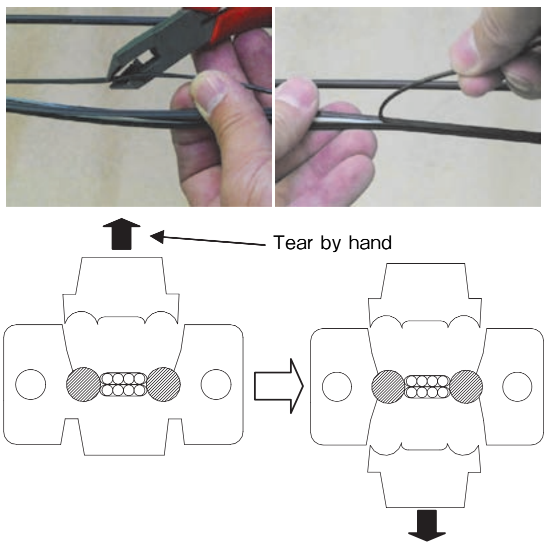

Figure 4 **Tearing off the sheath by hand for a required length.**

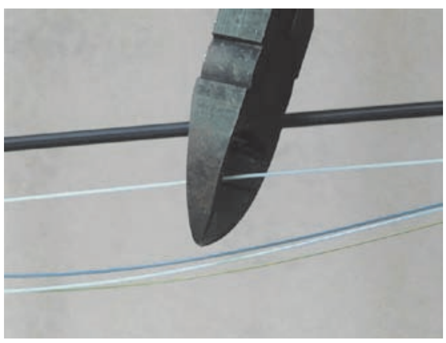

Figure 5 Removing the sheath and filler.

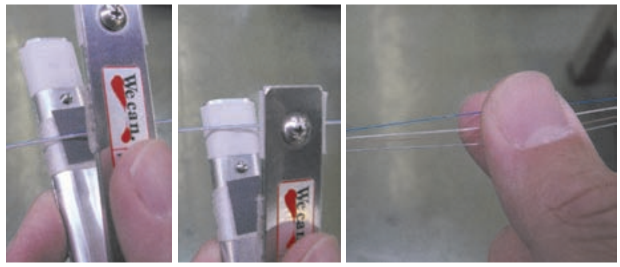

Figure 6 Separating the 4-fiber QS ribbon.

Table 1 Typical loss increase during branching work.

Process	Max. loss variation Measurement wavelength: 1550 nm Sampling time: 1 ms
Connection part cutting	<0.1
Sheath separation using nipper	<0.1
Sheath tearing off by hand	<0.1
Sheath and filler removal	<0.1
QS ribbon separation	<0.1

Table 2 Cable characteristics.

Test item		Conditions	Result
Transmission characteristics		1310 nm	<0.34 dB/km
		1550 nm	<0.25 dB/km
Mechanical characteristics Measurement wavelength: 1550 nm	Tension	2500 N	<0.1 dB
	Squeezing	R=250 mm, 90°, 700 N, 4 cycle	<0.1 dB
	Bending	R=30 mm x 10 cycle	<0.1 dB
	Lateral pressure	1200 N/25 mm×1 min	<0.1 dB
	Twisting	±90°/m×1 cycle	<0.1 dB
	Impact	300 g・ϕ20 mm×1 m	<0.1 dB
	Vibration	Span 35 m, amplitude: 25 cm, 2 Hz x 1 million cycle	<0.1 dB
Temperature characteristics		-30～70℃, 10 cycle	<0.1 dB/km

4. CONCLUSION

A low-count aerial optical fiber cable capable of mid-span branching using a low-cost, easily available tool of angular tooth cutting nipper has been developed. Use of this cable developed here can flexibly respond to demands for opening up optical communications, so that it is expected that the cable will significantly serve to implement efficient optical distribution networks.

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