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Adhesive Sandwich Optical Fiber Ribbons

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In 1974 a proposal was made to put optical fibers together into easily handled units for optical communication purposes.[1] This proposal suggested "the use of fiber ribbons consisting of linear arrays of fibers embedded in a thin, flexible supporting medium as components of a cable for fiber transmission systems." This note is a brief description of fiber ribbons made by sandwiching fibers between two layers of polyester-backed adhesive (adhesive sandwich ribbons).

The machine for making these ribbons has evolved around two

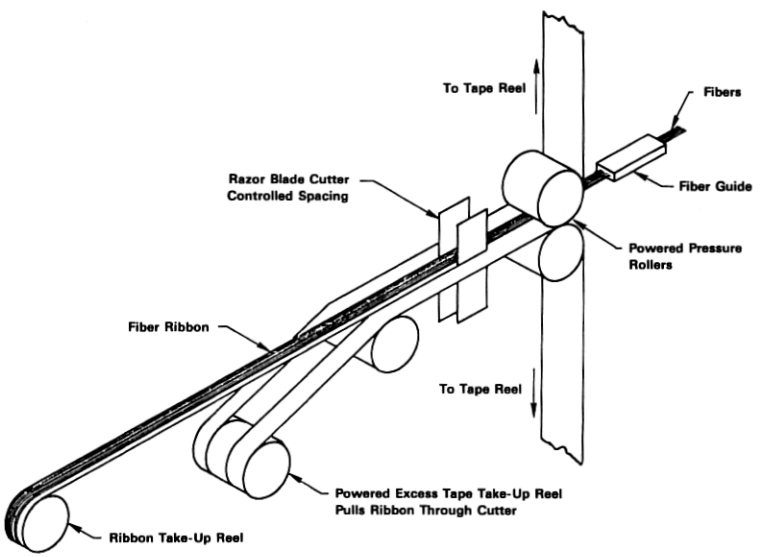

Fig. 1—Schematic diagram of adhesive sandwich ribbon machine.

motor-driven pressure rollers. Figure 1 is a schematic diagram of the machine. Twelve fibers from payout reels are directed through the fiber guide where they are made contiguous. The fibers then pass between the two pressure rollers and are sandwiched between two layers of polyester backed adhesive tape supplied from large reels. After emerging from the pressure rollers, the sandwich is cut by a blade cutter to a width somewhat larger than the width of the 12 fibers. The excess tape that has been cut away from the fiber-carrying ribbon is attached to a reel that supplies the power to pull the tape through the system. The ribbon with the fibers is either wound on a reel or is permitted to fall, under zero tension, into a container so that loss measurements can be made. Currently, we are making kilometer lengths of ribbon at speeds of about 0.2 m/s. However, shorter lengths of ribbon have been made at a speed of 0.8 m/s. We have made about 100 adhesive sandwich ribbons, including ribbons for the Atlanta Fiberguide System Experiment,[2] varying in length from 0.2 to 2 km.

The added loss of fibers in these ribbons, caused by microbending,[3] is quite small. The average added loss of the fibers in the ribbons used to make the two cables, each 1 km in length, for the Atlanta Fiberguide System Experiment was 0.95 ± 0.07 dB/km for 137 fibers and 0.55 ± 0.05 dB/km for 132 fibers.[4] Some fiber breakage occurred, caused both by defects in the machine and by the fibers being wound improperly on the reels.

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