LASER PULSE SHAPING WITH LIQUID CRYSTALS

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In this paper we report a new method of laser pulse shaping by the use of liquid crystals as nonlinear materials. The basis of this method is similar to the one reported by us for an hybrid optical bistable device (1), but with a different electronic circuitry and feedback.

This system is based on a 1 x 2 switch reported by us previously (2) and uses twisted nematic liquid crystal structures as its fundamental part. The schematic diagram is shown in Fig. 1

Two are the reported cases. The first one gives symmetrical pulsed optical signals. The second one, asymmetricals. Both cases are able to work either with continuous or with variable intensity laser beams. In the first case, the continuous wave is converted to a pulsed signal by an hybrid optical bistable device according to the method employed by us (3).

A sample of the above pulsed light is converted to a proportional voltage signal. The result of its comparison with a reference voltage is applied to the 1 x 2 switch. When the obtained proportional voltages are lower than the reference, the input light will go through exit B. Higher voltages will switch the input beam to exit A.

Output light pulses through exit A are shown in Fig. 2. When the electronic comparator is a symmetrical one, I_1 and I_2 have the same values. The resulting pulse width can be controlled by ajusting the electronic comparator. The signal shown in Fig 2 is the one obtained for triangular input pulses. Other input signals will give equivalent outputs.

This system is able to work with unpolarized input light. This is is because the electrooptical properties of the 1 x 2 switch. Moreover, the behaviour is not dependent on the laser wavelenght.

If the output light is represented versus input light, an hysteresis cycle is obtained for the asymmentrical case (Fig. 3). This hysteresis cycle has zero area for the symmetrical operation mode. In both cases, its position with respect to the I_{in} axis can be varied. Two are the possibilities: a change on its width or a change on its possition keeping width constant.

Obtained switching times are smaller than 0.05 msec. The minimum pulse width achieved has been ~0.1 msec.

REFERENCES

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(3). J.A.Martín-Pereda and M.A. Muriel. Paper presented at the XII Int. Quantum Electron. Conf. Munich, June 1982.

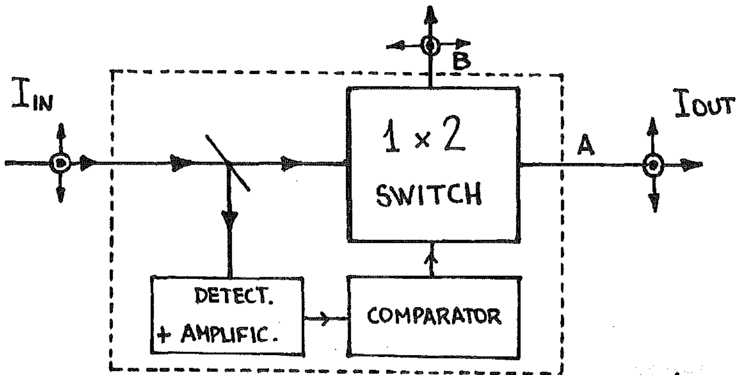

FIG. 1

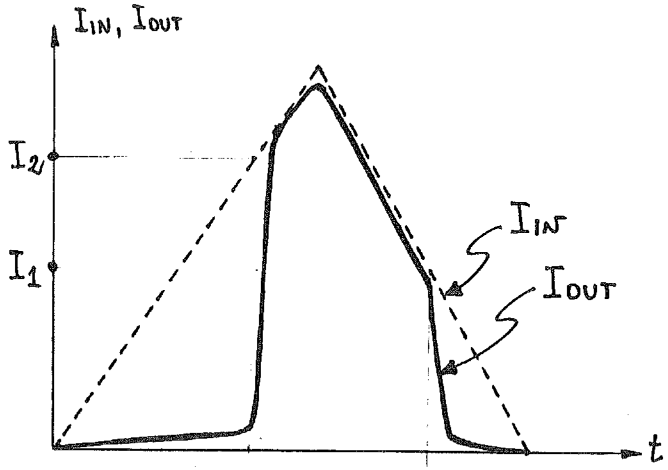

FIG. 2

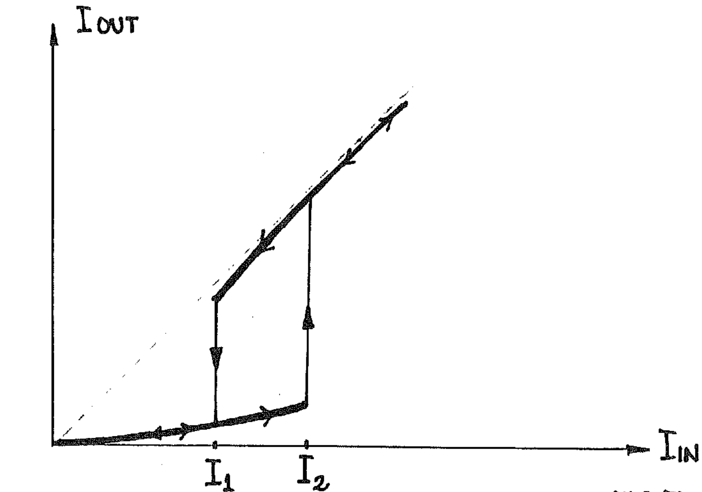

FIG. 3