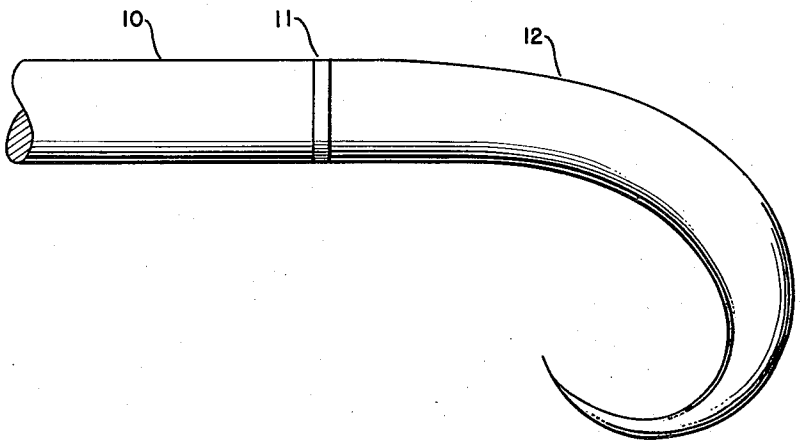
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ABSORBING MEANS FOR DELAY LINES

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ABSORBING MEANS FOR DELAY LINES

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10 Claims. (Cl. 178—44)

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This invention relates in general to absorbing means and, more particularly, to such devices for absorbing supersonic waves.

In certain types of radio echo-detection systems, it is desired to delay a particular pulse of electromagnetic energy within the system for a time of the order of magnitude of a thousand microseconds. One means of accomplishing this delay consists in transforming the electrical pulse to a supersonic pulse by means of a crystal, sending the supersonic packet of energy down a fused quartz line, and picking up the energy at the end of the line by means of a crystal, by transforming it back into electrical energy. A number of embodiments of one type of this solid delay line are explained in detail in an application by David L. Arenberg filed July 9, 1945, Serial No. 604,046, Pat. No. 2,418,964, issued April 15, 1947. In order that reflections do not occur to give false signals to the receiving crystal, however, the delay line must have a termination that does not allow reflections, i. e., a termination that absorbs substantially all of the energy entering it. Some designs of delay lines must have terminations at both ends thereof.

Accordingly, among the objects of the present invention are:

1. To provide a termination for a solid supersonic delay line; and

2. To provide such a termination that absorbs a large percentage of the energy of the supersonic waves entering it.

In accordance with the present invention, there is provided, in association with a fused quartz delay line, a glass termination which tapers gradually down to a point, and which is curled on itself. This curved portion breaks up the waves entering it sufficiently, and provides such long paths for the waves, that they are subjected to a large amount of attenuation.

This invention will best be understood by reference to the sole figure of the attached drawing which presents a perspective view of the delay line termination according to the present invention.

Referring now to the drawing, there is shown a portion 10 of a solid supersonic delay line. A crystal 11, used to transmit or to receive supersonic energy, may be soldered to delay line 10, and soldered to the absorbing termination 12, which is curved in a pigtail-like manner. If a crystal is used adjacent to this termination, it should preferably be one-half wavelength thick, to prevent reflections therefrom, this also being

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a requirement for a transmitting crystal and a receiving crystal in this type of delay line.

Delay lines of the type described in the above-mentioned patent to Arenberg are often made of fused quartz, and sometimes of glass, and employ supersonic waves in the compressional mode. Under these conditions, glass is a preferable material for the absorbing termination. Cast aluminum and cast magnesium are also satisfactory. If the delay line is made of some material other than fused quartz, or if a mode other than the compressional mode, say the transverse mode, is used, the termination or absorbing material would preferably be chosen so as to provide the proper matching conditions, since the value of the acoustic impedance depends only upon the material and the mode of vibration. Glass would not necessarily fulfill this requirement.

If the tapered termination was not curved, there would be at least one circumference around which an equi-phase condition would exist, thus constituting a possible source of undesirable reflections. Thus the curved, tapered arrangement breaks up the impinging wave into such a a non-coherent pattern that no appreciable reflected energy is allowed to build up. Transformation to the transverse mode also occurs. As the termination tapers gradually, no supersonic energy will be returned to the input thereof for a relatively long time, and by then it will be attenuated and will have lost its wave shape.

While there has been described what is at present considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention, and it is, therefore, intended to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In combination with a fused quartz medium through which supersonic waves pass, a glass terminating means tapered down to a point and curved in a pigtail-like manner.

2. In combination with a fused quartz medium through which supersonic waves pass, a cast aluminum terminating means tapered down to a point and curved in a pigtail-like manner.

3. In combination with a fused quartz medium through which supersonic waves pass, a cast magnesium terminating means tapered down to a point and curved in a pigtail-like manner.

4. In combination with a solid supersonic de-

lay line, a solid, wave-dissipating, terminating means tapered down to a point and curved in a pigtail-like manner.

5. In combination with a solid supersonic-wave transmission medium, a compressional wave transducer having one face in operative contact with a surface of said medium, and a solid, energy absorbing means having an input end in operative contact with the opposite face of said transducer, said absorbing means tapering from said input end to a point.

6. In combination with a solid supersonic-wave transmission medium, a compressional wave transducer having one face in contact with a surface of said medium, energy absorbing means having an input end operatively coupled to said transducer, said absorbing means tapering down from said input end to a point in the form of a pigtail-like curve.

7. In combination with a solid supersonic-wave medium for transmitting compressional waves of predetermined supersonic frequency, a crystal compressional wave transducer having one face operatively connected to said medium, said transducer having a thickness along its compressional axis of one-half the wavelength of said waves, and solid compressional-wave absorbing means having an acoustic impedance substantially the same as the acoustic impedance of said medium, said absorbing means comprising a curved rod

tapered to a point and having its large end operatively coupled to the opposite face of said transducer.

8. The combination set forth in claim 7, wherein said medium is made of fused quartz and said absorbing means is made of glass.

9. The combination set forth in claim 7, wherein said transmission medium is made of fused quartz and said absorbing means is made of cast aluminum.

10. The combination set forth in claim 7, wherein said transmission medium is made of fused quartz and said absorbing means is made of cast magnesium.

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