2.5×10^{-6}, and use of equation (2) with this and other appropriate values indicates that the domain size is

$$l = 0.035 \text{ mm}, \tag{21}$$

as reported above.

A check on this value can be obtained from the frequency, f_m, corresponding to the maximum of the δ vs f curve. If we use equation (16),

$$l^2{}_0 f_m/R = 0.13, \tag{22}$$

with $f = 1.5 \times 10^5$ (Fig. 11), we find $l = 0.045$ mm, in reasonable agreement. An actual photograph of domains in a single crystal of nickel, taken by H. J. Williams and reproduced in Fig. 13, shows the presence of domains of various sizes ranging from about 0.01 to 0.2 mm. Any such range in domain sizes will naturally tend to flatten the maximum of the δ vs f curve and, on account of the form of the δ vs f function, will push the maximum to a higher frequency than that corresponding to the initial slope, and will give a lower maximum value to the decrement frequency curve.

The average domain size derived from our experiments is somewhat larger than that previously obtained in 68 Permalloy.[5] This may be expected, for nickel has a very high magnetostriction and the movement of domain boundaries by stress will be relatively large, possibly so large that the regions swept over by the domain walls will correspond to whole domains of the original domain structure, when the stresses are equal to those used in our experiments. The domain size which we have determined is based on this interpretation.

APPENDIX

METHOD OF MEASUREMENT—FORMULAE

From transmission line theory (see reference of footnote 12) the ratio of outputs, r, defined in the text and applicable to the circuit of Fig. 9 is given by

$$r = \cosh \theta l_0 + \frac{1}{2}\left(\frac{Z_T}{Z_0} + \frac{Z_0}{R_T}\right) \sinh \theta l_0 \tag{24}$$

where $\theta = A + jB =$ propagation constant

$Z_0 = \dfrac{jS\rho\omega}{A + jB} =$ characteristic impedance of rod

$Z_T =$ resistive terminating impedance provided by crystals

$S =$ area of rod

This expression may be expanded into real and imaginary parts and the latter term set to zero in accordance with the condition of phase balance.

Assuming that $|Z_0| \gg Z_T$ and that $Q = \dfrac{B}{2A} > 10$, the ratio r which is now a real number determines the attenuation A in accordance with equation (13) of the text.

If the crystal resonance frequency f_c is slightly different from the balance frequency f_x obtained with the rod specimen in place, correction may be made by considering a new terminating resistance Z'_T formed by the crystal driver and a small section of the rod sufficient to make the combined resonance equal to f_x. A slightly different length, l'_0, of rod is then used to compute velocities and attenuation. Also a different mass M'_R and ratio r' result. The equation applicable provided $f_x = f_c$, is

$$\sinh Al'_0 = \frac{\pi Z'_T\,(r' - \cosh Al'_0)}{f_x M'_R} \qquad (25)$$

where

$$\begin{aligned}
r' &= \frac{r}{1 + \dfrac{Q_c}{2Q}\left(\dfrac{f_c}{f_x} - \dfrac{f_x}{f_c}\right)} \\
Z'_T &= M_c \pi f_x \left[\frac{f_c}{Q_c f_x} + \frac{1}{2Q}\left(\frac{f_c^2}{f_x^2} - 1\right)\right] \\
M'_r &= M_r\left[1 - \frac{M_c}{M_r}\left(\frac{f_c^2}{f_x^2} - 1\right)\right] \\
l'_0 &= l_0\left[1 - \frac{M_c}{M_r}\left(\frac{f_c^2}{f_x^2} - 1\right)\right]
\end{aligned} \qquad (26)$$

In the above a sufficiently accurate value of Q is ordinarily obtained by assuming $f_c = f_x$. Further accuracy, if needed, can be obtained by recalculation, using the corrected value of Q.

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