values of χ^2 and of the corresponding probabilities, the deviations from symmetry is too large to be attributed to statistical fluctuations. This is all the more obvious if the monotonic character of most obtained angular distributions is taken into account. This character is particularly pronounced at $R > 12\ \mu$ and $R > 18\ \mu$. The nuclear emulsion method used in the experiment is quite simple, thoroughly investigated, and verified in many other measurements, and in this concrete case we see likewise no flaws in the experimental procedure, capable of imitating the registered asymmetry of the angular distribution of the electrons.

SLOWING DOWN OF DISLOCATIONS IN FERROMAGNETS

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Dislocations moving in ferromagnetic materials should be slowed down by the interaction between the deformations accompanying them with the spin waves. Some of the losses are connected with the scattering of the "thermal" spin waves and can be described in the same manner as the slowing down of phonons. More interesting, in our opinion, is another loss mechanism, brought about by generation of spin waves by the moving dislocation. The generation condition, as usual, is that the dislocation be faster than the phase velocity V_s of the spin wave. Owing to this condition, this contribution to the deceleration force should have a velocity threshold. The threshold velocity V_s can be altered by means of an external magnetic field H_0, for it is known [1] that $V_s \sim \beta + (H_0/M_0)$, where β is the anisotropy constant and M_0 is the density of the magnetic moment. Therefore when $H_0 \gg M_0$ the value of V_s increases to such an extent that the process of spin-wave generation is interrupted and the corresponding part of the dislocation deceleration vanishes. This circumstance can be used for an experimental observation of the deceleration, since a sudden disappearance of part of the deceleration forces can become manifest in the form of a jump on the stress-strain diagram of the sample.

The purpose of the present investigation was to analyze the aforementioned threshold mechanism of deceleration in ferromagnets. The calculation is carried out in the macroscopic approximation and consists of determining the force exerted on the dislocation by the magnetoelastic coupling. To this end, we use the law of conservation of the energy of the ferromagnet. The energy density W includes elastic, magnetoelastic, and electromagnetic components. They have the usual form (cf., e.g., [1, 2]), but allowance for the dislocations requires, as is well known, the replacement of the deformation tensor $\partial u_k/\partial x_j$ by the elastic-distortion tensor w_{ik}, which is not expressed in terms of derivatives of the vector $\vec{u}$ (of the geometric displacement of the medium) with respect to the coordinates, owing to the presence of plastic deformation [3]. Allowance for the plastic deformation makes it possible to connect w_{ij} with the velocity of the medium $\vec{v} = \dot{\vec{u}}$ [3]:

$$\frac{\partial w_{ij}}{\partial t} = \frac{\partial v_j}{\partial x_i} + J_{ij} \, . \qquad (1)$$

Here J_{ij} is the dislocation flux density given, in the case of a single dislocation characterized by a tangential vector $\vec{q}$, a Burgers vector $\vec{b}$, and a velocity $\vec{V}$, by

$$J_{il} = [q \times V]_i b_l \delta(\vec{\xi}), \tag{2}$$

where $\vec{\xi} \perp \vec{q}$ is the radius vector defining the position of the given point of the dislocation line in space.

It is necessary to take into account in W the energy of the moving dislocation, consisting of the proper energy of the dislocation lines and of the kinetic energy of their motion under the influence of the external stress. Being interested only in the loss to radiation of spin waves, we shall not take into account here the dissipation processes accompanying the motion of the elastic medium and the magnetic moment. Therefore the time variation of W should reduce to the spatial divergence of the energy flux density. When $\dot{W}$ is transformed in this manner, the effective field H in the equation of the magnetic moment, and the stress tensor σ_{ij} in the equation of motion of the elastic medium, are both determined in the usual manner. We do not present here these expressions, for they differ from those customarily employed in the analysis of coupled magnetoelastic waves (cf., e.g., [1]) only in that the deformation tensor is replaced by w_{ij}. Besides H and σ, the transformation of $\dot{W}$ with allowance for (1), (2), and the equation of motion of the dislocation makes it possible to find the deceleration force I per unit path length. Leaving out the intermediate steps, which are analogous to those given in [4], we present the final result:

$$F = q \times \vec{\Sigma}; \qquad \Sigma_l = \sigma^u_{il} b_l \,, \tag{3}$$

where σ^u is the "elastic" part of the stress tensor contained in the equation of motion of the medium (the volume force in the latter includes also the gradient of the field stress tensor [1] $\sigma^m_{ij} = (1/4\pi)(H_i B_j = (1/2)H^2\delta_{ij})$. The expression for σ^u, which we do not write out here for brevity, depends both on the distortion w and on the magnetic moment μ.

Let us outline the subsequent course of the solution and present the main results. We consider for simplicity a single uniformly-moving straight-line dislocation (in (2) this corresponds, for example, to $\vec{q} \parallel z$, $\vec{V} \parallel x$, $\delta(\xi) = \delta(x - Vt)\delta y$). We use the Fourier expansion in terms of the coordinates x and y ($w, \mu, v \sim \text{esp}\ i(k_x x + k_y y)$), and obviously the time dependence is determined by the factor $\exp(-itk_x V)$, i.e., the role of the frequency is played by $k_x V$. From the equation of motion we determine a system of inhomogeneous algebraic equations for the Fourier components μ, v, and w. The determinant of this system has roots $\omega = f(k)$, which determine the spectrum of the waves in the ferromagnet; in our case, owing to the equality $\omega = k_x V$, the corresponding poles of the expressions for μ, v, and w appear only when $V > (f(k)/k)$, the phase velocity of the wave. Obviously, this condition can be satisfied only for the spin-wave branch of the spectrum. We do not take into account the dissipation processes, and therefore a contribution to the deceleration force (3) exists only in the presence of the aforementioned poles, i.e., when the conditions for Cerenkov generation of spin waves are satisfied. By way of an estimate, let us consider the case of a uniaxial ferromagnet in an external field parallel to the easy magnetization axis $\vec{n}$. For a screw dislocation with $\vec{q} \parallel \vec{n}$ we obtain for the deceleration force per unit dislocation length

$$F = -\frac{b}{2\pi} M_0^2 \frac{\left(\gamma + \frac{H_0}{M_0}\right)^2}{\beta + \frac{H_0}{M_0}} \frac{\operatorname{arc\,tg} a}{a} \theta(a - 1), \tag{4}$$

$$a = \frac{V}{b\omega_s}, \quad \theta(x) = \begin{cases} 1, & x > 0 \\ 0, & x < 0 \end{cases}. \qquad (4)\ \text{(Cont'd.)}$$

Here γ and β are the parameters of magnetoelasticity and anisotropy, $\Omega = gM_0$, and $\omega_s = \Omega[\beta + (H_0/M_0)]$. When $\vec{q} \parallel \vec{n}$ the edge dislocation does not experience deceleration. In the case when $\vec{q} \perp \vec{n}$ the values of the force differ little from (4) for either a screw or an edge dislocation. Formula (4) was derived for $V \ll s$, where s is the speed of sound; in this case the dispersion of the elastic moduli can be disregarded.

For typical values of the parameters, $b \sim 10^{-7}$ cm, $M_0 \sim 10^3$ G, $\Omega \sim 10^{10}$ sec^{-1}, $\gamma \sim 1$, and $\beta \sim 1$, the threshold velocity is $V_s = b\omega_s \sim [1 + (H_0/M_0)] \times 10^3$ cm/sec; at the threshold we have $F \sim -[1 + (H_0/M_0)](10^{-1} - 10^{-2})$ dyne/cm. We note that the force of the electronic deceleration of dislocation has a similar value at $V \sim 10^3$ cm/sec [4]. It is observed experimentally in transitions to the superconducting state, when this force vanishes. We can therefore expect the here-considered observation of the mechanism of loss to spin waves to be experimentally feasible.

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EXPERIMENTAL VERIFICATION OF SIMILARITY THEORY AT THE CRITICAL POINT OF Ar

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Attempts to compare experimental results on critical phenomena with similarity theory [4] have been made in [1 - 3]. Most authors conclude that the agreement is satisfactory.

We think, however, that a comparison of the theory with experiments in which different exponents are determined by different investigators (and all the more in different laboratories) is incorrect. Indeed, all the relations in similarity theory are determined by degrees of the relative temperature $t = |(T - T_{cr})/T_{cr}|$, and are highly sensitive to the absolute values of T_{cr}. The "scaling" equations include both large exponents (on the order of unity, for example γ), and small ones (on the order of 0.1, for example α). As a result of the accumulation of the errors of each author and the addition of errors due to the different choices of T_{cr} (which can differ by several hundredths of a degree in different laboratories, since the matching of the different scales is of this order), the total error may turn out to be larger than the smaller exponent. Then the verification becomes completely meaningless, as indeed it was in most cases. To determine the small indices it is necessary to perform different experiments pertaining to one value of T_{cr} and characterized by identical systematic errors. To this end we investigated the coexistence curve of