$$\begin{cases} \dfrac{\mathcal{J}_0^2(2c_1)}{2(a-1)} + \sum\limits_{k=1}^{\infty} \mathcal{J}_k^2(2c_1)\dfrac{a-1}{(a-1)^2-144k^2} = 0 \\[2ex] \dfrac{\mathcal{J}_0^2(2c_2)}{2(a+1)} + \sum\limits_{k=1}^{\infty} \mathcal{J}_k^2(2c_2)\dfrac{a+1}{(a+1)^2-144k^2} = 0. \\[2ex] \dfrac{\mathcal{J}_0^2(c_1+c_2)}{2a} + \sum\limits_{k=1}^{\infty} \mathcal{J}_k^2(c_1+c_2)\dfrac{a}{a^2-144k^2} = 0 \end{cases} \tag{14}$$

One of the solutions of the system (14) is $2c_1 \approx 2.3$, $2c_2 \approx 2.5$, $\alpha \approx 0.02$.

For solutions of the type (13) we have $\beta_a \sim \varepsilon^3$. For example, if we grow a crystal in which the inhomogeneous ML shift due to a random perturbing magnetic field does not exceed $\Delta\omega = 10^3$ sec, then by placing the crystal in an alternating magnetic field corresponding to the solution (13) with $T = 10^{-6}$ sec we could decrease the line width by 5 - 6 orders of magnitude.

The case considered here can, of course, not be regarded as proof that the ML width can be decreased in more realistic crystal models in which other broadening and inhomogeneous-shift mechanisms besides the magnetic-dipole one are taken into account. It should be noted, however, that formulas of the type (1) and (9) remain in force for all broadening mechanisms, so that the problem of choosing an external electromagnetic field that minimizes the quasienergy dispersion is meaningful for any crystal model.

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1) With the exception of the so-called "monopole" inhomogeneous shift.

2) The idea of "time averaging" the dipole-dipole interaction for a laser based on Mossbauer isomers was advanced in [2]; see [7] concerning EPR line narrowing.

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## STATIONARY "POTENTIAL WELL" FOR PLASMA IONS

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It is shown experimentally that a stationary "potential well" can be produced for the ions of a plasma produced in crossed axially-symmetric electric and magnetic fields of "mirror" geometry with a stabilizing magnetic field of opposite sign. The well "depth" reaches -700 V, or as much as 60 - 65% of the applied voltage.

It was shown theoretically in [1] that in a plasma placed in an exter-nal field the magnetic induction lines become exponential if the electron Larmor radius is much smaller than the characteristic dimension of the field, and the current density in the plasma is low. Under these conditions it is possible to produce in the plasma fields of various configurations. There are known applications of this possibility in stationary plasma accelerators with closed electron drift [2] and for plasma focusing [3]. The operating principle of a multicell magnetoelectric plasma trap with self-recuperation of the ion energy is described in [4, 5]. We present below the results of the first experiments on the creation of a stationary "potential well" for plasma ions in the central cell of a five-cell model of such a trap (Fig. 1). Here 1 - coils producing a magnetic field of mirror geometry in each cell, 2 - coils producing an oppositely directed stabilizing magnetic field coaxial with the mirror field, 3 - two symmetric groups of six coaxial conical ring electrodes each, having small radii (3, 9, 15, 21, 27, and 33 mm) and surface slopes that coincide with the slopes of the magnetic induction lines at their locations, 4 - analogous groups of end electrodes, 5 - grounded cylindrical boxes of nonmagnetic metal. The model was placed inside a vacuum chamber with continuous pumping of the working gas fed into the central box 5 (argon, hydrogen).

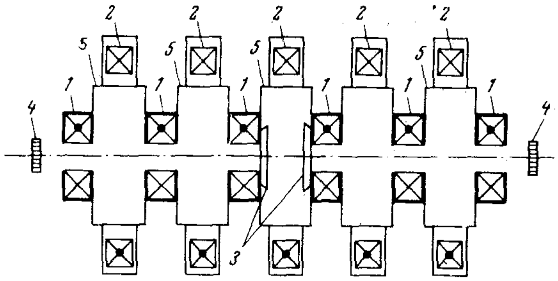

Fig. 1

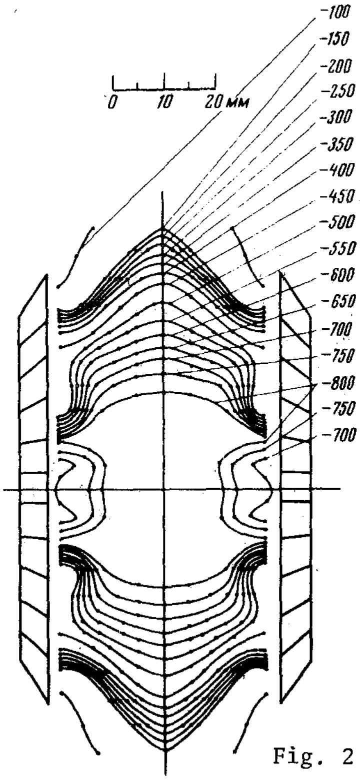

Fig. 2

If the potential distribution over the rings 3 is linear, the outer rings are grounded, the inner ones have the most negative potential (-U), and the ratio of the currents $(I_1/I_2)$ in coils 1 and 2 is such that the diameter of the peripheryo of the zeroth magnetic field is commensurate with the distance between the centers of the neighboring coils 1, then a stationary axially-symmetrical plasma formation, whose central section glows brightly, is produced in the central box 5. The distribution of the potential in this formation was measured with a "floating" probe of 0.05 mm diameter and 1 mm length, which was moved along and across the formation. Figure 2 shows this distribution in the axial section of a hydrogen plasma at U = -1250 V, $I_1/I_2 = 5.4$, $I_1N_1 = 2 \times 10^4$ ampere-turns, and a hydrogen pressure $1.2 \times 10^{-5}$ Torr in the chamber. We see that the depth of the "potential well" is about 700 V, i.e., more than 50% of the applied voltage. In the optimal cases this value reached 60 - 65%. The central zone of the "potential well," with approximate radius 15 mm, was equipotential in this regime. Figure 3 shows the dependence of the depth of the "potential Well" on the applied voltage (-U) at different pressures: 1 - $1.1 \times 10^{-5}$, 2 - $1.4 \times 10^{-5}$, 3 - $2.5 \times 10^{-5}$ Torr, at the same value of $(I_1N_1)$, and at $I_1/I_2 = 4.2$. We see that when U and the pressure are decreased, the depth of the "potential well" increases with decreasing level of the potential oscillations, and the minimum level of these oscillations is reached in each regime at a definite ratio $(I_1/I_2)$.

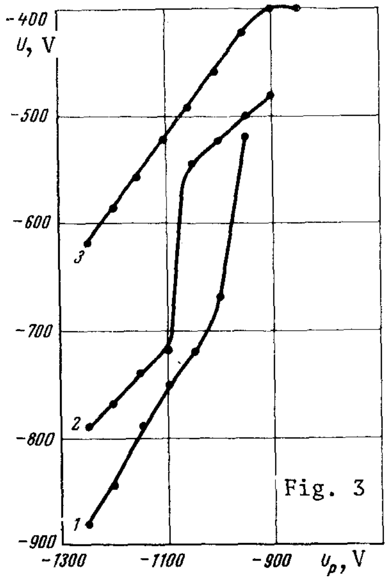

Fig. 3

It follows from the foregoing experimental data that, in accord with the theory, it is actually possible to realize in a plasma a stationary "potential well" for ions near -700 V, as a result of which the ions should be accelerated as they move to the center of the well and be decelerated on moving away from the center, executing stochastic oscillations within the corresponding equipotential surfaces.

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# MECHANISM OF THE SO-CALLED "ANOMALOUS" PHOTOCONDUCTIVITY

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I. Results of an investigation of the photoconductivity of amorphous selenium suitably treated in mercury vapor were presented in 1961 in [1]. It was found that the characteristics of the photoconductivity of this substance differ radically from all the previous data, and on this basis the observed photoconductivity was called "anomalous." The main features of the anomalous conductivity reduce to the following: 1) The stationary photoconductivity does not depend on the light intensity in a very wide range (many orders of magnitude) of the intensity and is determined only by the wavelength of the employed light. The maximum of the sensitivity is shifted in this case to the long-wave side relative to the intrinsic absorption edge. 2) The photoconductivity relaxation time is inversely proportional to the light intensity and is therefore very large (practically unmeasurable) after the light is turned off.

Detailed quantitative characteristics of anomalous photoconductivity are described in Korsunskii's 1972 monograph [2], where he presents also an interesting phenomenological model. This model, however involves the artificial assumption that certain local centers (called U-centers) having distinct properties are present in the forbidden band of the semiconductor.

We propose here an anomalous-photoconductivity model based on a perfectly realistic structure. All the features of anomalous photoconductivity follow from this model in natural fashion.

II. The anomalous photoconductivity should set in when light is absorbed by the free carriers (say, electrons) if there exist in the semiconductors two regions with different electron densities, separated by a potential barrier (Fig. 1)[1].

Indeed, the measured conductivity between contacts 1 - 1' or 3 - 3' placed on any of the electronic regions should change after illumination, since the electrons of regions I and III can, after absorbing the light, overcome the potential barrier, as shown by the arrows of Fig. 2. As a result, since the electron transitions from left to right and from right to left are in general not equal in intensity, the conductivities of regions I and III will change, and furthermore in opposite directions, i.e., positive photoconductivity is produced in one region and negative in the other. This photoconductivity has the above-mentioned characteristics of the "anomalous" photoconductivity.

Indeed, the change in the number $N_1$ of the electrons, say in region I, is determined by oppositely directed flows of electrons above

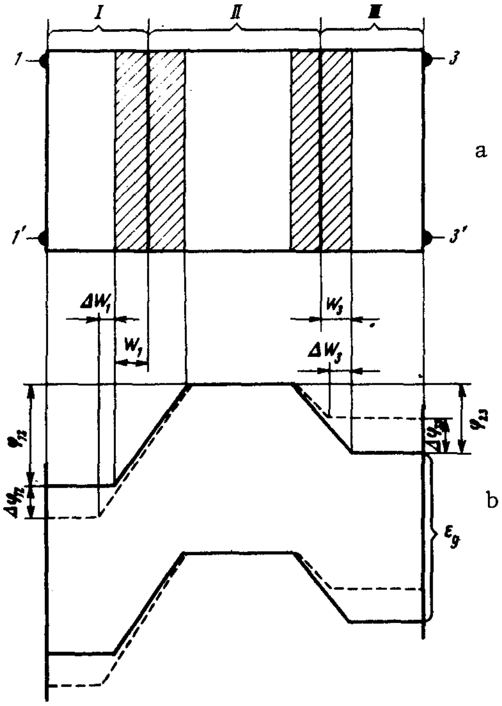

Fig. 1. Model of "anomalous" photoconductor: a) geometry; b) level scheme. Solid lines - prior to illumination, dashed - changes due to illumination.