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Piezoelectric Lock Mechanism Resists Lockpicking

Most lock mechanisms which operate by response to electrical codes can be circumvented if a voltage is applied or a circuit is closed at the proper point. Furthermore, electrical memory circuits used in the coding operations are generally sensitive to high magnetic fields which may destroy the memory. Electrical codes may be deciphered with sufficiently sophisticated techniques, or the circuitry may be damaged by the application of undesirable electrical impulses.

Electrically coded piezoelectric lock mechanisms that have been developed are free of these problems. Their codes are extremely difficult to circumvent because the operator must know in which polarity to apply power from an external source to each of the piezoelectric elements. (For 10 active elements, the number of possible combinations is almost 1,000,000.) The lock mechanisms are rugged, have few moving parts, are resettable, and are relatively unaffected by high magnetic fields. Random trial-and-error attempts to open a piezoelectric lock make its operation progressively more difficult.

Piezoelectric materials, especially ferroelectric and antiferroelectric ceramics, are subjected to high-mechanical stresses under electrical fields. The associated dimensional changes (strains), while quite small, permit the blocking or release of tightly fitting pieces of the strain elements made of these materials. These characteristics provide the basis for the construction of simple, electrically controlled lock mechanisms which incorporate either ferroelectric or antiferroelectric locking elements.

Ferroelectric locking elements have a built-in memory. The electrical release code can be varied by changing their polarization. Locks with antiferroelectric elements are easier to build than those with ferroelectric elements and require a minimum of machining accuracy, but they have no memory. To effect a combination change in an antiferroelectric lock requires either mechanical disassembly or a change of the wiring. The strains obtainable with the antiferroelectric locking elements are much greater than those with ferroelectric elements.

Notes:

1. Detailed descriptions of these locks are given in U.S. Patent No. 3,390,559, available for 50 cents from the Commissioner of Patents, Washington, D.C. 20231.
2. Inquiries concerning this invention may be directed to:

   Sandia Office of Industrial Cooperation
   Org. 3416
   Sandia Laboratories
   Albuquerque, New Mexico 87115
   Reference: B69-10281

Patent status:

Inquiries about obtaining rights for commercial use of this invention may be made to:

Mr. Dudley W. King, Chief
Albuquerque Patent Group
U.S. Atomic Energy Commission
Albuquerque Operations Office
P. O. Box 5400
Albuquerque, New Mexico 87115

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Category 01