Nov. 14, 1950 V. E. COOLEY 2,529,487

ROTOR ASSEMBLY

Filed March 13, 1944

FIG. 1.

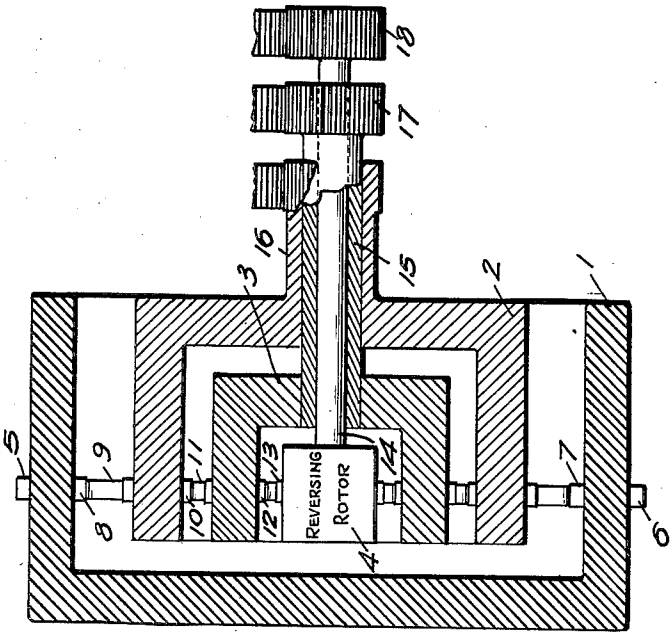


FIG. 3.

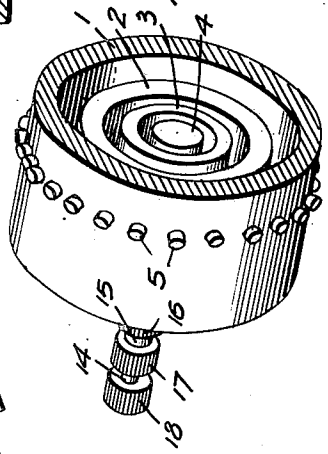
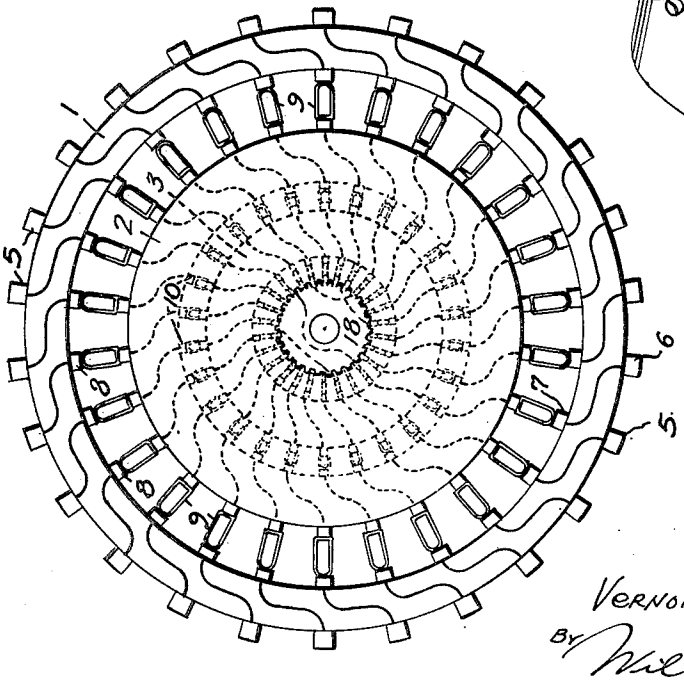


FIG. 2.



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ROTOR ASSEMBLY

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5 Claims. (Cl. 35—4)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment of any royalty thereon.

This invention relates to cryptographic devices, and more particularly to improvements in rotors used in such devices.

In certain electromechanical cryptographic devices, a plurality of rotors are mounted on a common shaft side by side in a row. This arrangement necessitates a relatively large casing which is a disadvantage to military personnel in the field considering the various other equipment it is necessary to carry.

It is, therefore, an object of this invention to provide a novel arrangement of rotors of a cryptographic device whereby a relatively small casing is required.

A further object is to provide in a cryptographic device an arrangement whereby a plurality of rotors are nested so that they occupy no more space than is usually required for one rotor.

These and other objects are attained by the novel arrangement and construction hereinafter described and illustrated in the accompanying drawings, forming a part hereof, and in which:

Fig. 1 is a sectional view of a rotor arrangement embodying the invention,

Fig. 2 is plan view of the arrangement shown in Fig. 1, and

Fig. 3 is a perspective view of the rotor arrangement, certain elements being broken away to illustrate the construction to better advantage.

Referring to the drawings, in Fig. 2 there is shown a casing 1, cup-shaped and preferably made of a plastic insulating material or the like. Positioned in the casing 1 is a rotor 2, which has nested therein a second rotor 3, and the latter has nested therein a third rotor 4, the several rotors being spaced from each other.

Protruding from the outer surface of casing 1 are a signal input contact 5 and a signal output contact 6. On the inner surface of the casing 1 are contacts 7 and 8 which are electrically connected respectively to contacts 6 and 5. The outside of casing 1 is provided with 26 contacts, such as contacts 5 and 6, to represent the 26 letters of the alphabet, and the inside of the casing is also provided with 26 contacts such as contacts 7 and 8. The output contact 6 need not be diametrically opposite contact 5 as shown in Fig. 2, but may be any one of the 26 contacts on the outside of casing 1. As shown in Fig. 2, the contacts on the outside of the casing are not connected to immediately opposite contacts on the inside of the

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casing, but are connected to contacts spaced therefrom. The order of connecting the outside contacts with the inside contacts need not be regular, and preferably is irregular.

It will thence be understood that the expressions "input" and "output," as applied to the electrical contacts above-mentioned, relate to function rather than to structure, and an input contact in one enciphering operation may be an output contact in the following operation.

Each of the rotors 2, 3, 4 is provided with 26 brushes on the outside thereof to engage contacts on the inside of the adjacent rotor, the contacts on the outside of each rotor being electrically connected in an irregular manner to contacts on the inside of that particular rotor. Rotor 4, of course has no inside surface, and the contacts on the outside of the rotor 4 are connected in various manners electrically to other contacts on the outside of rotor 4. A few connections are shown schematically in Fig. 2.

Rotor 2 is connected to a tubular shaft 16 in which is telescoped a tubular shaft 15 connected to rotor 3, and a solid shaft 14 is connected to rotor 4. Attached to shafts 14 and 15 are gears or other means 18 and 17 of the same diameter as tubular shaft 16 so that all of the shafts can have the same angular rotation. Means are provided to apply stepping impulses to the shafts, and if desired, one of the shafts can be arranged to have rotation in an opposite direction to that of the other shafts. However, the shafts can be rotated by any well known means which form no particular part of this invention.

In operation, when a signal is applied to an input contact on the outside of casing 1, it passes to rotor 2 and thence to rotor 3, which rotors rotate in the same direction, and thence to rotor 4, which may rotate in an opposite direction. The signal is passed through rotor 4 and then back through rotors 3 and 2 to the output contact on casing 1. In this manner, a succession of intelligible letters (plain text) is modified into a succession of scrambled unintelligible letters (ciphered text); with the use of the same or another similar cryptographic machine, the cipher text can be reconverted into plain text.

From the above description, it will be seen that there has been provided a simple and effective arrangement of rotors for use in cryptographic devices. The rotors can be readily nested within each other and thus require relatively little space.

The above description is to be considered as illustrative and not limitative of the invention, of

which obviously modifications can be made without departing from the scope of the appended claims.

The invention having been described, what is claimed is:

1. In a cryptographic device, a cylindrical casing having a plurality of spaced contacts about its periphery, and a plurality of cylindrical rotors nested in the casing, each of said rotors having a plurality of spaced contacts about its periphery, the contacts on the rotors and casing lying in the same plane.

2. In a cryptographic device, a cylindrical casing, a plurality of electrical contacts therein, and a plurality of cylindrical rotors telescoped within the casing, each of said rotors being provided with a plurality of electrical contacts, the contacts of one of said rotors contacting severally the said first-mentioned contacts and the contacts of each rotor contacting severally the contacts of another rotor.

3. In a cryptographic device, a hollow cylindrical casing, a first hollow cylindrical rotor having a first tubular shaft, a second hollow cylindrical rotor having a second tubular shaft telescoped in the first tubular shaft, a third cylindrical rotor having a shaft telescoped in the second tubular shaft, said rotors being telescopically arranged and positioned within the casing, and means for making electrical connections between a plurality of points on said rotors.

4. In a cryptographic device, a hollow cylindrical casing have a plurality of spaced contacts about its periphery, and a plurality of hollow cylindrical rotors telescopically arranged in the casing, each of said rotors having a plurality of spaced contacts about its periphery, the contacts on the casing and the rotors lying in the same plane, and means for making electrical connections between said contacts.

5. In a cryptographic device, a hollow cylindrical casing, a plurality of hollow cylindrical rotors telescopically arranged in the casing, and means for making electrical connections between a plurality of points on said rotors.

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