Dec. 5, 1933. W. KORN 1,938,028

ELECTRICAL CODING AND DE-CODING DEVICE

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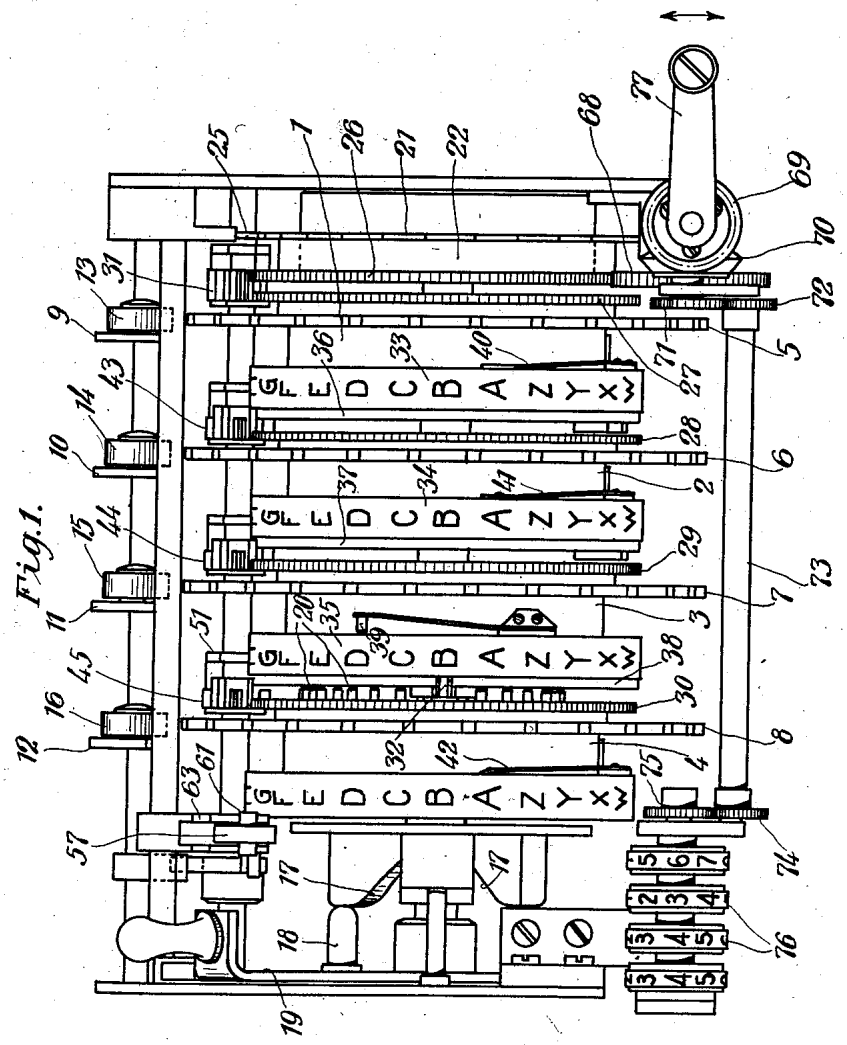
Fig. 1.



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ELECTRICAL CODING AND DE-CODING DEVICE

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Fig. 2.

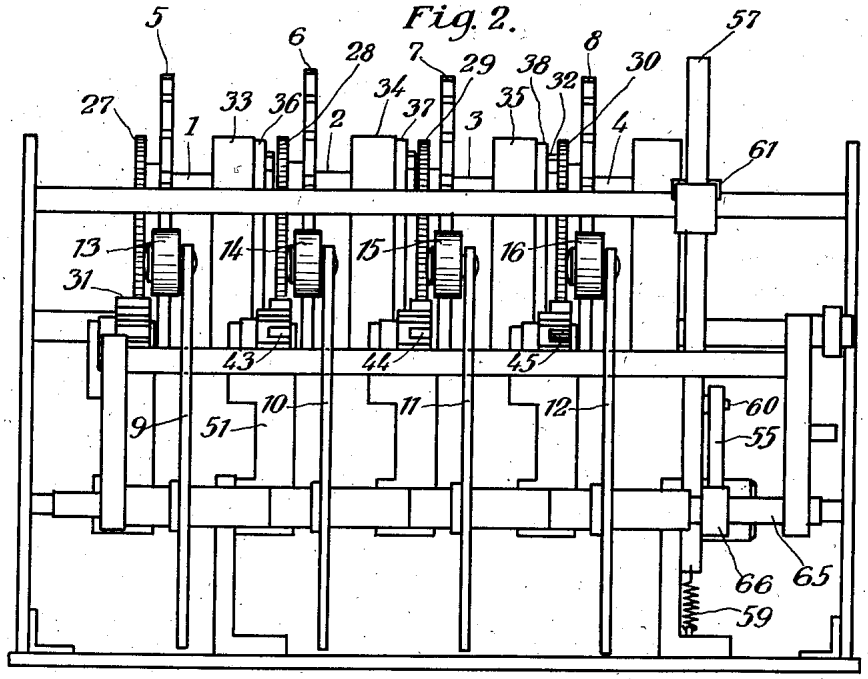


Fig. 3.

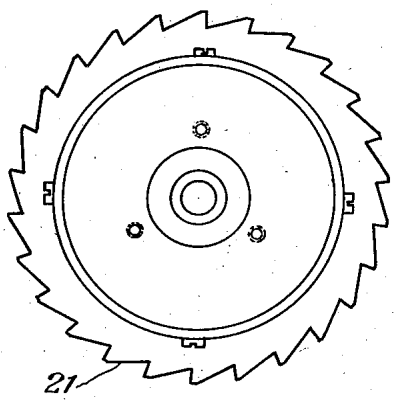
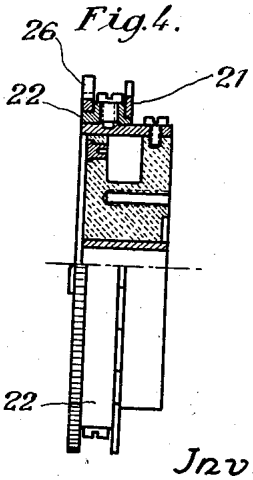


Fig. 4.



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ELECTRICAL CODING AND DE-CODING DEVICE

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Fig. 2.

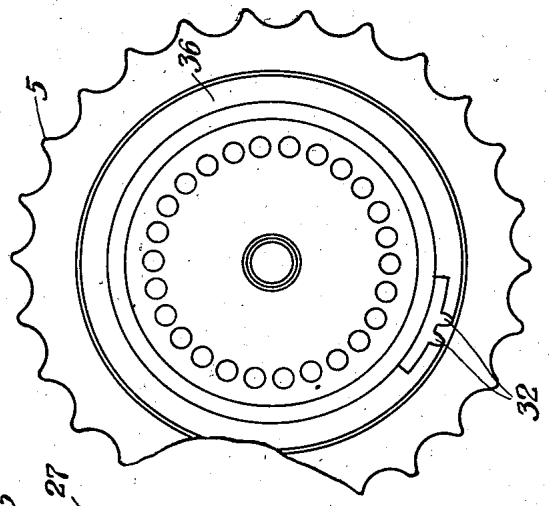


Fig. 5.

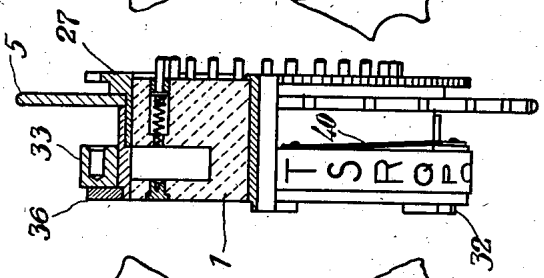
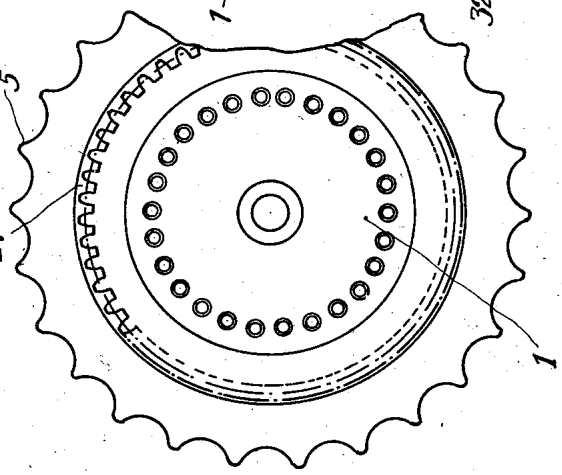


Fig. 6.



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ELECTRICAL CODING AND DE-CODING DEVICE

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Fig. 8.

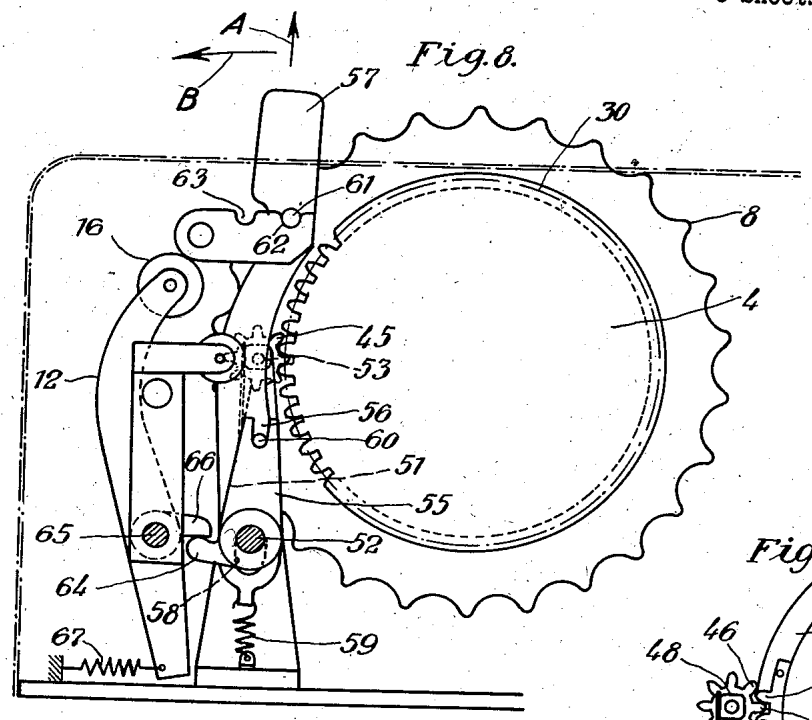


Fig. 10.

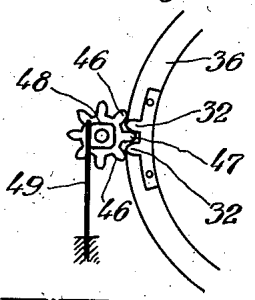
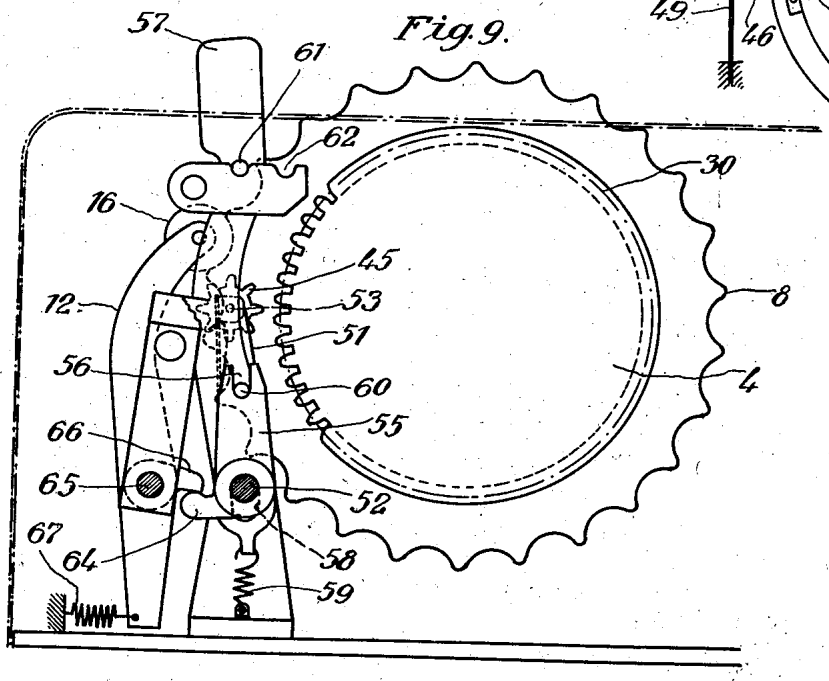


Fig. 9.



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ELECTRICAL CODING AND DE-CODING DEVICE

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Fig. 11.

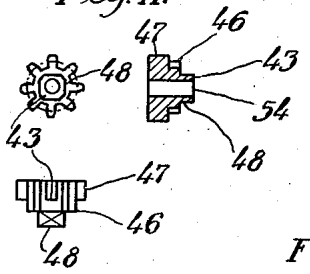


Fig. 12.

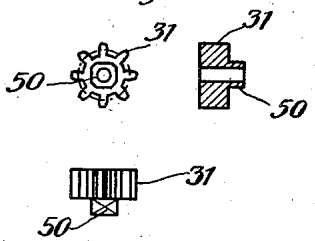
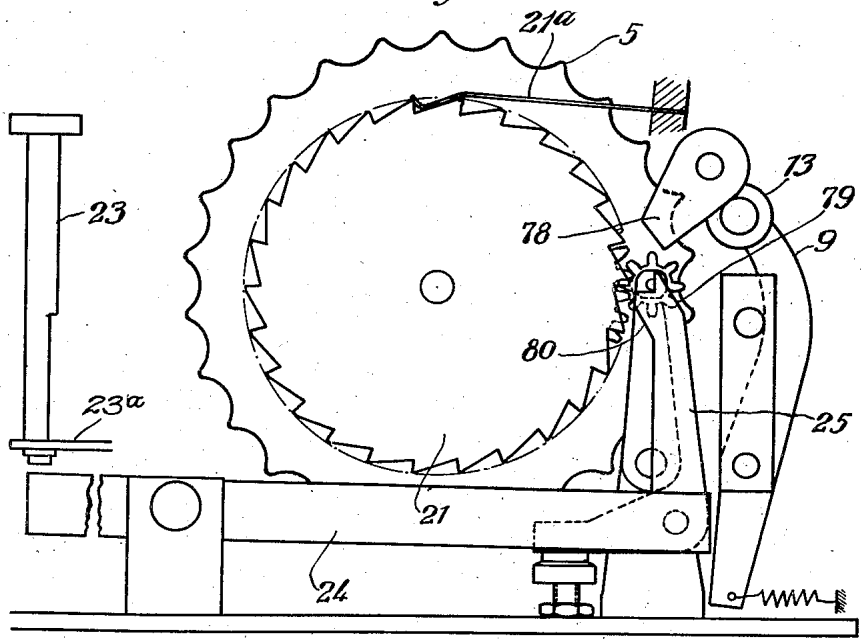


Fig. 13.



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ELECTRICAL CODING AND DE-CODING DEVICE

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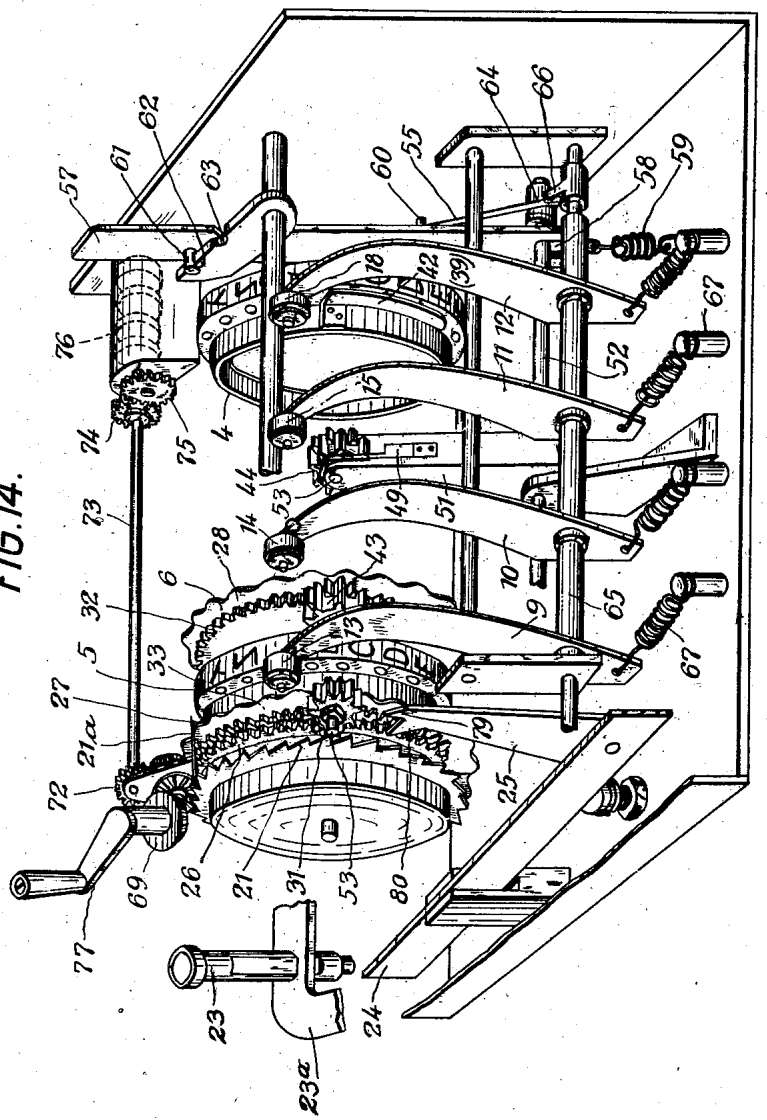
FIG. 14.



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UNITED STATES PATENT OFFICE

1,938,028

ELECTRICAL CODING AND DE-CODING DEVICE

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Application November 5, 1929, Serial No. 405,000, and in Germany November 8, 1928

7 Claims. (Cl. 35—13)

Electrical devices for coding and decoding are known, in which individual coding cylinders touch one another by means of electrical contacts, and are rotatably arranged between end cylinders, and contain the paths for the electric current. During the coding these cylinders are displaced relatively to one another in two different ways. Either ratchet wheels are secured to the individual coding cylinders, into which ratchet wheels there drop pawls partly at each depression of a key and partly at definite positions of the individual cylinders, and move the cylinder in question forward through a distance corresponding to one ratchet tooth, or else gapped toothed wheels are provided which, for the purpose of prolonging the coding period, preferably present a prime number division and engage in corresponding rings of teeth on the coding cylinders. In this case sometimes one cylinder, sometimes the other cylinder and sometimes several simultaneously are moved forward aperiodically one step.

The first-mentioned construction has the disadvantage that the coding cylinders are only coupled to one another in one direction of rotation. Now if the person coding or decoding thinks, after effecting a rather long coding or decoding operation, that he has made some mistake, he must go back to the code key adjusted at the beginning of the coding or decoding operation, i. e., by adjusting the rollers, must set this key afresh or in other words he must rotate the cylinders back again and begin the coding or decoding afresh from the start. It is, on the other hand, not possible for him to go back only to the source of error, since he does not know the key which was adjusted just at the source of error.

When employing gapped toothed wheels for actuating the coding cylinders the coding key consists not only of a certain position of the coding cylinders relatively to one another but also of a definite position of the gapped toothed wheels for driving the coding cylinders. Consequently the given position of these gapped toothed wheels must be visible externally and adjustable from the outside. This, however, involves a comparatively complicated piece of apparatus, which in itself is expensive and makes the device considerably larger. The device is, however, thereby made useless for many purposes where it is above all a question of transportation and storage of the device in a small space.

The present invention overcomes these disadvantages and provides an appliance which fulfils the most exacting demands of coding technology.

The invention is illustrated, by way of example, in the accompanying drawings in which

Figure 1 is a plan of the most important parts of the device,

Figure 2 a back view of these parts,

Figure 3 a view of a detail,

Figure 4 a partial side elevation and section through this detail,

Figure 5 a partial section and partial side elevation of another detail,

Figure 6 a partial elevation thereof from one side,

Figure 7 a partial elevation thereof from the other side,

Figure 8 an elevation view of driving members for the coding cylinders in a coupled condition,

Figure 9 a view of these members in an uncoupled condition,

Figure 10 an elevation view of details of this drive,

Figure 11 a detail view of the drive of the coding cylinders in side elevation, plan and cross-section,

Figure 12 a detail, in side elevation, plan and cross-section of the drive of that coding cylinder from which the feeding of the other coding cylinders is obtained,

Figure 13 an elevation view of details which illustrate the blocking of the drive of that coding cylinder from which the feeding of the other coding cylinders is obtained, and

Fig. 14 is a detail perspective view of details with parts omitted.

In these drawings 1, 2, 3 and 4 denote coding cylinders, 5, 6, 7 and 8 denote notched wheels rigidly connected with these coding cylinders, and 9, 10, 11 and 12 denote check levers, with check rollers 13, 14, 15 and 16. The latter are adapted to enter the notches in the notched wheels and thereby to hold the coding cylinders firmly in their contact positions. 17, 17 are inclined planes on the coding cylinder 4, upon which there act pressure pins 18 on a rocking lever 19. This device serves to press the individual coding cylinders against one another for coding purposes, and to keep them in the contact position, whereas during the rocking of the lever 19 the individual coding cylinders are released from one another so that they can be taken out of the apparatus.

20, 20 are contact pins by which the coding cylinders come into contact with one another, this being only shown in Figure 1 for the sake of simplicity, between the cylinders 3 and 4.

21 is a ratchet wheel for driving that coding cylinder from which the feeding of the other

coding cylinders is obtained. 21a is a spring by which the ratchet wheel is always maintained in a position corresponding to the division of the ratchet wheel. This ratchet wheel may be secured to the said coding cylinder. In the example of construction illustrated, however, this ratchet wheel 21 is, according to the invention secured to an independent wheel body 22. 23, 23 are keys for signalling apparatus, which act through levers 24 and a pawl 25 upon the ratchet wheel 21, as shown for example more particularly in Figures 3, 4, 13 and 14. The keys are guided in a guiding strip 23a.

The spring arm 21a suitably mounted on a part of the machine engages the teeth of the wheel 21.

The independent wheel body 22 also carries, besides the ratchet wheel, a toothed wheel 26, the division being preferably so selected that the divisions of this toothed wheel are twice as great as those of the ratchet wheel 21. Each of the individual coding cylinders has a respective toothed wheel 27, 28, 29 or 30 connected with it. Each feeding step of the independent wheel body 22, upon depression of a key 23, is transmitted by a pinion 31 through the toothed wheel 27 to the coding cylinder 1, so that the latter is moved one step at each depression of the key.

Each of the coding cylinders, with the exception of the last coding cylinder 4, which may be constructed for example as a so-called reversing cylinder, that is to say a cylinder in which the electric current is reversed and led back again through the system of cylinders, is equipped with two single teeth 32 arranged in pairs, as shown in Figs. 1, 7 and 10. These paired teeth are fitted to rings 36, 37 and 38, the purpose of which will be further explained below. These rings, with the two single individual teeth, are connected with the coding cylinder in question.

In the case of the constructional example illustrated, special signalling rings 33, 34 and 35 are rotatably and clampably arranged upon their coding cylinders, this being provided by means of a resilient catch pin 39 entering deeply from the side into corresponding apertures in the signal rings and only releasable by a distinct manual operation, as shown for the coding cylinder 3 in Figure 1, the pin being drawn out for the sake of clearness. For the operative condition the catch pin has obviously entered the corresponding holes in the signal rings, as shown at 40, 41 and 42. By the adjustability of the signal rings 33, 34 and 35 it is possible to alter the indication of the electrical connections, as they exist in any code cylinder.

In the case of the individual feed steps of the coding cylinder 1, the further feeding of the other coding cylinders is effected by means of toothed pinions 43, 44, and 45. These pinions have long teeth 46 and short teeth 47 distributed alternately round their peripheries (Fig. 11). These pinions also exhibit a square portion 48, against which there bears a spring 49. The object of this device is to hold the pinions fast in a definite position of engagement when the coding cylinders are removed from the apparatus.

The pinion 31 also comprises a similar square portion 50, likewise with spring locking means. The short teeth of the toothed pinions engage permanently in the teeth of the toothed wheels 28, 29 and 30, and are adapted to enter the gaps between the individual teeth 32. The long teeth on the other hand slip upon the rings 36, 37 and 38. In this way rotation of the pinions is prevented and therefore each succeeding coding cylinder is locked in its position. Only when the gap between the individual teeth 32, and a gap simultaneously present here in the rings 36, 37 and 38, comes into the region of the pinions is a rotation thereof possible and therefore also a rotation of the succeeding cylinders.

Furthermore, according to the invention the toothed pinions, for the purpose of connecting the coding cylinders with one another or with the independent wheel body, are coupled to the check levers in such a way that from time to time either only the toothed pinions or only the check levers are in engagement with the coding cylinders. This is particularly illustrated in Figures 8 and 9 for the coding cylinder 4. The toothed pinion 44 is for this purpose supported by a lever 51 which is rigidly connected with a shaft 52. At 53 is indicated a supporting pin which engages in a corresponding aperture 54 in the pinion. With this shaft 52 is likewise rigidly connected a lever arm 55, which has a slot 56. A lever 57 is slidably supported upon the shaft 52 for which purpose a slot 58 is provided in the lever. The lever is subjected to the action of a tension spring 59. The lever is also connected by a pin 60 with the lever arm 55, and has a check pin 61 which can engage in notches 62 or 63 of a member which is secured to the casing wall of the device. By means of these notches the lever is held fast in two different positions. To the shaft 52 is rigidly secured a cam 64, and to the shaft 65 supporting the check levers is secured a coacting cam 66.

Figure 8 shows the position of the lever 57 in which the toothed pinion 45 is in mesh with the ring of teeth 30, while the check roller 16 of the check lever 12 is out of engagement with the notches in the check wheel 8 of the coding cylinder 4. This is the position for the operating of the coding device. If, on the contrary, the lever is first raised in the direction of the arrow A and then rocked in the direction of the arrow B, so that it comes into the position shown in Figure 9, the cam 64, and also the counter-cam 66 are also thereby rocked. As a result of this the check levers are set free from the pull of their springs 67 whereby the check rollers enter the notches in the check wheels while the toothed pinions are out of engagement with the rings of teeth on the coding cylinders. This is the position for adjusting the coding cylinder key or the counting mechanism.

From a toothed wheel of the first coding cylinder or, in the case of the example of construction illustrated, from the toothed rim 26 of the independent wheel body 22 (Fig. 4), the movement thereof is transmitted by way of a toothed wheel 68, a bevel wheel 70 connected with the wheel 68, a bevel wheel 69 meshing with the bevel wheel 70, a toothed wheel 71, a toothed wheel 72, a shaft 73, and toothed wheels 74 and 75 to a counting mechanism 76.

A positioning member such as a crank 77 is provided, which can be inserted into the said hollow shaft, and thereby permits the coding cylinders and also the counting mechanism to be adjusted at will, together or separately, either forwards or backwards.

A checking member, for instance a checking nose 78 is provided, which limits the driving movement of the coding cylinder 1 or of the independent wheel body 22, exactly to one feed step, one edge 79 of the pawl 25 bearing against the said blocking nose, and the other edge 80, by bearing against the flanks of a ratchet tooth, thus

preventing the further rotation of the ratchet wheel.

The apparatus presents the following advantages as compared with the known coding appliances:

(1) The device according to the present invention, in the event of an error at any point in the coding or decoding, enables the device to be returned immediately in a simple manner to the condition and to that position of the device at which the error must occur, so that it is only necessary to take up the coding or decoding operation afresh from there, without it being necessary to begin all over again from the start.

(2) By arranging a special detail for the driving of that coding cylinder from which the other coding cylinders are actuated, it is possible to take all the coding cylinders out of the apparatus, store them separately, and exchange them for one another at will, or exchange them for another set of coding cylinders. The security against improper use by subordinate persons is increased. For the storage of the most important parts of the coding apparatus, the coding cylinders, but little room is required, thereby giving the possibility of locking them away in special cases, safes and the like, and affording greater certainty in coding owing to unlimited exchangeability.

(3) The selected adjustment of the signal rings and their fixing relatively to the coding cylinders gives the possibility of a further marking of the code key with greater certainty in the coding operation.

(4) By the counting mechanism the individual coding and decoding steps are counted and it is possible to employ the number of the counting mechanism as a key sign.

(5) By the special coupling of the toothed pinions for the feeding of the coding cylinders with the catch levers, during the coding, a very easy movement of the moving parts of the apparatus is obtained, because the catch rollers, which are held in the notches under strong spring pressure, are removed from the notched wheels during the coding or decoding operation. On the other hand the coding cylinders are checked in their position, so that disturbance of the coding cylinders, with consequent breaking of the contact, cannot take place. By lifting out the toothed pinions for the driving of the coding cylinders it is, on the other hand, possible to adjust the coding cylinders individually to any desired key, and also to adjust the counting mechanism separately, independently of the coding cylinders. With the toothed pinions disengaged, moreover, it is easy to inspect the apparatus for possible defective contacts because the driving of the coding cylinders is completely disconnected, and consequently in the event of a key being depressed, no disarrangement occurs.

(6) By arranging a separate blocking member, provision is made that the most important coding cylinder, namely the one from which the feeding of the other coding cylinders takes place, or the independent wheel body which moves this coding cylinder, when driven from the key members, is only moved through exactly one feed step, so that the correct contact between this coding cylinder and the next is always ensured.

What I claim is:—

1. An electrical device for coding and decoding, consisting in the combination of a plurality of individual coding cylinders arranged side by side, contacts on the end faces of the coding cylinders at equal distances on all the coding cylinders and connected by conductors through the coding cylinders, a toothed wheel fitted on one end face of each coding cylinder, a ring mounted on the other end face of each coding cylinder, individual teeth mounted upon each of the said rings, toothed pinions, with teeth of different lengths alternatively arranged, between the individual coding cylinders, meshing with all their teeth in the toothed wheels on one end face of the coding cylinders and in the individual teeth mounted upon the rings when these individual teeth come into a meshing feeding position, but checking one coding cylinder by the long teeth bearing upon the periphery of the ring of the adjacent coding cylinder until the time of the feeding movement, and a driving means for rotating one of the outer coding cylinders.

2. An electrical device for coding and decoding, consisting in the combination of a plurality of individual coding cylinders arranged side by side, contacts on the end faces of the coding cylinders at equal distances on all the coding cylinders and connected by conductors through the coding cylinders, a toothed wheel fitted on one end face of each coding cylinder, a ring mounted on the other end face of each coding cylinder, individual teeth mounted upon each of the said rings, toothed pinions, with teeth of different lengths alternately arranged, between the individual coding cylinders, meshing with all their teeth in the toothed wheels on one end face of the coding cylinders and in the individual teeth mounted upon the rings when these individual teeth come into a meshing position, but checking one coding cylinder by the long teeth bearing upon the periphery of the ring of the adjacent coding cylinder until the time of the feeding movement, an independent wheel body beside the set of coding cylinders, a toothed wheel on one end face of the independent wheel body, a ratchet wheel on the other side of the independent wheel body for the engagement of a feeding means for the set of coding cylinders, and a pinion with teeth of equal length meshing both with the toothed wheel of the independent wheel body and with the toothed wheel of the adjacent coding cylinder.

3. An electrical device for coding and decoding, consisting in the combination of a plurality of individual coding cylinders arranged side by side, contacts on the end faces of the coding cylinders at equal distances on all the coding cylinders and connected by conductors through the coding cylinders, a toothed wheel fitted on one end face of each coding cylinder, a ring mounted on the other end face of each coding cylinder, individual teeth mounted upon each of the said rings, notched toothed pinions, with teeth of different lengths alternately arranged, between the individual coding cylinders, meshing with all their teeth in the toothed wheels on one end face of the coding cylinders and in the individual teeth mounted upon the rings when these individual teeth come into a meshing position, but checking one coding cylinder by the long teeth bearing upon the periphery of the ring of the adjacent coding cylinder until the time of the feeding movement, a check wheel upon each coding cylinder, resilient check levers with check members arranged opposite to the check wheels and adapted to engage by means of the check members in the notches thereof, an independent wheel body beside the set of coding cylinders, a toothed wheel on one end face of the independent

wheel body, a ratchet wheel on the other side of the independent wheel body for the engagement of a feeding means for the set of coding cylinders, and a pinion with teeth of equal length meshing both with the toothed wheel of the independent wheel body and with the toothed wheel of the adjacent coding cylinder.

4. An electrical device for coding and decoding, consisting in the combination of a plurality of individual coding cylinders arranged side by side, contacts on the end faces of the coding cylinders at equal distances on all the coding cylinders and connected by conductors through the coding cylinders, a toothed wheel fitted on one end face of each coding cylinder, a ring mounted on the other end face of each coding cylinder, individual teeth mounted upon each of the said rings, notched toothed pinions, with teeth of different lengths alternately arranged, between the individual coding cylinders, meshing with all their teeth in the toothed wheels on one end face of the coding cylinders and in the individual teeth mounted upon the rings when these individual teeth come into a meshing position, but checking one coding cylinder by the long teeth bearing upon the periphery of the ring of the adjacent coding cylinder until the time of the feeding movement, a check wheel upon each coding cylinder, spring-actuated check levers with check members arranged opposite to the check wheels and adapted to engage by means of the check members in the notches thereof, individual levers fixedly connected with a shaft as a carrier for the notched pinions, a cam secured upon the said shaft, a further shaft rockably supporting the check levers, a lever finally connected with the said shaft on each side of the set of coding cylinders, a co-acting cam mounted fast upon the said shaft in contact with the cam on the pinion shaft, a rod connecting the two levers and adapted to act upon the check levers, a notched operating lever slidable to some extent in the longitudinal direction and when rocked rotating the first-mentioned shaft and thereby disengaging the pinions from their toothed wheels but engaging the check members of the check levers, by means of the said cam and co-acting cam, in the notches of the check members of the coding cylinders, an independent wheel body beside the set of coding cylinders, a toothed wheel on one end face of the independent wheel body, a ratchet wheel on the other side of the independent wheel body for the engagement of a feeding means for the set of coding cylinders, and a pinion with teeth of equal length meshing both with the toothed wheel of the independent wheel body and with the toothed wheel of the adjacent coding cylinder.

5. An electrical device for coding and decoding, consisting in the combination of a plurality of individual coding cylinders arranged side by side, contacts on the end faces of the coding cylinders at equal distances on all the coding cylinders and connected by conductors through the coding cylinders, a toothed wheel fitted on one end face of each coding cylinder, a ring mounted on the other end face of each coding cylinder, individual teeth mounted upon each of the said rings, notched toothed pinions, with teeth of different lengths alternately arranged, between the individual coding cylinders, meshing with all their teeth in the toothed wheels on one end face of the coding cylinders and in the individual teeth mounted upon the rings when these individual teeth come into a meshing position, but checking one coding cylinder by the long teeth bearing upon the periphery of the ring of the adjacent coding cylinder until the time of the feeding movement, a check wheel upon each coding cylinder, spring actuated check levers with check members arranged opposite to the check wheels and adapted to engage by means of the check members in the notches thereof, individual levers fixedly connected with a shaft as a carrier for the notched pinions, a cam secured upon the said shaft, a further shaft rockably supporting the check levers, a lever fixedly connected with the said shaft on each side of the set of coding cylinders, a co-acting cam mounted fast upon the said shaft in contact with the cam on the pinion shaft, a rod connecting the two levers and adapted to act upon the check levers, a notched operating lever slidable to some extent in the longitudinal direction and when rocked rotating the first-mentioned shaft and thereby disengaging the pinions from their toothed wheels but engaging the check members of the check levers, by means of the said cam and co-acting cam, in the notches of the check members of the coding cylinders, an independent wheel body beside the set of coding cylinders, a toothed wheel on one end face of the independent wheel body, a ratchet wheel on the other side of the independent wheel body for the engagement of a feeding means for the set of coding cylinders, a pinion with teeth of equal length meshing both with the toothed wheel of the independent wheel body and with the toothed wheel of the adjacent coding cylinder, a counting mechanism coupled with the independent wheel body, and means for adjusting the counting mechanism, and with it the coding cylinder if desired, in position.

6. An electrical device for coding and decoding, consisting in the combination of a plurality of individual coding cylinders arranged side by side, contacts on the end faces of the coding cylinders at equal distances on all the coding cylinders and connected by conductors through the coding cylinders, a toothed wheel fitted on one end face of each coding cylinder, a signal ring mounted on the periphery of each coding cylinder, a ring mounted on the end face of each signal ring, individual teeth mounted upon each of the said rings, toothed pinions, with teeth of different lengths alternately arranged, between the individual coding cylinders, meshing with all their teeth in the toothed wheels on one end face of the coding cylinders and in the individual teeth mounted upon the rings when these individual teeth come into a meshing position, but checking one coding cylinder by the long teeth bearing upon the periphery of the ring of the adjacent coding cylinder until the time of the feeding movement, an independent wheel body beside the set of coding cylinders, a toothed wheel on one end face of the independent wheel body, a ratchet wheel on the other side of the independent wheel body for the engagement of a feeding means for the set of coding cylinders, and a pinion with teeth of equal length meshing both with the toothed wheel of the independent wheel body and with the toothed wheel of the adjacent coding cylinder.

7. An electrical device for coding and decoding, consisting in the combination of a plurality of individual coding cylinders arranged side by side, contacts on the end faces of the coding cylinders at equal distances on all the coding cylinders and connected by conductors through the coding cylinders, a toothed wheel fitted on one end face

of each coding cylinder, a ring mounted on the other end face of each coding cylinder, individual teeth mounted upon each of the said rings, toothed pinions with teeth of different lengths, notched toothed pinions, with teeth of different lengths alternately arranged, beween the individual coding cylinders, meshing with all their teeth in the toothed wheels on one end face of the coding cylinders and in the individual teeth mounted upon the rings when these individual teeth come into a meshing position, but checking one coding cylinder by the long teeth bearing upon the periphery of the ring of the adjacent coding cylinder until the time of the feeding movement, an independent wheel body beside the set of coding cylinders, a toothed wheel on one end face of the independent wheel body, a ratchet wheel on the other side of the independent wheel body for the engagement of a feeding means for the set of coding cylinders, and a pinion with teeth of equal length meshing both with the toothed wheel of the independent wheel body and with the toothed wheel of the adjacent coding cylinder, a pawl moved by the depression of a key for engagement with the ratchet wheel of the independent wheel body, and a checking nose limiting the movement of the pawl.

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