

April 25, 1933.

W. KORN
CODING MACHINE

1,905,593

Filed Nov. 12, 1929

3 Sheets-Sheet 1

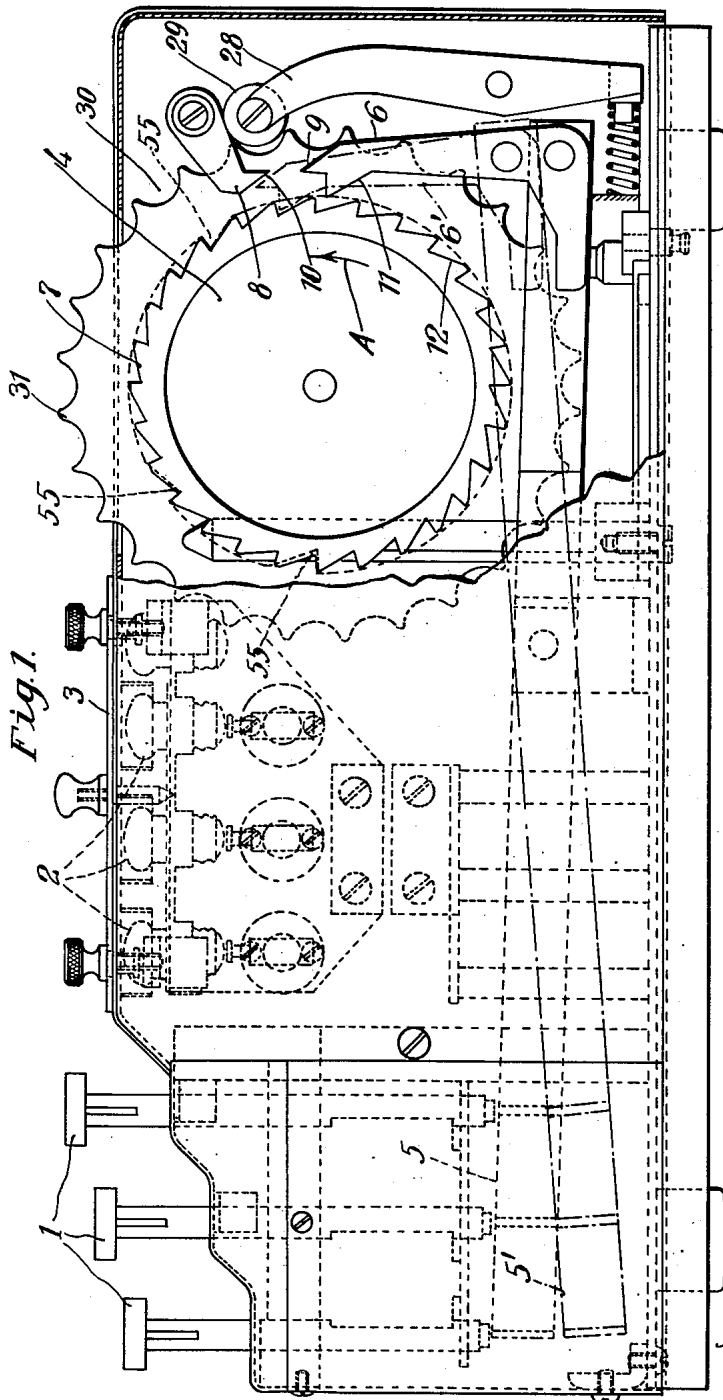


Fig. 1.

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Fig. 3.

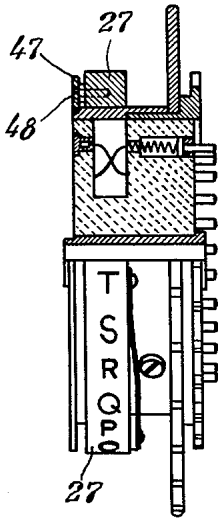


Fig. 2.

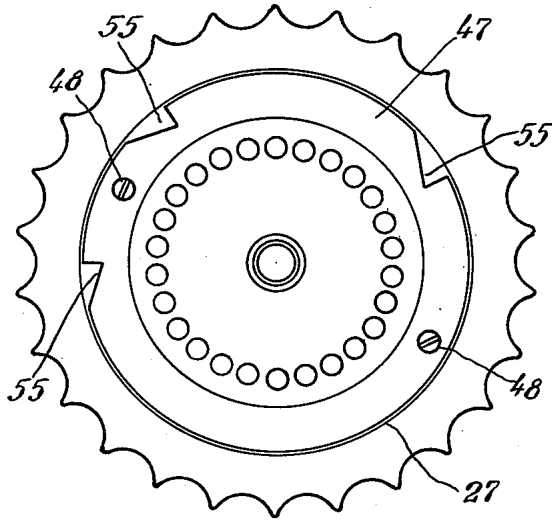
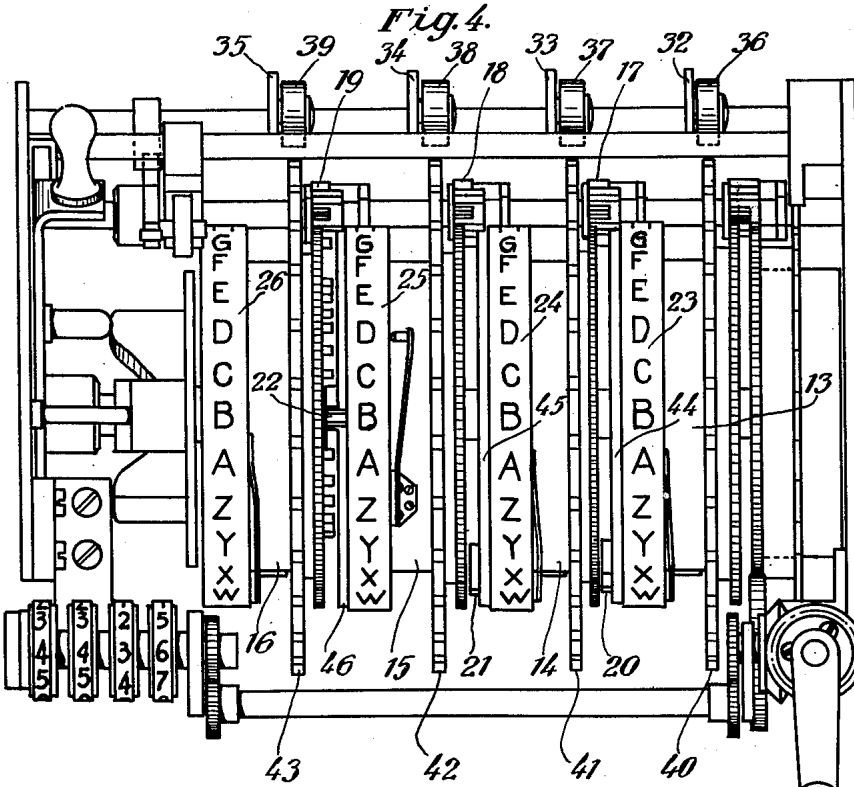


Fig. 4.



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Fig. 5.

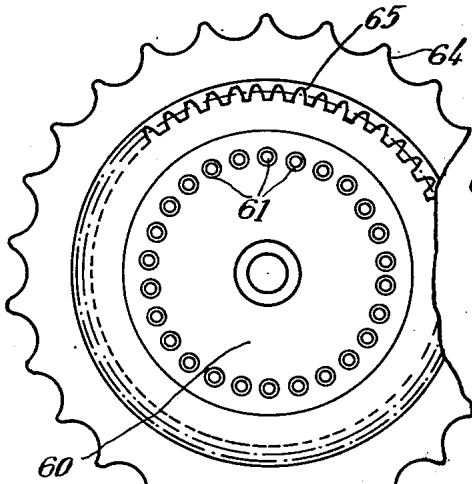


Fig. 6.

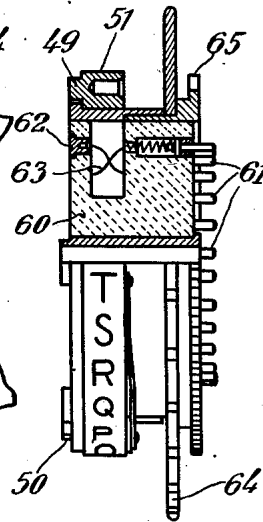


Fig. 7.

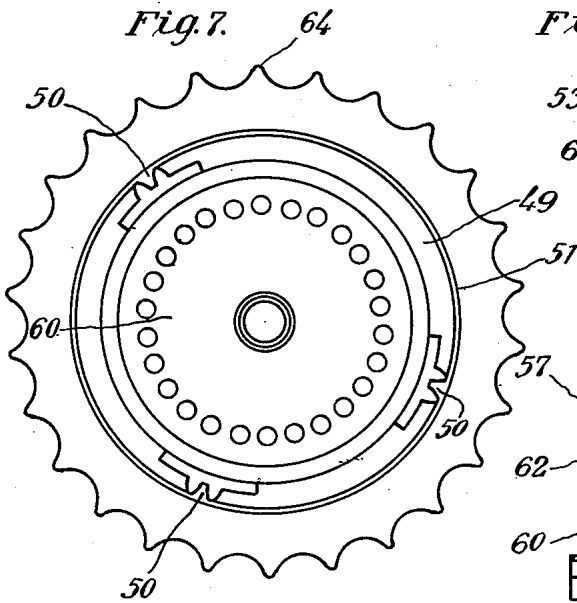


Fig. 8.

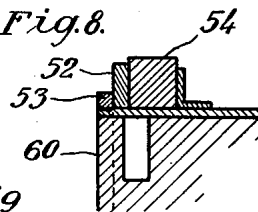
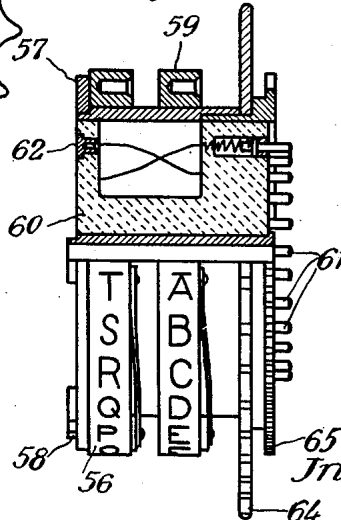


Fig. 9.



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UNITED STATES PATENT OFFICE

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CODING MACHINE

Application filed November 12, 1929, Serial No. 406,695, and in Germany, November 16, 1928.

Coding machines having coding drums are known, in which there is rigidly connected to the body of the coding drum a control member for advancing the coding drums. Such a control member has hitherto usually consisted of a ring provided with a single notch for the engagement of a pawl or a tooth-gap for the engagement of a driving pinion.

It has also been proposed to provide on the bodies of the coding drums character rings which are rotatable and adjustable with respect to them, for expressing the coding key in another way than by characters arranged directly on the actual drum bodies. The forward feed of the separate coding drums was effected in each case in accordance with the position of the single notch or the single tooth-gap in the control member with respect to the body of the coding drum according to a definite system of connections as determined by the wire connections in the interior of the coding drums. The shiftability of the character ring is of only small advantage, as this shiftability did not find expression in the coded message and no fresh transpositions of those parts which are essential for the coding were effected (variation in alphabetic correspondence).

In an arrangement of this kind it may occur that in spite of the character ring being turned, that is to say with a totally different code key designation, nothing will be changed as regards the position of these coding drums with respect to the other coding drums, thus offering an additional possibility of unauthorized decoding.

According to the invention the control member is connected to the rotatable and fixable character ring. This provides the advantage that, on the character ring being displaced with respect to the body of the coding drum, not only is the key made more obscure, but the drive of the coding drum which happens to be the adjacent one is fundamentally changed. In a modified constructional form means are provided through a plurality of single notches or single tooth-gaps, the number of which is preferably a prime number, for bringing about a particularly frequent shifting of adjacent coding

drums and thereby producing each time the character rings are displaced a particularly favourable setting of the controlling mechanism. It is of particular advantage for the various coding drums to have different numbers of points of application for the control member (single notches, single tooth-gaps or the like) prime numbers being again preferable for this purpose.

In another constructional form the control member is connected to the character ring so as to be releasable and in some cases interchangeable, thus further increasing the secrecy of the code.

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

Fig. 1 is a side elevation of a coding machine partly in section,

Fig. 2 an end view of a single part (coding drum),

Fig. 3 a view partly in cross-section and partly in side elevation of the said separate part,

Fig. 4 a plan view of a coding machine in which some of the parts are modified,

Fig. 5 a partial end view of a separate part of the construction shown in Fig. 4 (coding drum),

Fig. 6 the same detail partly in section and partly in elevation,

Fig. 7 a rear view of Fig. 5,

Fig. 8 a partial cross-section through a coding drum of somewhat different construction and

Fig. 9 a coding drum of any constructional form partly in cross-section and partly in side elevation.

In Fig. 1 the reference 1 indicates the character transmitting members (keys) which bear the separate characters, for instance the letters of the alphabet. The parts 2 are character indicators, for instance incandescent electric lamps which, on a key 1 being depressed, light up and cause the characters in the coded or decoded message to appear on a transparent disc 3 which is disposed above the incandescent lamps and which bears the same characters, for instance letters, as the keys. At 4 a plurality of

coding drums lying one behind the other is indicated which are provided on both sides with electric contacts corresponding to the number of characters on the keys. The contacts on one side of the coding drums are connected to the contacts on the other side of the same coding drums by electric conductors which are arranged as irregularly as possible. The coding drums which are arranged one behind the other are connected together electrically by the contacts on their faces so that on a key being depressed the electric current must flow from a source of current (not shown) through all the drums along a zig-zag path, as it were, before reaching the character indicators 2 and causing the corresponding incandescent lamp to light up. The arrangement of such separate coding drums one behind the other is shown in Fig. 4. Such arrangements are already known, for instance through German Patent 425,147. American Patent 1,533,252 and British Patent 163,357.

During the coding operation, that is to say on a key being depressed, the drums are in such coding machines turned with respect to one another with the object of continuously changing the coding key during coding. In Fig. 1 the part 5 is a lever which is rocked on one of the keys 1 being depressed so that it moves into the position indicated by 5'. At the end of this lever is a pawl 6 which is shown at 6' in the rocked position. This pawl is capable of engaging in a ratchet wheel 7 and, on a key being depressed, shifting one of the coding drums, for instance the coding drum 4, through the distance of one tooth in the direction of the arrow A. A stop member 8 is provided which on the pawl 6 being rocked allows the coding drum to advance only by exactly one forward step through the pawl striking with its edge 9 against the edges 10 of the stop member, thus preventing it from moving outwards and the edge 11 by striking against the flank 12 of one of the teeth preventing the coding drum from being further advanced through the mass of the drum being accelerated beyond the desired forward step.

The other coding drums are displaced either by a depression of the keys causing similar pawls to be put in motion, which engage in corresponding notches in the adjacent coding drums or by being driven by a coding drum through any suitable means, for instance pinions, which engage in toothed wheels on the adjacent coding drums and are themselves put in motion by single teeth. Such a method of advancing single coding drums 14, 15, 16 from a coding drum 13 by means of pinions 17, 18, 19 is shown in Fig. 4, single teeth engaging in toothed gaps 21, 22 for driving these pinions being also indicated. For setting a definite coding key in such a coding device the characters, for

instance the letters of the alphabet, are marked on the coding drums themselves or on rings mounted on the coding drums. These rings hereinafter referred to as character rings are capable of rotating and of being fixed with respect to the coding drums, compare for instance German Patent 411,126. Such character rings are shown by way of example in Fig. 4 at 23, 24, 25 and 26 and in Fig. 3 at 27.

For setting the coding key, that is to say for turning the coding drums, the drums must be notched in order that the separate coding drums shall make contact with one another, so that the contacts on the drums will be in exact register and consequently the passage of the electric current will be secure under all circumstances. For this purpose detents 28 are provided with rollers 29 which engage in notches 30 on the notched wheels 31. These notched wheels are rigidly connected to the individual coding drums. Besides in Fig. 1 such detents are shown in Fig. 4 at 32, 33, 34, 35 with detent rollers 36, 37, 38, 39. In Fig. 4 these detents and detent rollers are shown in the position in which they are just out of engagement with the corresponding notched wheels 40, 41, 42, 43.

The forward feed of the individual coding drums during the coding operation is thus effected by a separate control member consisting either of a ring or disc provided with a notch and connected rigidly to the coding drum or of the single tooth-gaps 20, 21, 22, already referred to, which may be mounted either directly on the drums or on the rings 44, 45, 46. In this case the rings are also rigidly connected to the body of the coding drums.

According to the invention these control members are connected to the character rings which are capable of being rotated or fixed and are thus themselves capable of being set. This connection is established by such a control member in the form of a ring 47 being connected by screws 48 rigidly with the corresponding adjustable character ring 27. Another constructional form is shown in Fig. 6 in which the control member consists of a ring 49 having single tooth-gaps 50 and forming a single piece with the adjustable character ring 51.

In another constructional form shown in Fig. 8 an independent ring 52 is provided as the support for a single tooth-gap; this ring is however normally pressed firmly by a nut 53 against an adjustable character ring 54, being thus rigidly connected to it. In this last constructional form the ring 52 with its single tooth-gap is also adjustable with respect to the character ring 54 and can be removed after the removal of the nut 53 so that the character ring 54 may be combined with another ring 52 having single tooth-

gaps of a different kind, for instance a plurality of such gaps.

By this arrangement the great advantage for coding is obtained that a displacement of the character ring will not only set a different coding key but will also change the way in which the other coding drums are advanced and thereby change the substitute alphabet. This increases the safety of the coded message against being decoded by an unauthorized person.

While in the hitherto known coding devices of such a type having coding drums and a control member for advancing the coding drums by means of a control part, for instance a pawl or a pinion and character rings with a control member, only a single point of application for the control part, for instance a single ratchet notch or only one single tooth gap acting on the connecting pinion is provided, according to the invention the control member is provided with a plurality of such points of application.

In Figs. 1 and 2 this is indicated by three points of application (ratchet notches 55).

In Fig. 7 this is indicated by three single tooth-gaps 50 on the ring 49 which is integral with its corresponding character ring 51.

The number of points of application is preferably a prime number, this number in the example shown being the prime number 3.

A particular advantage is obtained if the number of points of application on the control member is different in each individual coding drum.

The result of such an arrangement is that during the coding operation by displacing the adjustable character ring a different forward feed, namely a particularly frequent forward feed of the coding drums is effected and consequently a frequent change of the substitute alphabet, while by using a prime number for the number of points of application a repetition of the same substitute alphabet will be prevented, which would result in a shortening of the coding period.

The prime numbers are so selected that none of these prime numbers is divisible into the number of characters on the character rings, for instance the number of 26 letters.

According to the invention another character ring may be provided on the individual coding drums besides the rotatable and fixable character ring connected to a control member for the advance of the other coding drums. This is shown in Fig. 9. In this figure 56 is a rotatable and fixable character ring connected to a ring 57 supporting the control member, for instance a single tooth gap 58. 59 is the additional character ring which is also rotatable and fixable with respect to the body of the coding drum, and which in this case only serves the purpose of setting the coding key and, through being

adjustable, of increasing the secrecy of the code.

In Figs. 5 to 9 the part 60 is the body of the coding drum, 61 are the contacts on one side, 62 the contacts on the other side, 63 the electric conductors, 64 the notched wheel, 65 the ring of teeth, which meshes with a corresponding pinion by which it is driven, as shown in Fig. 4.

The character rings are adjustably connected to their corresponding code cylinders by spring latches as indicated in Figure 4 at 66, 67, 68, 69 for the four character rings 23, 24, 25 and 26. It is shown at 68 how such a spring latch is loosened in order that the character ring 25 may be rotated and adjusted in another position with respect to the code cylinder 15.

The course of the current through the coding device, the arrangement of the keys and the coding cylinders, the indicating means (incandescent electric lamps) are the same as described in my U. S. Patent 1,733,886 and shown in Fig. 2 for the course of the current.

The means for rotating at predetermined periods each code cylinder from the preceding one are described and shown in my pending U. S. patent application, Serial No. 504,000 of 5th Nov. 1929, especially Figs. 10, 11 and 13.

What I claim is:

1. An electrical coding device comprising coding cylinders containing electric conductors and electrical contacts for passing the electric current through the coding device for the purpose of exchanging characters, a gear connected with each coding cylinder, means for rotating the coding cylinders, character keys operating the rotating means for the coding cylinders, manually operable character rings adapted to be operated with respect to the coding cylinders, means for fixing the character rings on the coding cylinders, means for rotating at predetermined periods each coding cylinder from the preceding one, and a plurality of teeth for the rotating means connected with the character rings to enable a frequent rotation of the adjacent cylinder.

2. An electrical coding device comprising coding cylinders containing electric conductors and electrical contacts for passing the electric current through the coding device for the purpose of exchanging characters, a gearing connected with each code cylinder, means for rotating the coding cylinders, character keys operating the rotating means for the coding cylinders, manually operable character rings adapted to be rotated with respect to the coding cylinders, means for fixing the character rings on the coding cylinders, means for rotating at predetermined periods each coding cylinder from the preceding one, and a plurality of teeth for the rotating means connected with the character

means irregularly distributed over the periphery thereof to enable a frequent rotation of the adjacent cylinder.

3. An electrical coding device comprising
5 coding cylinders containing electrical conductors and electrical contacts for passing the electric current through the coding device for the purpose of exchanging characters, a
10 gear connected with each coding cylinder, means for rotating the coding cylinders, character keys operating the rotating means for the coding cylinders, manually operable character rings adapted to be rotated with respect to the coding cylinders, means for fixing
15 the character rings on the coding cylinders, means for rotating at predetermined periods each coding cylinder from the preceding one, and a plurality of teeth for the rotating means connected with the character rings irregularly distributed over the periphery
20 thereof, the number of teeth being a prime number to enable a frequent rotation of the adjacent cylinder.

4. An electrical coding device comprising
25 coding cylinders containing electrical conductors and electrical contacts for passing the electric current through the coding device for the purpose of exchanging characters, a gear connected with each coding cylinder,
30 means for rotating the coding cylinders, character keys operating the rotating means for the coding cylinders, manually operable character rings adapted to be rotated with respect to the coding cylinders, a plurality
35 of teeth for the rotating means connected with the character rings, and the teeth on the single character ring being different from one another in number and position to enable frequent rotation of the cylinder.

5. An electrical coding device comprising
40 coding cylinders containing electrical conductors and electrical contacts for passing the current through the coding device for the purpose of exchanging characters, a gear
45 connected with each coding cylinder, means for rotating the coding cylinders, character keys operating the rotating means for the coding cylinders, manually operated character rings adapted to be rotated with respect
50 to the coding cylinders, means for fixing the character rings on the coding cylinders, means for rotating at predetermined periods each coding cylinder from the preceding one, and a plurality of teeth for the rotating
55 means detachably connected with each ring and interchangeably connected with the character rings.

In testimony whereof I have signed my name to this specification.

60

WILLI KORN.