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## PATENT SPECIFICATION

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### COMPLETE SPECIFICATION.

#### Improvements in and relating to Coding Devices with Electrical Transmission of Signals.



I, ALEXANDER VON KRYHA, of 109, Schillerstrasse, Berlin - Charlottenburg, Germany, a German subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to coding devices, in which the signals are transmitted electrically from the key-board system of a transmitter to the type system of a receiver with the interposition of a transposing device, which is moved by stages for the purpose of altering the key.

In the device according to the invention, the key-board circuits are electrically interlinked with one or more auxiliary circuits. The auxiliary circuits put a transposing device into action after the depression of a key and block the key-board circuit during the movement thereof. The transposing device may consist of two distributor discs capable of being turned relatively to one another and provided with contact pieces. The movement of the discs is derived from a coding wheel which is in turn operated at each depression of the key by unequal angular displacements the extent of which is determined by gaps between teeth or by the distribution of holes at the periphery of the wheel, with which a coding lever can engage. The coupling of the coding wheel with its driving mechanism is effected by the armature of a coding magnet, which is supplied with electric current through a collecting contact common to all key-board circuits. Further, the magnet lifts the coding lever which acts as a lock for the coding wheel, thereby setting the wheel in action. The movement of the coding wheel displaces a set of contacts which causes the coding magnet and all key-board circuits to be deprived of current. For the latter purpose the key-board circuits include a joint collecting

contact. In order to prevent the pressure of a key extending in error over a number of pauses in the revolution of the coding wheel, and resulting in a number of signal impressions, a safety relay is provided, which is switched on when any type is depressed. This relay opens a further collecting contact which is common to all key-board circuits so that a second impression of a type is impossible.

In the device in accordance with the invention, only two auxiliary circuits are arranged in addition to the key-board circuit, which materially simplifies the switching of the coding device and increases its certainty in action. Of these auxiliary circuits, one includes the coding magnet which is switched on through a joint collecting contact for all key-board circuits on the depression of a type. The second auxiliary circuit includes the safety relay which opens all key-board circuits during the period of depression of a key and is in due course switched in from the first auxiliary circuit.

A further feature of the invention is the provision of a transmitter which possesses a type field which is actuated electromagnetically, windings of the magnets of said field being in series with the corresponding windings of the magnets for the receiver types. It is therefore impossible to print a signal by error by the transmitter during the rotation of the coding wheel, as the keyboard circuit is then kept open by the safety relay.

Another constituent part of the device consists in the arrangement of the key-board circuits so that they include a switch which is arranged between the transposing device and the type magnets in the transmitter or receiver respectively. This enables the direction of flow of current through the transposing device to be reversed, as is necessary when the coding device is changed from coding to decoding. The switch is so constructed that

the reversing of the direction of the flow of current is effected by a single handle thus avoiding the tedious re-arrangement of all conductors between the transmitter and the transposing device on the one hand and between the transposing device and the receiver on the other hand. To enable this to be done the conductors end in contact rings, which are arranged on the periphery of discs lying one over the other. Special rings are provided both for the leads of the type magnets and those of the transposing device, which rings are arranged on separate discs which are relatively moved when the direction of the flow of current is to be reversed.

In designing the coding device, special attention has been given to obtaining as high a speed of recording as possible. This requires a high number of revolutions of the coding wheel and increases the possibility of the coding wheel being undesirably moved beyond its final position as a consequence of the inertia forces or of intermediate positions of the distributing discs occurring, leading to faulty transmission. In order to avoid this risk, a stop device is actuated by the coding magnet which at each movement prevents the movable disc of the transposing device turning too far, and only allows it to come to rest in the one position in which the contact pieces thereof register with the contact pieces of the counter disc. To achieve this result the movable part of the transposing device has on its periphery a ring of recesses, the number and distance apart of which is equal to that of its contact pieces. The stop device which is formed as a pin engages in one of these recesses, being raised by the armature of the coding magnet as soon as the disc comes to a standstill. During the movement of the disc, the pin is pressed away by its solid part and thereby holds the armature of the coding magnet, which is connected rigidly with the stop device, in the position to which it is drawn, even after the magnet itself has been deprived of current.

A tappet is provided for acting on the set of contacts controlled by the coding magnet, a number of cams which rotate together with the coding wheel being provided to displace said tappet as desired. The cams may be of conical shape and are located on the periphery of an independent disc driven by the coding wheel. A lifting device keeps the tappet normally out of contact with the cams and presses it against the springs of the set of contacts. As soon, however, as the coding lever drops into one of the holes of the coding disc and thereby brings the transposing device to a standstill—i.e. at the moment

of giving the signal—the lifting device is brought out of contact with the tappet and allows the latter to drop again in the path of the cams. This prevents the tappet and its actuating rods being affected by the cams during the rotation of the coding wheel.

The coding wheel is attached so that it may be exchanged easily at any time and is yet retained safely in its position. To effect this a spring loaded bolt carried by an arm, which can be angularly displaced is provided. The bolt takes effect on the upper side of the coding lever and assists the engagement of the latter in the holes of the coding wheel. The coding wheel also is pressed with a certain force against the coupling connected with it. If the wheel is to be changed, the arm, together with bolt, is swung to one side thereby releasing the tension between coding wheel and the coupling.

The collecting contact controlled by the safety relay is opened by a spring loaded pressure pin which is displaced axially by the relay armature. The pin is secured in position by a locking bolt during the period of depression of any key-board lever, owing to the movement of the bolt into a constriction in the pressure pin under the action of a spring as soon as a plate actuated by the key-board lever is moved away from the path of the bolt. This plate is provided with a frame shaped continuation which frees the constriction in the pressure pin for a bolt as soon as one of the key-board levers comes into contact with the plate. On the pressure of the key being released, the plate and the bolt carried back by it over a catch are again brought back into their inoperative position.

The meaningless series of letters resulting as a rule in the coding make it further necessary to subdivide the coding wheel into groups of signals, in such way that an interval is interposed, for instance, after each fifth or tenth signal. Otherwise the decoding of an uninterrupted and continuous series of signals would give considerable difficulty owing to the difficulty in reading the meaningless series of letters and would lead to faulty renderings.

The coding device in accordance with the invention provides that the required subdivision of the coding wheel into various groups of signals is effected automatically. This is effected by a switch element which is moved forward progressively on each depression of a key and brings into operation at uniform distances that particular space key which belongs to the type field recording the coding wheel. By this means independently of

the lengths of words of the plain text, a subdivision of the coding wheel into groups of signs of uniform size is brought about in the requisite manner. It serves to simplify the construction of the coding device if the space keys belonging to the transmitter or receiver typewriting machine respectively are used for the aforesaid purpose, which space keys are necessary at any rate for the rendering of the clear text.

As the coding wheel may appear both on the receiver and on the transmitter, according to whether the device for coding or decoding is used, a change-over switch is provided for the purpose of being able to use the circuit closed by the switch element optionally for feeding the space key magnet of the receiver or of the transmitter.

The current impulses effecting the movement forward of the switch element may be taken from one of the before mentioned auxiliary circuits which are common to all keyboard circuits and are closed on depressing the keys.

The switch element may be in the form of a roller, which is moved forward over a ratchet by the armature of a magnet excited on each depression of a key; the form of the switch element is, however, by no means to be restricted hereto. Contacts may be distributed over the periphery of the roller at a mutual distance which is equivalent to the total of all switch steps necessary for the formation of a group of signs. These contacts belong to the circuit of the space key magnets and serve for bridging of the free ends of springs over which they slide. In order to enable groups of signs of various lengths to be obtained in the coding wheel, a number of groups of contacts are provided which can be put into operation optionally over a change-over switch and have various mutual distances. If these groups of contacts are combined on a single switch element individual strips are so dimensioned that they do not lie in the path of the springs which magnetise the strips of another group. This is effected in the most simple manner by giving the strips different lengths.

In order that the invention may be the better understood I will now proceed to describe the same in relation to the accompanying drawings, reference being had to the letters and figures marked thereon; like letters refer to like parts in the various figures in which:—

Fig. 1 is a wiring diagram of the device consisting of a transmitter, receiver and the coding instrument proper, shown in diagrammatic form;

Fig. 2 is a view from above of the cod-

ing instrument;

Fig. 3 is a part longitudinal section in the direction of the line 3—3 of Fig. 2 which shows the coding magnets and the coding wheel together with the drive, from the front;

Fig. 4 is a part longitudinal section in the direction of the line 4—4 of Fig. 2, which shows the coding magnets and the distributor in side elevation;

Fig. 5 illustrates the device for influencing the set of contacts appertaining to the coding wheel, viewed from the front;

Fig. 6 illustrates the change-over switch, partly in elevation and partly in section;

Fig. 7 is a longitudinal section through the transmitter showing the safety device of the transmitter in side elevation;

Fig. 8 is a plan view of the safety device shown in Fig. 7;

Fig. 9 is a part longitudinal section through the receiver;

Fig. 10 is a wiring diagram of the device for automatic subdivision of the coding wheel in diagrammatic form;

Fig. 11 is a front elevation of the device diagrammatically illustrated in Fig. 10; and

Fig. 12 is a fragmentary plan view of a part of Fig. 11.

In Fig. 1, one of the key-board circuits is indicated by I and the two auxiliary circuits by II and III. Each key-board circuit includes a key contact 10, a type magnet 11 for the transmitter and a type magnet 12 for the receiver. Between both magnets is the transposing device with the contact pieces 13 and 14 of the rotating and the fixed distributor discs. On each side of the distributor contacts the key-board circuit is conducted over the change-over switch, the lead coming from the transmitter magnet ending in the two contacts 15 and 15<sup>1</sup> in parallel with one another, whilst the lead conducting to the receiver magnet runs from contacts 16 and 16<sup>1</sup> in parallel with one another. The contact 13 on the rotating distributor disc is connected with a change-over switch contact 17, whilst the contact 14 of the fixed distributor disc is connected up to the change-over switch contact 18.

In coding, the contacts 15 and 17 or 16 and 18 respectively are connected with one another. The current coming from the transmitter magnet flows, in the case of the representation in accordance with Fig. 1, from left to right through the distributor in the receiver. On decoding, the connection is effected, instead of this, between the contacts 15<sup>1</sup> and 18 on the one side and 16<sup>1</sup> and 17 on the other side. The current coming from a transmitter magnet therefore flows on decoding, in the

case of the representation according to Fig. 1, from right to left through the distributor in the receiver.

Each receiver magnet 12, on being energised, closes a collecting contact 19, 20 common to all key-board circuits: this, however, only takes place after a depression of the type both in the transmitter and in the receiver. The collecting contact 19, 20 lies in the circuit II and thereby feeds the coding magnet 21 also contained therein, which in turn opens the contacts 23, 24 and closes 25, 26. The contacts 23 and 24 also lie in the circuit II, so that the coding magnet is without current immediately after being energised. Contacts 25, 26 on the other hand lie in the second auxiliary circuit III and enable the safety relay 27 in the transmitter to be energised. The safety relay opens a further collecting contact 28, 29, which is common to all key-board circuits, so that these are deprived of current immediately after the energisation of the coding magnet and any depression of the type can no longer take place.

Below is a description of the various parts of the device in conjunction with their method of working.

On the depression of a key 97 in the transmitter, a pair of contacts 10 is closed (Fig. 7), which cause the magnet 11 appertaining thereto to be energised. This attracts an armature 98, which is pivoted at 99 in an angle frame 100. The type of a transmitter typewriting machine is actuated by an adjustable rod 101 which engages with the end of the armature 98. The magnet 12 of the key-board circuit of the receiver is energised simultaneously with the corresponding magnet 11 of the transmitter (Fig. 9). The magnet 12 attracts an armature 98<sup>1</sup> which is pivoted at 99<sup>1</sup> in an angle frame 100<sup>1</sup>. An adjustable rod 101<sup>1</sup> engages with the end of the armature 98<sup>1</sup> and thereby actuates the type of the receiver typewriting machine appertaining thereto.

On the depression of a type rod 101<sup>1</sup>, one of two hinged plates 114, 115 is deflected downwards, the said hinged plates being pivoted on a spindle 117 carried on stand 116. Each plate on its downward movement operates one pair of contacts 19, 20 or 19<sup>1</sup>, 20<sup>1</sup> connected in parallel, and these contacts complete the auxiliary circuit II for the coding magnet 21 shown in Figs. 2 and 3, which is composed of twelve powerful coils.

The armature 30 of the coding magnet is of fork shape above the coils and is carried in a bearing block 31 in which it is pivoted by means of a pin 32. The free end of the armature 30 operates a coding lever 35 arranged in the bearing

block 31, through a pressing screw 33 and an adjusting screw 34. The free end of the lever 35 is equipped with a coding nose 36 (Fig. 5) which is arranged above the rotating coding wheel 37 having a circle of holes therein. The holes of the circle are spaced at unequal angles from one another in known manner. The coding lever 35 is so supported that the nose 36 thereof is raised from engagement with the coding wheel 37, by the two screws 33 and 34, when the armature 30 is attracted. The nose remains in this position even when the coding magnet is not energised, as it is prevented from dropping by the solid parts of the coding wheel on the rotation of the latter. The coding lever 35 returns to its lower position only when one of the holes of the coding wheel 37 is disposed beneath the nose 36. This downward movement of the coding lever 35 is assisted by a spring-loaded plunger 38, the lower end of which rests on the coding lever 35, being located in a groove 40 in said lever, the depth of said groove decreasing from one edge of the lever 35 to the other. The plunger 38 is carried in a housing arm 39 capable of being angularly displaced and on being placed on the lever exercises a certain pressure thereon as a consequence of the gradually increasing slope of the groove 40. This pressure is utilised for the purpose of pressing the coding wheel against the parts lying under it, so that a firm hold is given to such wheel. For the changing of the wheel it is sufficient to swing the arm 39 to one side, in order to release the pressure connection.

The armature 30 is further rigidly connected through a stretching screw 41 with a coupling lever 42 (Fig. 3), which is pivoted by means of a bolt 43 in the block 31. The free end of the coupling lever 42 is fork-shaped and engages in a peripheral groove in the lower driven coupling part 44, which is connected with the coding wheel 37 by means of a sleeve 50. The part 44 of the coupling is provided on its operative surface with a plurality of teeth which cooperate with teeth on the upper driving part of the coupling 47. The number of teeth on the part 47 is made sufficiently large to avoid undue lost time in engagement when operation is desired. The drive of the part 47 of the coupling is effected by a driving gear 49 through a worm gear 48, which driving gear might suitably be represented by a small electric motor as shown in Fig. 2. The part 47 of the coupling is continuously rotated and is mounted for free rotation on the sleeve 50. An arbor 51, is vertically arranged on the base plate of the device said arbor passing through the sleeve 50

and serving as a bearing for the parts described above. The coding wheel 37 is fixed on the sleeve 50 by means of a milled screw-cap 52.

5 A gear wheel 46 is mounted on the lower end of the sleeve 50 and drives a pinion 54 through an intermediate wheel 53 (Fig. 2), said pinion being loosely mounted on the arbor 55 (Fig. 4). On the  
10 arbor 55 is the rotating distributor disc 56, which carries on its periphery a circle of contact pieces 13. Each of these contact pieces is connected with one of the slip-rings 58 through an insulated lead 57,  
15 which slip-rings are arranged in layers one over the other on the arbor 55 and are separated from one another by insulating discs. Each of the slip-rings during rotation rubs a plate 60 having at its end a terminal connection 61 for an electrical  
20 conductor. The plates appertaining to the block of slip-rings are fixed alternatively to two stands 62.

The block of slip-rings is held together by bolts 64 the lower ends of which engage with a ratchet wheel 65, on which supports the whole block of slip-rings.

The contact pieces 13 operate jointly with the contact piece 14 of a fixed distributor disc 66, these contacts being loaded by springs in a radial direction—i.e. in the direction of their contact surfaces—in order to obtain a good contact pressure. The fixed system is supported  
30 by pillars 67. The transmission of current in the distributor is effected from the contact pieces 14 to the contact pieces 13, and thence over the leads 57, slip-rings 58 and plates 60 to the terminals 61. The arrangement of the contacts 14 to their counter-contacts 13—and thereby to the terminals 61—is definitely settled by the path covered by the travel of the coding wheel 37 when displaced.

45 In order to prevent any backward movement of the movable system, the latter is moved forward by the ratchet wheel 65 and the spring pawls 68 (Fig. 2). The spring pawls 68 are carried by a flange 69 and are fixed to the latter, the flange being connected to the gear wheel 54. The transmission of the rotary motion from the gear wheel 54 to the distributor disc 56 is accordingly effected by the inter-  
50 position of the pawl and ratchet driving gear hereinbefore described.

The flange 69 is formed in two parts, the lower part of which has a plurality of holes 70, the number and distance of which are equal to those of the contact  
60 pieces 13. A stop pin 71 is arranged beneath the circle of holes 70 and is supported by a member actuated by the armature in such a way that, at predetermined moments, it can penetrate into the hole

located above it in the following manner. The member comprises a lever 74 hinged on a standard 73 and a cross-lever 76 which is pivotally supported by the bearing block 31. The lever 74 is connected  
70 to the armature 30 by a bolt 75 and is therefore moved by the armature. The fork-shaped end of the cross lever 76 grips the stop pin 71, which is guided in a cylindrical hollow body 77, so that its  
75 movement in a straight line on the circle of holes of the flange 69 is ensured. The stop pin 71 carries out this movement as soon as the nose 36 of the coding lever drops in one of the holes of the coding  
80 wheel 37 and the armature 30 is pressed down by the adjusting screw 34. This movement of the armature is transmitted via the parts 74, 75, 76 to the stop pin 71, and causes it to penetrate into one of the  
85 holes 70. This brings the movable distributor disc 56 instantaneously to a standstill, and its contact pieces are brought precisely opposite those of the fixed distributor disc 66. If the armature of the coding magnet 21 is then attracted,  
90 as is the case on a further signal being given, and the coupling for the coding wheel engaged the distributor will also rotate and the stop pin 71, by the reversal of movement of the parts 74 to 76, will be  
95 returned to the position of release, so that no delay in the starting of rotation of the distributor takes place. Whilst the distributor is in motion, the solid parts of the flange 69 presses the stop pin 71 down  
100 and it remains in this position, even when the coding magnet 21 is no longer energised, inasmuch as the armature 30 of the magnet 21 is, as stated above, held in the attracted position by the coding lever  
105 35, and in this position definitely maintains the stop pin 71 in its lower position through the parts 74 to 76.

The gear wheel 46 further serves to  
110 drive a pinion 78 which carries an interrupter disc 79. (Fig. 5). This is provided with a crown of projections which have a conical shape. A lever 81 is disposed above the path of the projections 80 and on engagement with said projections the  
115 lever 81 is turned about the pivot 82. During this movement the free end of the lever 81 displaces the tappet 83, which is pivoted to it at 84. The lever 81 is suitably provided with a projection at the point where it comes in contact with the projections. On rising, the tappet 83 engages with a system of contact springs  
120 23 to 25, the lower pair 25, 26 thereby being closed, whilst the upper pair 23, 24 remains open. This is effected by that the free end of the uppermost contact spring carries a nipple 23<sup>1</sup> against which the contact spring 25 is pressed by the tappet 83  
130

and in such way lifts the spring 23. The contacts 23 to 25 appertain to the two auxiliary circuits II and III, as may be seen from Fig. 1. The operation of the contacts is effected by the gear wheel 46, pinion 88, interrupter disc 79, projection 80, lever 81 and tappet 83, i.e. at the same moment at which the coding wheel is put into rotation.

In order to prevent the lever 81 and consequently the tappet 83 falling back into their original position as soon as the lever is no longer supported by a projection 80, the following arrangement is provided:

Under the action of a spring 90 a hinged piece 89 with a triangularly shaped nose 91 penetrates into a slot of the tappet 83 and lifts the tappet, owing to the incline of the nose, to such a height that the lever 81 loses contact with the projection 80. Only when the hinged piece 89 is angularly displaced against the spring 90 in the opposite direction to the hands of a clock does the nose release the tappet and the latter can then fall until the lever 81 drops on one of the projections 80. The angular displacement is effected by a lever 87 and connecting rod 88, which is controlled by the coding lever 35, the under side of the latter engaging with the surface 85 of the pin 86 on the free end of the lever 87. If now the nose 36 of the coding lever drops into one of the holes of the disc 37, the hinged piece 89 is swung in the opposite direction to the hands of a clock through the surface 85, pin 86, lever 87, rod 88, and the nose 91 is thereby drawn out of the slot of the tappet, which thereupon carries out its downward movement. The tappet is therefore removed from the contacts 23 to 26 only on the coding wheel coming to a standstill whilst, on the other hand, it remains pressed thereto as long as the coding wheel rotates.

The change-over switch, which effects the reversing of the direction of the current in the distributor, consists essentially of two discs 92 and 93, capable of being turned towards one another and lying one over the other (Figs. 2 and 6). Each individual disc carries two concentric rings of contacts, the upper disc 92 taking all contacts 17 and 18 of the leads coming from the distributor, whilst the lower disc contains all contacts 15, 15<sup>1</sup>, 16, 16<sup>1</sup> of the leads which run from the two type magnets 11 and 12. The contacts 15 and 15<sup>1</sup> and 16 and 16<sup>1</sup> respectively of each key-board circuit are connected in parallel in pairs one after the other and together form a triangle, the corners of which are electrically connected, diagonally, by bridges. If the direction of the current

in the transposing device is to be reversed, the pairs of contacts 17, 18 are shifted from the pairs of contacts 15, 16 to the pairs of contacts 15<sup>1</sup>, 16<sup>1</sup>. This is effected by turning one disc towards the other by means of a handle 94. The diagonal connection of the triangle points 15, 15<sup>1</sup>, 16, 16<sup>1</sup> has the effect that at the time the mentioned turning of the discs results in the desired reversing of the direction of current, as will be seen at once from Fig. 2.

The contacts 17 and 18 may be loaded with springs, with the object of obtaining a better contact with their counter-contacts. The two discs 92 and 93 are carried by an upright 95 and are provided with a guide 96, through which the lead running to the upper disc, not shown here, is passed. For this purpose the guide body is provided with bores, not shown here.

The safety device of the transmitter is shown in Figs. 7 and 8. The transmitter keys 97, on being depressed, come into contact with a striker plate 102, which is continued in a strutted frame 103. The frame is pivoted at 104 by an angle bracket 105, and is kept continuously pressed against the keys by a spring 106. A cranked interrupter lever 107 (Fig. 8), which is also pivoted in the angle 105 at 108, engages by means of a pin 109 on the frame 103 and is loaded by a spring 110. Its free end having the tendency to penetrate into an annular groove of a pressure pin 111, which endeavours to open a collector contact 28, 29 common to all key-board circuits. The advance movement of the pressure pin necessary for this purpose is effected by the armature 112 of a safety relay 27 lying in the auxiliary circuit III. The armature is provided for this purpose with a hammer-shaped piece 113.

When the pressure pin is so far pushed forward that it separates the contact 29 from the opposite spring 28, its annular groove lies above the lever 107, so that the latter can snap into it as soon as it is carried upward. This happens as soon as the key 97 is depressed on to the striker plate 102 and the frame 103 drops, so enabling the rod 107, under the action of its spring 110, to swing, when it makes the aforesaid upward movement and thereby retains the pressure pin in its advanced position by dropping into its annular groove. As long as a transmitter key 97 is depressed, the pressure pin also remains in the advanced position and consequently the contacts 28, 29 open and all key-board circuits are interrupted, so that no incorrect second print can be made. If, on the other hand, the key 97 is released, the

striker plate, together with the frame 103, under the action of its spring 106, rises and causes a counter-swinging movement of the interrupter lever 107, through the catch 109, when the said lever comes away from the annular groove. The pressure pin 111 then snaps back under the action of its loading spring and the contacts 28, 29 again close.

The device for the automatic subdivision of the coding wheel is shown in Figs. 10 to 12. As will be seen from the wiring diagram in Fig. 10, an operating magnet 211 is excited on depressing one of the transmitter keys 97. The magnet may, as shown in the diagram here, lie behind a branching point of all key-board circuits I. of which, for purposes of simplification, only five are shown here, or it may be arranged in a special auxiliary circuit which is joint with all key-board circuits and by means of a relay arrangement therefrom is closed on the depression of a key. The armature of the magnet 211, on the latter being excited, closes a contact 212, which lies in the circuit of the space key magnets 213e and 213s respectively of the receiver and transmitter respectively. The switching over to one of these magnets is effected at 214.

On the magnet 211 being excited, an armature 215 is moved in such way that it moves forward a ratchet wheel 216 by one stage and thereby a commutator 217 connected therewith. The commutator 217 carries on its surface contact strips 218, 218<sup>1</sup>, 218<sup>II</sup>, and 219, 219<sup>1</sup> etc. respectively, which form various groups of contacts according to their length. A separate brush 220 and 221 respectively is provided for each group of contacts, which brushes conduct the current to the contacts, whilst the collection of the current is effected by a brush 222 common to the groups of contacts. The contact strips make contact with the brushes in such way that they make an electrical connection between their ends when the commutator is in selected positions. The switching over to one of the groups of contacts 218, 219 is effected by means of a change-over switch 223. Naturally the body of the commutator consists of insulating material, in which the strips are imbedded.

The contact strips 219, 219<sup>1</sup> etc. lie centrally between the contact strips 218, 218<sup>1</sup> etc. As the strips 218, 218<sup>1</sup> etc. are double the length of the strips 219, 219<sup>1</sup>, the distance between the contact strips on the one half of the commutator, to which the strips 219, 219<sup>1</sup>, do not extend, measured in the direction of the periphery of the commutator, is double as great as on the other half. The transmission of cur-

rent between the brush 220, which belongs to the contact group 218, and the brush 222, therefore takes place half as frequently as between the brushes 221 and 222. As on each depression of a key the commutator is turned a stage further, the arrangement of the contact strips and groups results in the space key magnet being attracted half as frequently when the brush 220 conducts current as when this is the case with the brush 221, i.e. in other words that the interruptions in the coding wheel in the one case take place half as frequently as in the other, and thereby, moreover, the number of signals contained within these interruptions is doubly as great. It has proved to be suitable to allow the commutator to move five or ten stages between each making of contact, so that the signals are combined into groups of five or ten each respectively. Naturally, the lengths of the groups of signals are not to be restricted hereto.

In Fig. 11 the device is shown in a form of construction as mounted on the base-board of the receiver. The actuating magnet 211 is placed in the angle bearing 226, in which is pivoted at 227 an armature 215. The armature is loaded by a spring 216, which is fixed to the base-plate, in such way as to hold the armature away from the magnet core. A plate 228 is attached to the armature by means of rivets or the like said plate being extended beyond the armature. The extended part of the plate 228 is cranked and carries an adjusting screw 229, which rests on a plate 230 of a switch lever 231. The switch lever 231 is pivoted on a standard 232 by means of a pivot 233 and is pressed against the screw 229 by means of a spring 234. At the other end the switch lever is equipped with an insulating block 235, which normally separates a contact spring 212 from its counter-spring. The closing of the contact can only take place when the lever 231 comes into contact with the screw 229 on the depression of the armature 215; the insulating block is at the same time raised from the lower contact spring, said spring by virtue of its elasticity cooperating with its counter-spring. The contact springs are supported by a standard 236 fixed to the base plate.

The switching element 238 of the device is formed as a cylinder and is made of insulating material, e.g. fibre. It is supported by two bearing standards 239, 239<sup>1</sup> and is rotated by a pawl 242 cooperating with the ratchet wheel 240 carried on the spindle of the element 238 (Fig. 12). The pawl 242 is provided with a spring 241 and is pivoted on the lever 231 to enable effective cooperation with the ratchet wheel to take place. It comes into opera-



tion each time that the pawl and ratchet wheel come into operation each time the lever 231 is operated by the depression of the screw 229 on the armature 215 being attracted. A retaining pawl 243 also engages in the teeth of the ratchet wheel 240, which pawl is pivoted on an extension 244 of the bearing standard 239. The extension is equipped with a slot guide which renders it possible to fix it in an adjustable manner to the bearing standard 239. A strong spring 245 is arranged between the retaining pawl 243 and the standard 232 so as to ensure the cooperation of the pawl 243 with the ratchet wheel 240.

The periphery of the switching element is provided with contact strips 218, 218', 219, 219' in the manner already described, which strips make contact with the brushes 220 to 222. The free ends of these are formed like the arc of a circle, and they are carried by contact pillars 246.

In order to prevent the pawl 242 moving too far, which would result in the switching element being rotated by more than one stage, a stop-screw 247 is provided for the lever 231, said screw being carried by an upright 248. The upright 248 also takes the lever 231 in its upper forked end, and consequently therefore serves as its lateral guide.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Coding device, the signals of which are transmitted electrically from a key-board system to a type system, with the interposition of a transposing device moved by stages for the purpose of altering the key, characterised by that the key-board circuits are electrically interlinked with one or more auxiliary circuits common to them, which, after the depression of a key, put the transposing device into operation and lock the key-board circuits during their movement.

2. Coding device as claimed in claim 1, in which two distributor discs, capable of being turned towards one another by means of a coding wheel and provided with contact pieces, are used as transposing device, characterised by that the coupling of the coding wheel (37) with its driving mechanism (49) is controlled by the key-board circuits.

3. Coding device as claimed in claims 1 and 2, characterised by that on depressing a type over a collector contact (19, 20), a coding magnet (21) is switched in, the armature (30) of which puts into gear a clutch (45, 47) for the setting into operation of the coding wheel (37) and lifts a

lock (36) for this disc, whereupon a set of contacts (23 to 25) is affected by the movement of the coding wheel, which deprives the coding magnet and all key-board circuits of current.

4. Coding device as claimed in claims 1 to 3, characterised by that all key-board circuits I are supplemented by two auxiliary circuits II and III of which one includes the coding magnet (21) and the accessory collector contact (19, 20) whilst the other is connected up through the contact (25, 26) actuated by the coding magnet and feeds a safety relay (27), which opens all key-board circuits during the period of depression of the keys by means of a collector contact (28, 29).

5. Coding device as claimed in claims 1 to 4, characterised by that the set of contacts (23 to 26) which supplements the coding wheel (37) is operated by a tappet (83) which is displaced by projections (80) on a disc rotating with the coding wheel.

6. Coding device as claimed in claims 1 to 5, characterised by that a lifting device normally keeps the tappet out of contact with the projections (80) but on the dropping of the coding lever (35) into the coding wheel (37) and during the pause of the transposing device resulting therefrom, the said lifting device is disengaged from the tappet and allows the latter to drop in the path of the projecting lugs.

7. Coding device as claimed in claims 1 to 6, characterised by that a triangular nose (91) associated with the lifting device penetrates by means of one of its oblique surfaces into a slot in the tappet (83) so as to lift the latter, said tappet being maintained in this position by a spring loaded mechanism (87 to 89) until the dropping of the coding lever displaces the mechanism in such manner that the nose is brought out of engagement with the tappet.

8. Coding device as claimed in claims 1 to 7, characterised by that the coding lever (36) is loaded on the upper side by a spring bolt (68), carried in an angular displaceable arm (39), said bolt sliding in a groove (40) of the coding lever when the arm is moved the depth of said groove decreasing from the edge of the lever towards the inside.

9. Coding device as claimed in claims 1 to 8, characterised by that the individual contact pieces (13) of the rotatable distributor disc (56) are electrically connected with separate slip-rings (58), which are carried by the same shaft (55) as the distributor disc, over which slip-ring plates (60) slide and which plates are connected up to the contacts (14) of the stationary disc (66).



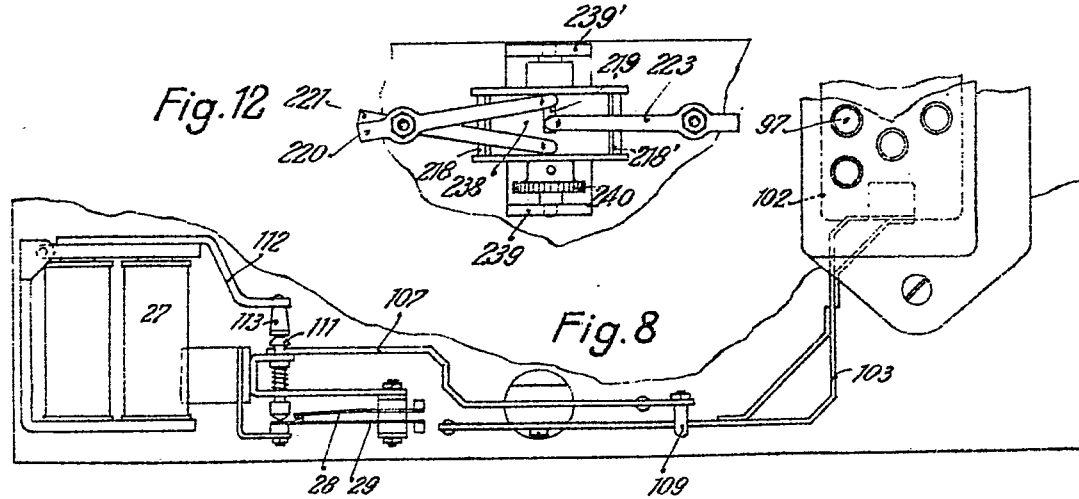
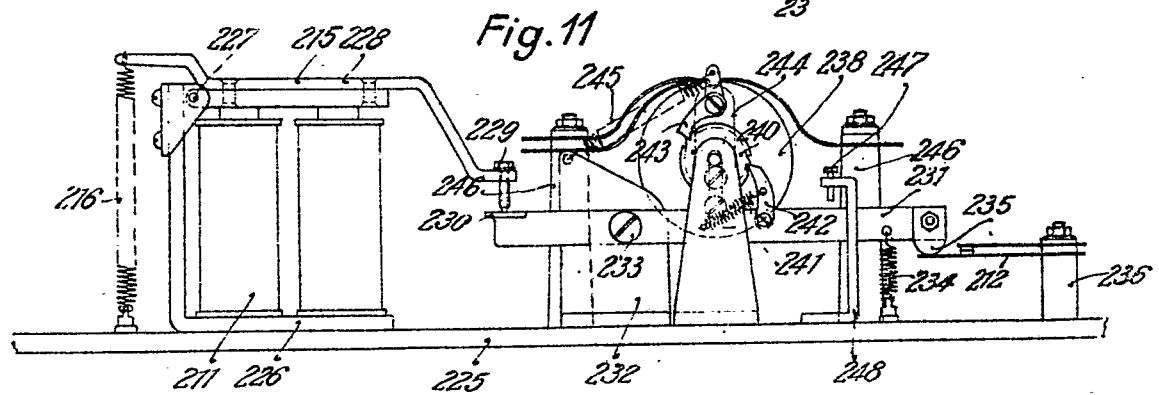
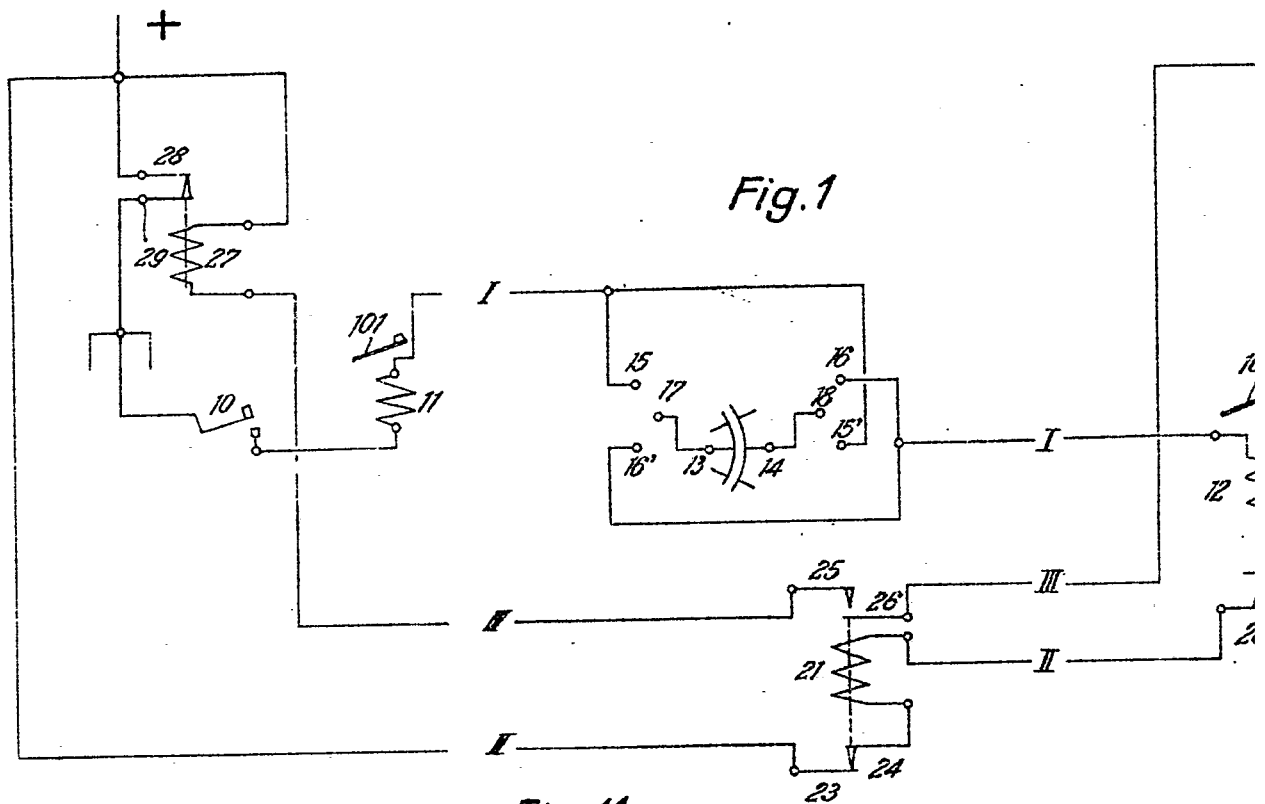
10. Coding device as claimed in claims 1 to 9, characterised by that a stop device actuated by the coding magnet (21) secures the movable disc (56) after each movement against improper turning and allows it to come to rest in one position only, viz. that in which its contact pieces (13) coincide with those of the stationary disc (66).
11. Coding device as claimed in claims 1 to 10, characterised by that the movable part of the transposing device is provided on its periphery with a row of holes (70), at the same distance apart as its contacts (13), a stop pin (71) carried by the armature (30) of the coding magnet entering one or other of said holes when the disc is stationary.
12. Coding device as claimed in claims 1 to 11, characterised by that a spring loaded pressure pin (111) is axially displaced by the relay armature (112) for the opening of the contact (28, 29) controlled by the safety relay (27) and is secured in this position by an interrupter lever (107) during the period of depression of a key lever.
13. Coding device as claimed in claims 1 to 12, characterised by that the interrupter lever (107) drops into a constriction on the pressure pin (111) under the action of a spring (110) when a striker plate (102) is depressed by the key levers.
14. Coding device as claimed in claims 1 to 13, characterised by that the interrupter lever (107) is provided with a catch (109) which is gripped by a frame-shaped extension (103) on the striker plate thereby moving the interrupter lever out of engagement with the pressure pin as soon as the striker plate again takes up its position of rest after release of the Key lever.
15. Coding device as claimed in claims 1 to 14, characterised by that the keyboard circuits I on each side of the transposing device each include a type magnet (11 and 12 respectively), one of which appertains to the transmitter and the other to the receiver.
16. Coding device as claimed in claims 1 to 15, characterised by that, on actuating the type levers in the receiver, one or more hinged plates (114, 115) are displaced and thereby close the collector contacts (19, 20 and 19<sup>1</sup>, 20<sup>1</sup> respectively) for the switching in of the coding magnet (21) and safety relay (27).
17. Coding device as claimed in claims 1 to 16, characterised by that the keyboard circuits between the transposing device and the type magnet are interrupted and carried to a change-over switch, which permits of reversing the direction of current in the transposing device if the coding device is to be changed over from coding to decoding.
18. Coding device as claimed in claims 1 to 17, characterised by that the change-over switch contains for each key-board circuit four contacts connected diagonally with each other (15, 15<sup>1</sup> and 16, 16<sup>1</sup> respectively) the transposing device being connected to said contacts of which a pair are from time to time brought into contact with two contacts (17, 18) to which the type magnets (11 and 12) are connected.
19. Coding device as claimed in claims 1 to 18, characterised by that the leads coming from the type magnets and from the transposing device end in special contact crowns, which are arranged on the periphery of discs (92, 93) lying over one another and are turned towards one another for the purpose of reversing the direction of current in the transposing device.
20. Coding device as claimed in claims 1 to 19, characterised by that a switching body, moved forward in stages on each depression of a key brings into operation at uniform intervals of time that space key which appertains to the type field recording the coding wheel, and thereby brings about a subdivision of the coding wheel into groups of signals of equal size, independently of the lengths of words of the clear text.
21. Coding device as claimed in claims 1 to 20, characterised by that the switching element when in its effective position closes a circuit which can be used, through a change-over switch (214) for feeding the space key magnet (213e) in the receiver or (213s) in the transmitter.
22. Coding device as claimed in claims 1 to 21, characterised by that the switching element has the form of a cylinder (218) which is rotated by a ratchet wheel (240) and a spring pawl (242) operated by the armature (215) of a magnet (211) excited at each depression of a key.
23. Coding device as claimed in claims 1 to 22, characterised by that the magnet armature (215), on being attracted, closes a contact (212) in the circuit of the space key magnet.
24. Coding device as claimed in claims 1 to 23, characterised by that contact strips (218, 218<sup>1</sup> and 219, 219<sup>1</sup> etc. respectively) appertaining to the circuits of the space key magnets are distributed over the periphery of the cylinder at a distance from one another which is equal to the total of all switching stages necessary for the formation of a group of signals.
25. Coding device as claimed in claims 1 to 24, characterised by that a number of groups of contacts differently distributed are arranged on the switching body,

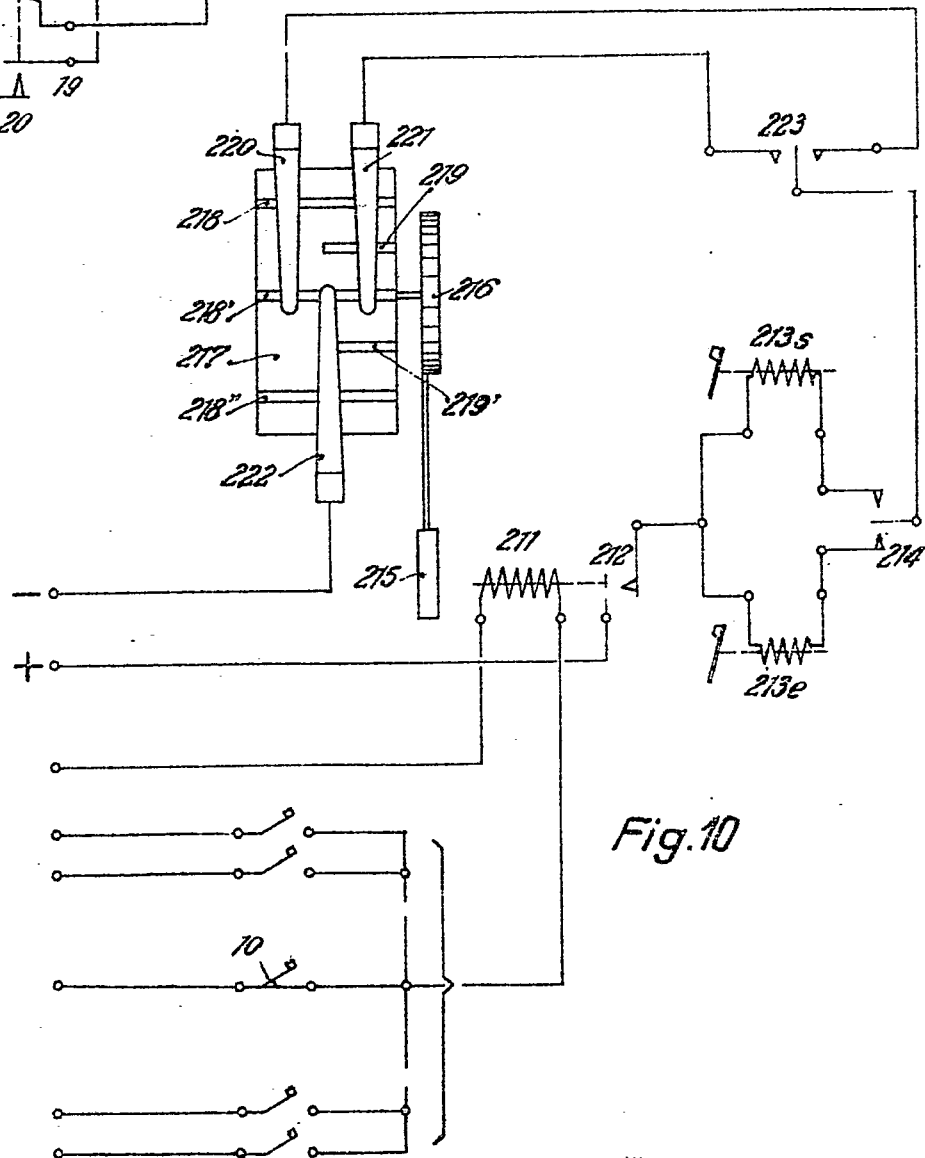
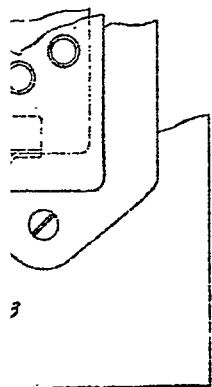
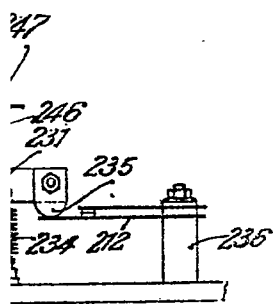
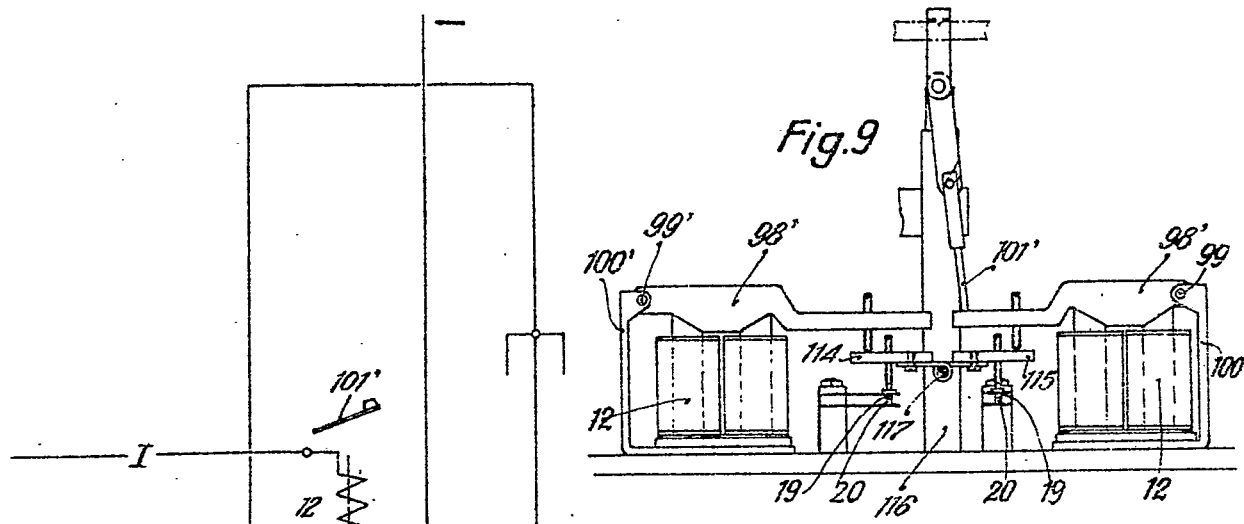
which groups of contacts can be switched described and illustrated in the accompanying drawing.  
in optionally through a change-over panying drawing.  
switch (223).

Dated this 10th day of September, 1929.

26. The arrangement and construction  
5 of a coding device substantially as  
FELL & JAMES,  
Agents for the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1931.





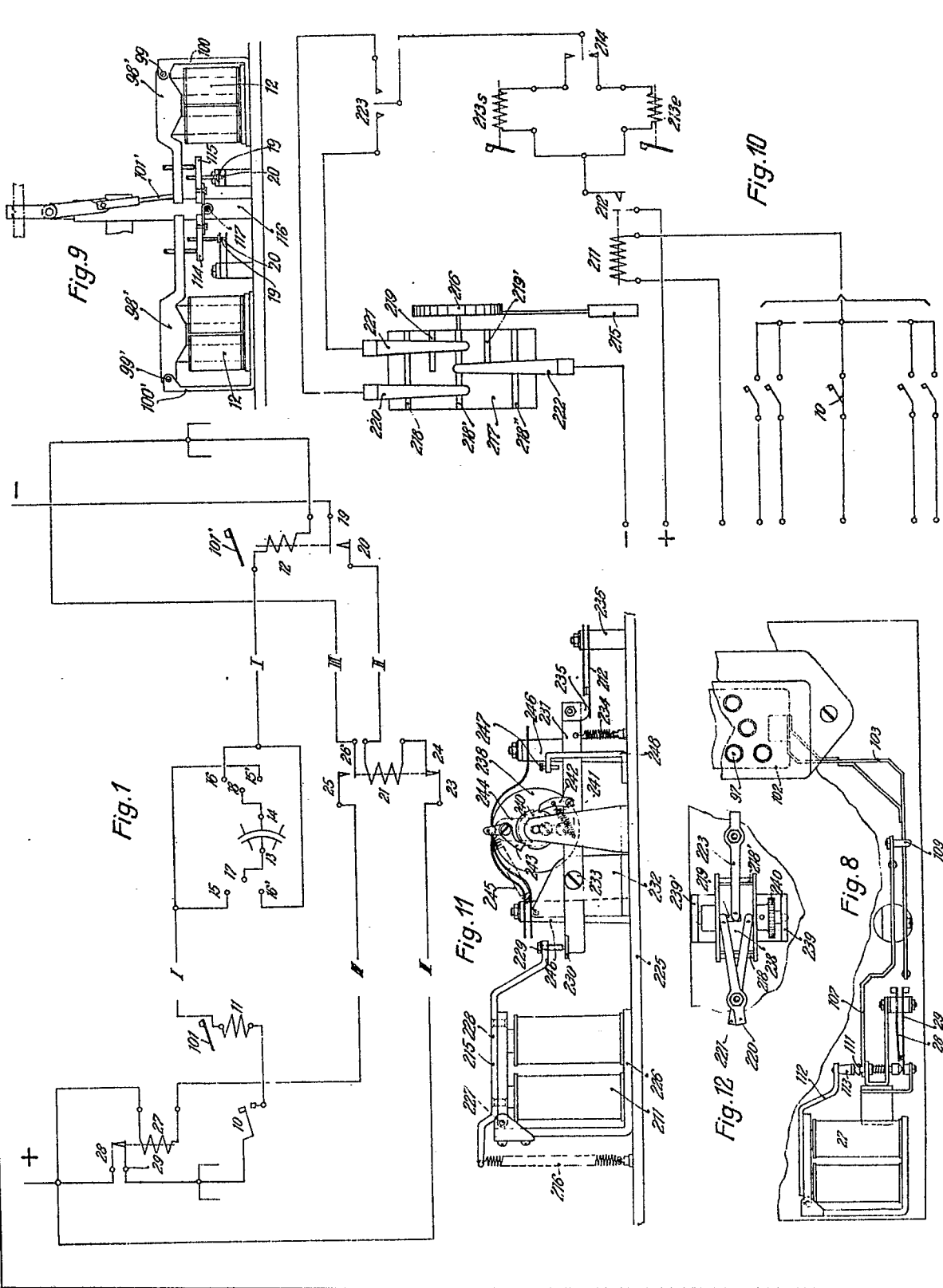
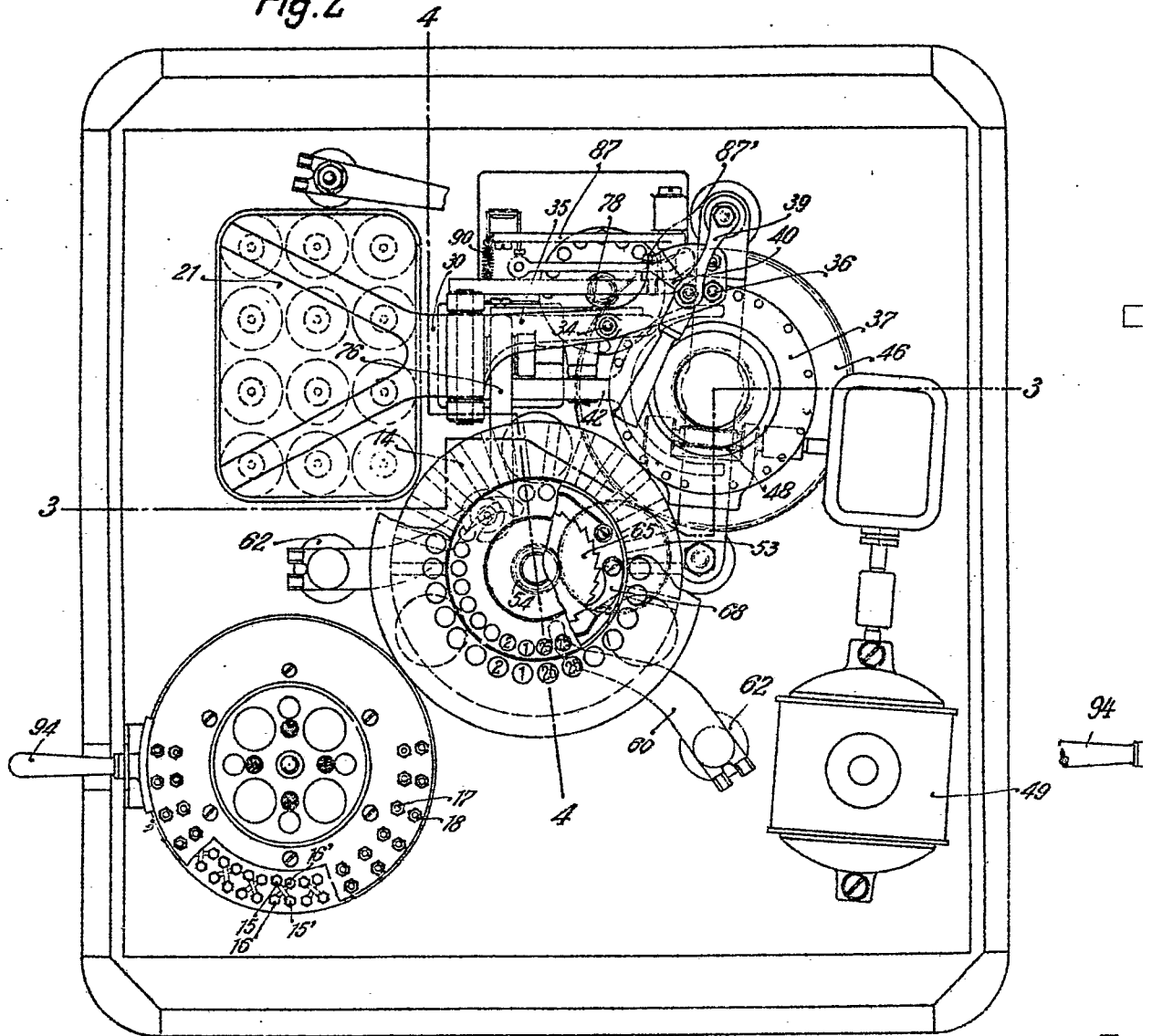


Fig.2



Fig

Fig.3

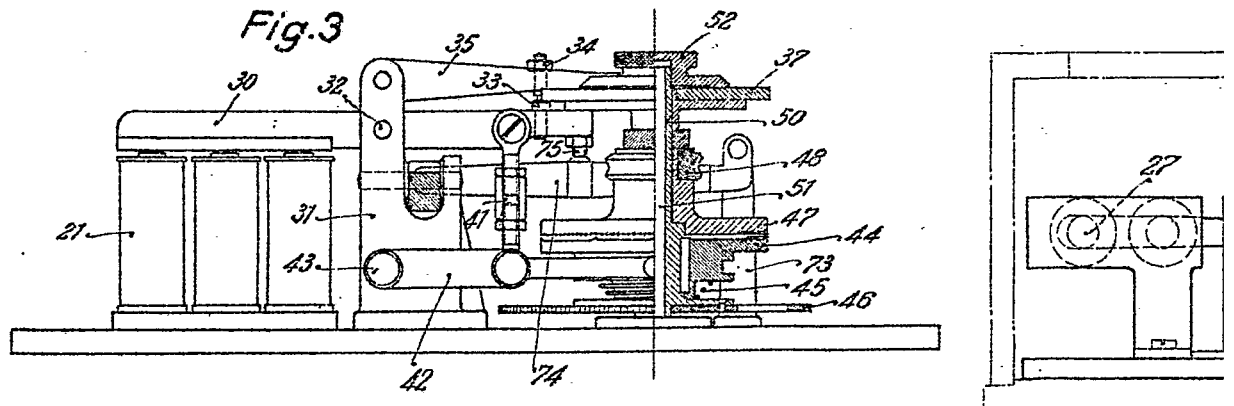




Fig. 4

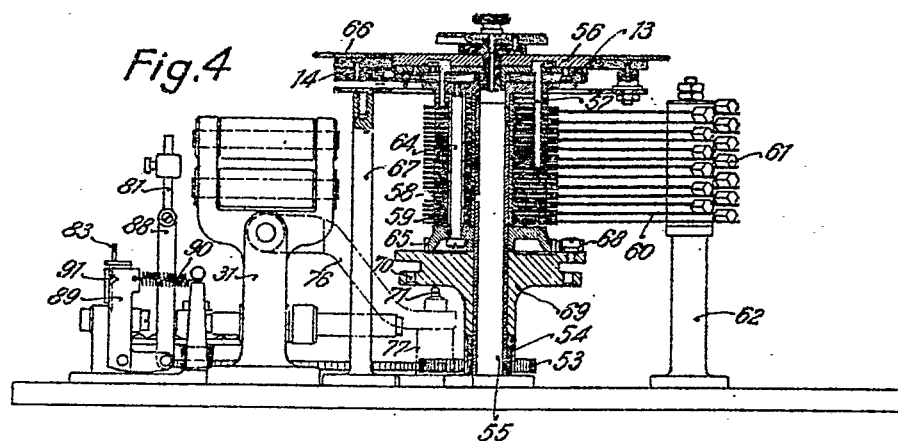


Fig. 5

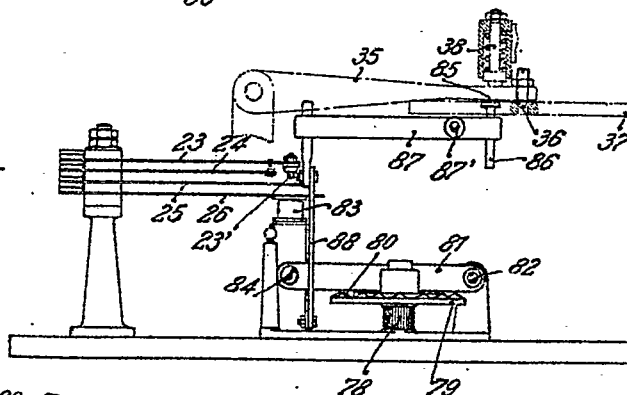


Fig. 6

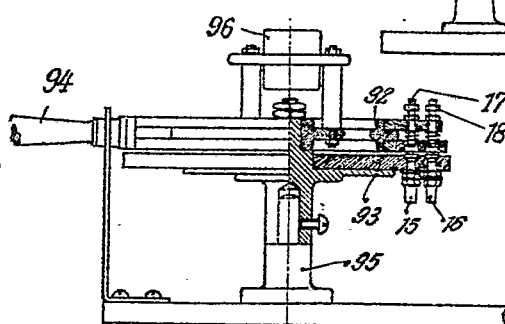


Fig. 7

