

Jan. 30, 1951

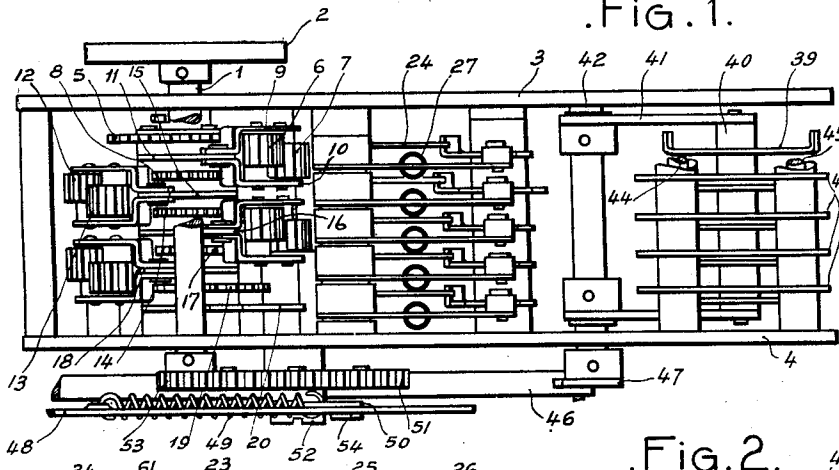
JEAN ESTOUP
OTHERWISE KNOWN AS
HENRI ESTOUP
PRINTING TELEGRAPH APPARATUS

2,539,509

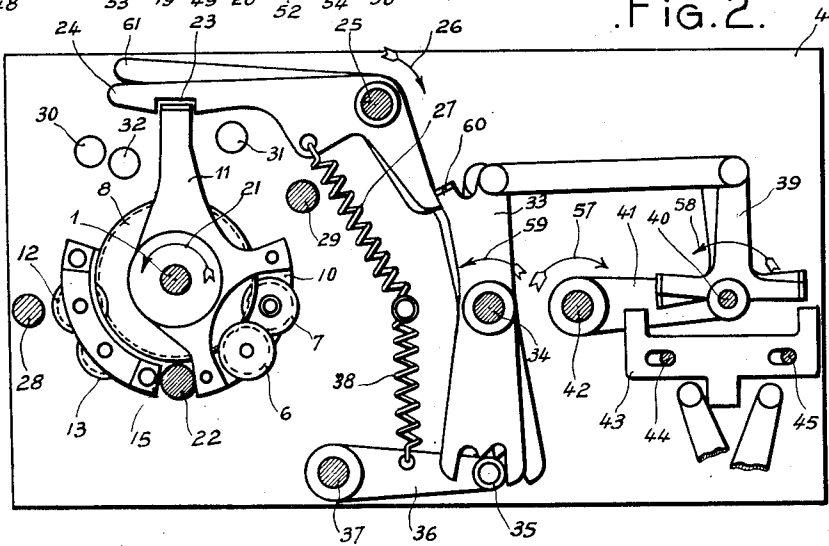
Filed March 25, 1947

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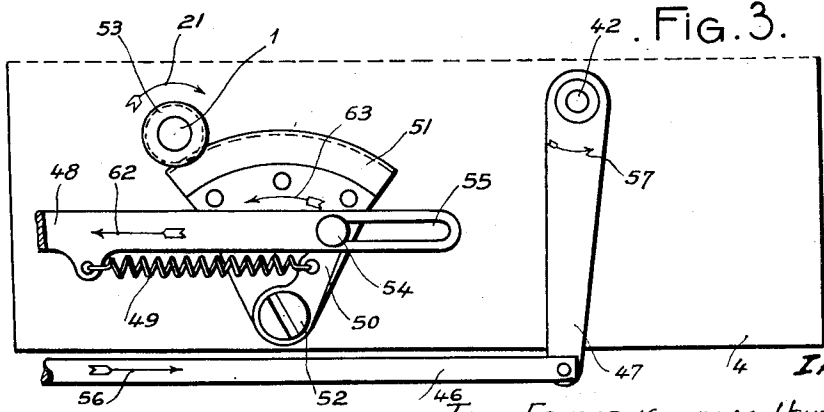
.Fig. 1.



.Fig. 2.



.Fig. 3.



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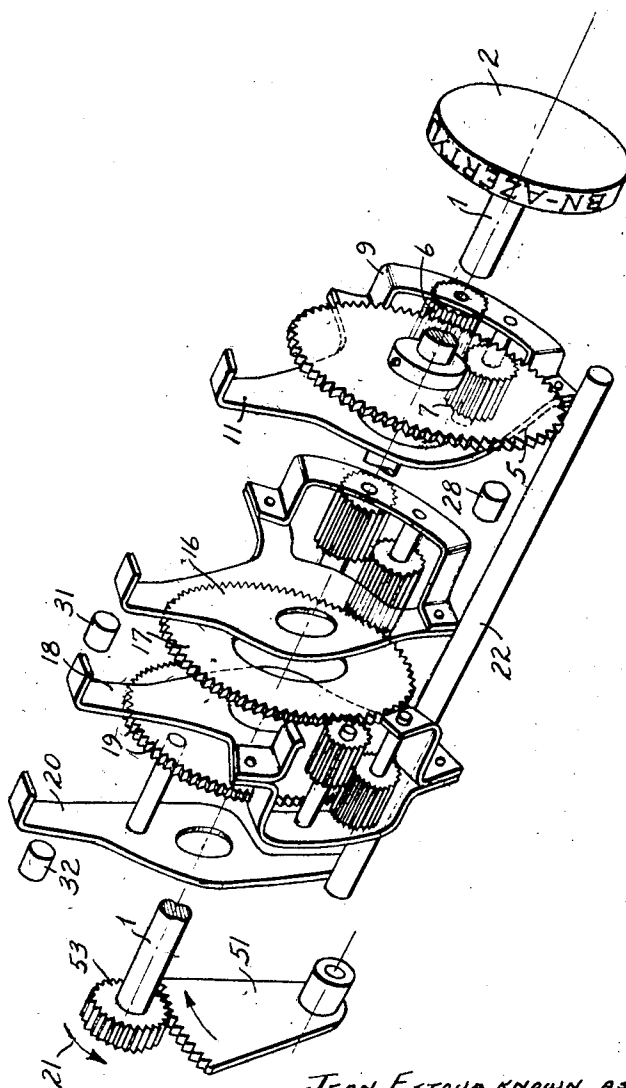
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2 Sheets-Sheet 2

Fig. 4



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PRINTING TELEGRAPH APPARATUS

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1

The present invention relates to printing telegraphic apparatus, to remote control and to like apparatus; it has for its object a combining translating mechanism for combining elements representing particularly but not exclusively, characters, figures, signs or controls of motions which may or may not be annexed to the characters, figures or signs being translated.

It has for its object to constitute a combining-translating mechanism which is simple, of inexpensive design and capable of accumulating a combination of elements and then to cause the revolution of an operating shaft, in order to bring the latter to a position which corresponds to the accumulated combination, the said shaft remaining in such position during the time necessary for its employment by a translating mechanism. The invention particularly applies, in the actual state of the art, to printing telegraphs and to remote control apparatus which represent each character, figure, sign or control of motion by means of five characteristic impulses capable of taking the one or the other of two values respectively called "rest" and "operative."

It is known that by assigning to each characteristic element two values: 0 or 1 for the first element, 0 or 2 for the second, 0 or 4 for the third, 0 or 8 for the fourth, and so on, . . . 0 or 2^{n-1} for the n^{th} , the value 0 always corresponding to the "rest" value of each element and the other value to the "operative" value of each element, then adding all the indications obtained, a characteristic number will be obtained for each combination of all said elements.

In this way, five "rest" values will be represented by the total value 0; one "operative" value followed by four "rest" values will be represented by the total value 1; one "rest" value followed by one "operative" value and three "rest" values will have the total value 2; two "operative" values followed by three "rest" values will have the total value 3, etc., each particular combination being represented by a given value different from the others, and all the values thus obtained then forming a continuous numerical sequence from 0 to $2^n - 1$. Consequently, assuming that the mechanism, starting from a position corresponding to the total value 0, imparts to an operating shaft an angular displacement equal to A for the first impulse, to 2A for the second, to 4A for the third, etc., up to $2^{n-1}A$ for the n^{th} , and adds to one another the various displacements, a different position of the shaft will be obtained for each combination, the positions thus determined following one another at the angle A of the preceding one, without any interruption of continuity.

2

It is known that the standard differential mechanism, comprising a driving wheel, a set of planet wheels and a driven wheel, affords a solution of the said problem for two angular displacements. Consequently, for the elementary case of two elements, when the driving wheel revolves through a given angle A in a given direction, the set of planetary wheels remaining stationary, the driven wheel revolves through the same angle A in reverse direction; if the set of planetary wheels revolves through a given angle B in a given direction, whilst the driving wheel remains stationary, the driven wheel revolves through twice that angle B in the same direction as the set of planetaries; finally if the driving wheel revolves through a given angle A in a given direction, and the set of planetaries through an angle B in the reverse direction, the displacements will add to one another and the driven wheel revolves through an angle $A + 2B$ in the opposite direction to the driving wheel.

Starting from the first two-element elementary mechanism, there may be arranged on the same shaft a series of differential mechanisms, each driven wheel driving the driving wheel of the following mechanism and the direction of rotation of the first set of planetaries being the reverse of that of the driving wheel of said first mechanism, that of the second set being in the same direction as the driving wheel of the second mechanism, and the following one being the reverse and so on, reversing each time the direction of rotation of the set of planetaries. With this arrangement, the displacements of the first driving wheel will be reproduced without modification by the driven wheel of the last differential mechanism; the displacements of each of the sets of planetaries will be reproduced by double displacements of the last driven wheel; the various displacements thus transmitted will add to one another, the last driven wheel thus reproducing the sum of the displacements of the first driving wheel and of twice the displacements of the successive sets of planetaries.

Consequently, it will be sufficient to impart to each of the said elements an angular displacement suitable for obtaining a mechanism which solves the said problem. It will be easily seen that any sequence may be chosen for that purpose. For example, an angular displacement of 4A may be imparted to the first set of planetaries, of A to the second and so on; but it is also apparent that it is advantageous, in order to reduce the amplitude of the displacements performed by each of the wheels and thus reduce the inertia of the system, to couple the operating shaft

with the driven wheel of the set of planetaries having the largest displacement to perform, such set being considered as the first of the series, the following set having half the displacement of the preceding one and so on, and the last set and its driven wheel having each a displacement equal to unity A. The last set consequently has a displacement equal to A, and the driving wheel of such last set also has a displacement equal to A.

For simplicity of construction, the preferred differential mechanism is of the spur pinion type comprising a driving spur wheel and a driven spur wheel of equal size and same number of teeth and a planetary set comprising two equal spur pinions engaging each other, one of them meshing with the driving spur wheel and the other with the driven spur wheel. It will be observed that two successive sets of planetaries will be displaced about the operating shaft in opposite directions. Consequently, if two successive sets of planetaries are started from two immediately adjacent angular positions moving away from each other, both said sets will draw closer to each other on the opposite side of the circumference. If the total angular displacement of the operating shaft is restrained to one revolution, which is not actually necessary for the operation of the combining mechanism, but is convenient for construction, the first set of planetaries will be displaced one quarter of a revolution and the following one $\frac{1}{8}$ of a revolution, i. e. as a whole $\frac{3}{8}$ of a revolution. Consequently a residual space of $\frac{5}{8}$ of a revolution will be preserved upon the circular paths described by said sets of planetaries. Consequently if the overall dimension of each mechanism is restricted to half such value, both successive sets will engage with the spur wheel, which will act as driving wheel for one of the mechanisms and as driven wheel for the preceding one; the effect of this will be not only an economy of half the gear wheels and the couplings between them, but also to secure an operation of the assembly which is safer and less subject to play.

On the other hand, owing to the great number of meshing wheels and pinions, it must be feared that by giving to each set of planetaries two precise positions, but leaving free the wheels and the operating shaft, the influence of play, at least after some wear, might render inaccurate the position of the shaft and involve overlap on adjacent positions. Consequently, when translation is performed, it is beneficial in the interest of accuracy, to subject the shaft to the permanent influence of a spring or like device having for its object to avoid play.

Finally, and particularly in telegraphic apparatus of the "start-stop" type, as well as in many telegraphic or telemechanical transmission systems, the combination of elements representing one character or a control of motions will appear as a whole, in the detecting members, only during a very short time interval, during which the transfer to the operating members is to be performed. If the latter have an appreciable mechanical inertia, the transfer will be hesitant and uncertain. It is consequently advantageous to perform the transfer to light accumulating members, the position of which determines the point to which the sets of planetaries and the last driving wheel may subsequently be displaced by the operating mechanism.

The invention will become apparent as this description proceeds, reference being made to the

accompanying drawing, which is given only by way of example, and in which:

Fig. 1 is an overall view of the mechanism which is the object of the invention;

Fig. 2 is a sectional view according to XX' of Fig. 1, showing the mechanical devices relating to a characteristic element;

Fig. 3 is a view from the bottom showing the operating mechanism; and

Fig. 4 is an exploded view of the principal parts.

According to one of the embodiments of the invention, in which it is assumed that five characteristic members are set in operation, this being the case for printing telegraphs of the Baudot and "Start-stop" types, the apparatus comprises an operating shaft 1, carrying a type wheel 2. The whole mechanism is contained between two plates 3 and 4.

The shaft 1 is operatively connected to a first spur wheel 5 of which it follows all the rotations. A first set of planetaries comprises the pinion 6 meshing with the spur wheel 5 and the pinion 7 meshing with the pinion 6 and with a spur wheel 8. The pinions 6 and 7 are mounted between the brackets 9 and 10 secured to the arm 11. The second spur wheel 8 and the arm 11 are freely pivoted about the shaft 1.

A second set of planetaries is constituted by the pinions 12, meshing with the spur wheel 8, and 13, meshing with the pinion 12 and with a spur wheel 14. The pinions 12 and 13 are secured to the arm 15 freely pivoted, as also spur wheel 14, about the shaft 1.

In the same way, a third set of planetaries 16, a fourth spur wheel 17, a fourth set of planetaries and a fifth spur wheel 19 are freely pivoted about the shaft 1. The fifth spur wheel 19 is operatively connected to an arm 20 identical with the arm 11.

When the shaft 1 is urged in the direction opposite to the arrow 21, each of the arms 11, 15, 16, 18 supporting the pairs of planetary wheels 6-7, 12-13, etc., and the arm 20 abut against rod 22 mounted on plates 3 and 4 and constituting a common stop for said arms. In this position, each arm comes in front of a slot 23 provided on an associated trigger 24 freely pivoted about a shaft 25 mounted between plates 3 and 4. A spring 27 resiliently urges trigger 24 in opposition to arrow 26 and toward arm 11, 15, 16, 18 or 20. Thus the arm 11, for example, enters the slot 23, of the corresponding trigger 24.

When the trigger 24 is removed from engagement with arm 11 by actuation in the direction of the arrow 26, the arm 11 may abut against the stop 28 so mounted between plates 3, 4 as to limit the angular displacement of the arm to 90°. In the same way, the arm 15 may abut against the stop 29. The sets of planetaries and their arms 16 and 18 and the arm 20 may abut against the stops 30, 31 and 32 secured on the plates 3 and 4, and the respective heights of which are calculated, for the stop 30 in order to freely allow the passage of the arm 11 and to stop the set of planetaries and arm 16—for the stop 31, in order to allow the passage of the arm 15 and to stop the arm 18—for the stop 32, in order to allow the passage of the arm 11 and the arm 16, but to stop the arm 20. Furthermore, stops 30, 31 and 32 will arrest arms 16, 18 and 20 respectively at $\frac{1}{8}$, $\frac{3}{8}$ and $\frac{5}{8}$ turns.

Each of triggers 24 may be spaced from the corresponding arm by means of an associated storing lever 33 freely pivoted about the shaft

34 and maintained in either one of two positions by a roller 35 carried by an arm 36 freely pivoted about the shaft 37 and constantly urged back towards the lever 33 by a spring 38.

The storing levers 33 may be set in position, as known, by means of tilting members such as 39 which can freely pivot about a common shaft 40, carried by a frame 41 pivotally mounted on a shaft 42, members 39 being governed by the position of parts 43 carried by two stops 44 and 45 and which may take up either of two positions, by sliding across the stops.

The shaft axis 42 may be displaced by the link 46 and the lever 47, through an operating mechanism not shown, for example of the type disclosed in French Patent 912,932 of March 13, 1945.

Such an operating mechanism pulls the rod 48, connected by a spring 49 to the arm 50 in turn secured to a toothed sector 51 pivoted about a screw 52 and meshing with a pinion 53 secured upon the operating shaft 1. A pivot 54, secured upon the rod 48 and slidable within a slot 55, maintains the rod 48 and secures a minimum value to the tension of the spring 49.

If now it be supposed that a combination of five elements has been registered in the members 43, for example by actuating elements A and B of the type disclosed in the aforesaid French patent the one being brought to the position shown in Fig. 2, the others having slipped towards the left of the figure, the operating mechanism imparts to the rod 48 a push in the direction of the arrow 56. The shaft 42 rotates in the direction of the arrow 57, thus projecting all of the tilting members 39 upon the parts 43. Those of such members which encounter a part 43 in the position shown in Fig. 2 rotate in the direction of the arrow 58, about the shaft 40, thus rotating the corresponding storing lever 33 in the direction of the arrow 59. The tail 60 then bears upon the trigger 24, rotating it in the direction of the arrow 26 and removing it from the corresponding arm 11, thus bringing it to the position 61. Such motion does not take place if the storing lever 33 is already in the said position. Those of the tilting members 39 which meet a part 43 having slid towards the right of Fig. 2, rotate in the direction opposite to the arrow 58, and rotate the levers 33 in the direction opposite to the arrow 59, allowing the trigger 24 to drop towards the levers 11 or leaving them in such position if they already are so.

When such an accumulating operation is performed, the link 46 withdraws, removing the tilting members 39 from engagement with the parts 43 and enables to move the latter without modifying the combination stored in the levers 33.

Thereafter, the operating mechanism moves the rod 48 in the direction of the arrow 62, driving, by means of the spring 49, the toothed sector 51 in the direction of the arrow 63. The operating shaft 1 is driven in the direction of the arrow 21, thereby rotating the spur wheel 5, then the first planetary set 6, 7, the spur wheel 8, the second set mounted on arm 15, the spur wheel 14, the third set mounted on arm 16, the spur wheel 17, the fourth set on arm 18 and finally the spur wheel 19.

Those of the arms in front of which is engaged a trigger 24 are locked in their slot 23, the other ones continuing their motion until they meet their stop 28, 29, 30, 31 or 32, respectively. From then on, the spring 49 is tensioned, applying

each arm upon the part which locks it and allowing displacement of the rod 48 to its end position. The space for the stops is provided in such a way that between their support within the slot 23 and their support upon their corresponding stop, the set of planetaries will perform a quarter of a revolution, the second $\frac{1}{8}$ of a revolution, the third $\frac{1}{8}$ of a revolution, the fourth and the wheel 19 $\frac{1}{8}$ of a revolution.

The displacement of the rod 48 is provided in order to secure, in addition to the revolution performed by the shaft 1 when all the hooks 24 are in the position 61, a supplementary angle, in order that the support of the arms 11 etc. will always be secured upon the corresponding stops by the tension of the spring 49.

The translation may take place by known means when the rod 48 is at the end of its stroke, after which the operating mechanism returns it to resting position, bringing all the arms 11 in contact with the common stop 22.

According to a modification of the invention, and assuming that it is desired to distinguish a "character" position from a "figure" position, a sixth wheel, a fifth set of planetaries, a sixth trigger 24 and a sixth storing lever 33 will only have to be added to the above-described apparatus; the said storing lever 33 will be brought into engagement, for instance, for the "characters," and out of engagement for the "figures." The displacement allowed for the fifth set of planetaries and for the driving wheel with which it meshes being $\frac{1}{64}$ of a revolution, the combining member will give 64 different positions, of which 32 in "characters" position and 32 in "figures" position.

The invention is not restricted to the embodiment particularly disclosed but comprises, on the contrary, all possible modifications, such as, for example, those in which the positioning of the storing levers 33 would be performed by any means other than those described; and those in which the angular displacements of the shaft 1 would operate other devices than a type wheel, and particularly mechanical motions of any type.

What I claim as my invention and desire to secure by Letters Patent is:

1. Mechanism for positioning a type-wheel or like working unit as a function of a combination of elements of a code materialized by the positioning of a given number of combining elements each adapted to occupy either one of two positions, said mechanism comprising: an operating shaft having a type-wheel keyed thereto, a spur wheel corresponding to each element of the code mounted on the shaft, the first wheel being rotatable with the shaft and the others free thereon, combining levers, in number one less than the number of wheels, mounted for free rotation on the shaft in alternate positions intermediate the wheels, each combining lever having mounted thereon a pair of planetary wheels each meshing respectively with the other and with one of the spur wheels situated on either side of the associated lever, the first of said combining levers, adjacent the spur wheel rotatable with the shaft, being adapted to swing about the shaft between two positions defining an angle of not more than 90° , each successive combining lever being similarly adapted to swing through an angle half of that defined for the preceding combining lever, and a lever rotatable with the last spur gear and adapted to swing about the shaft through an angle equal to that of the last combining lever.

7

2. In a mechanism as claimed in claim 1, a common stop engageable by all of said levers and spring means resiliently urging all said levers against said stop.

3. In a mechanism as claimed in claim 2 a trigger associated with each combining lever and complementary means on said trigger and lever for mutual engagement thereof, thereby to arrest said lever in a predetermined position adjacent to the position of engagement with said common stop, said predetermined position corresponding to one of the two positions of one of the combining elements.

4. A mechanism as in claim 3 wherein said predetermined position corresponds to the other position of said combining element.

5. In a mechanism as claimed in claim 4, means for rotating the shaft in opposition to said spring means until engagement of said combining levers either with the respective trigger, when said triggers are operative, or with said common stop when said triggers are inoperative.

8

6. A mechanism as in claim 5, the means for rotating the shaft further comprising means for returning the shaft to position of rest.

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