July 24, 1934. M. AMANN ET AL 1,967,216

TELEGRAPH RECEIVER

Filed Dec. 7, 1933 3 Sheets-Sheet 1

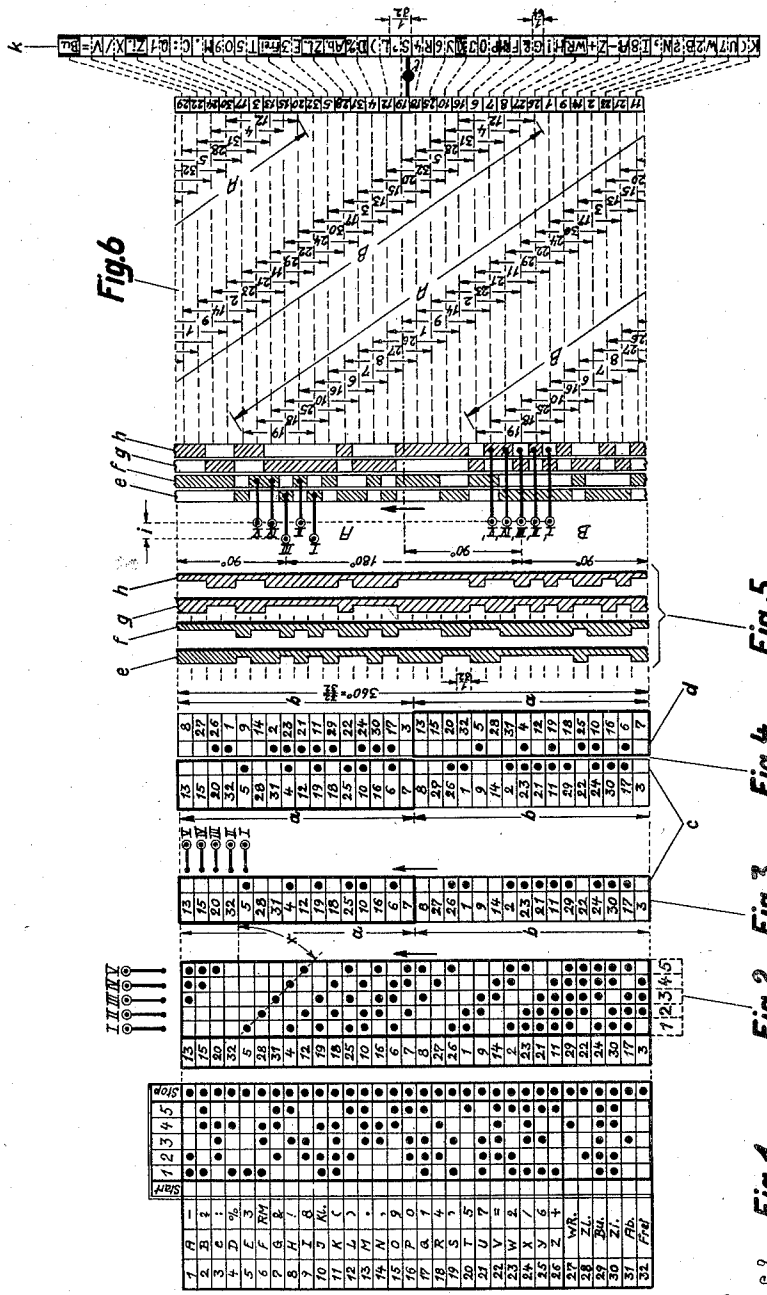


Fig.6

Fig.5

Fig.4

Fig.3

Fig.2

Fig.1

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TELEGRAPH RECEIVER

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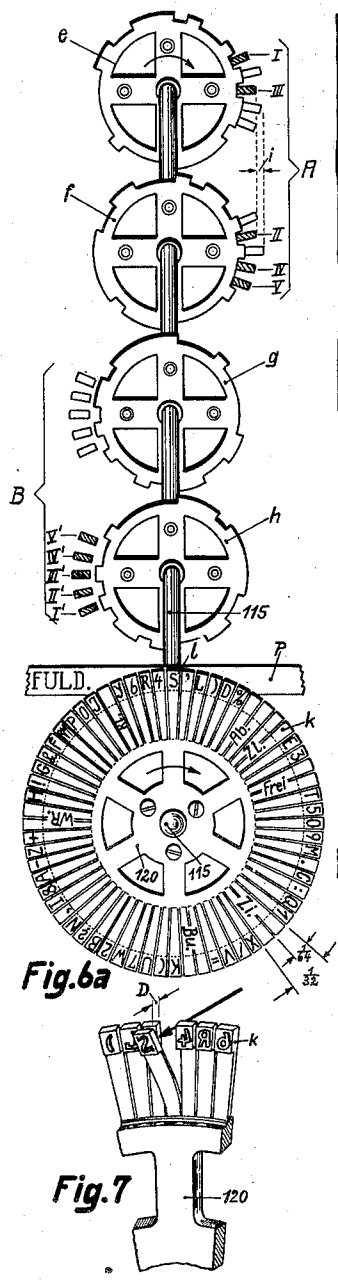


Fig.6a

Fig.7

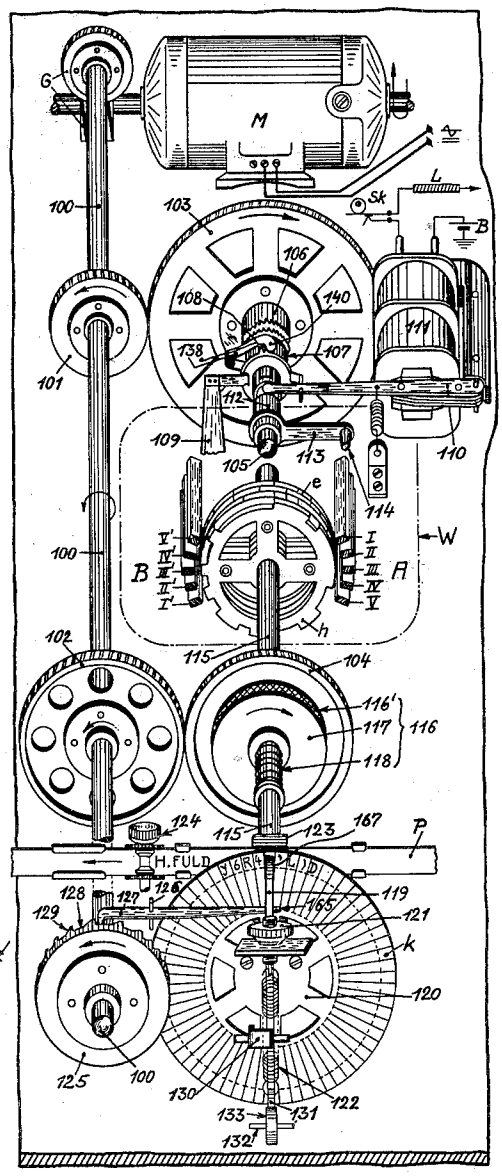


Fig. 8

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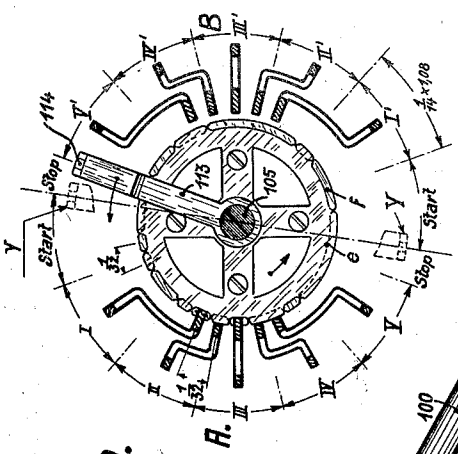


Fig. 10.

Fig. 9.

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UNITED STATES PATENT OFFICE

1,967,216

TELEGRAPH RECEIVER

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Application December 7, 1933, Serial No. 701,372
In Germany November 30, 1932

19 Claims. (Cl. 178—34)

This invention is concerned with the problem which occurs, for example, in telegraph receivers of selecting one out of a number of type characters by means of signal code current impulses of the Baudot type either for printing the type, setting it up, or making the type or for other analogous steps. In the arrangements used for this purpose today, selecting devices are used in which a group of contacting device co-operates with a set of selecting members which are controlled by the current impulses and controls the device for performing the desired final operation. The desired type is printed, set up, cast or otherwise acted upon in accordance with the setting of the selecting devices relatively to the contacting devices.

High speed receivers introduce a difficulty in that the setting up of the type and the returning of the set selecting members must take place during the time in which new code current impulses are being received for the setting up of a further type, because otherwise, the line over which the current impulses are transmitted would not be fully utilized. In the known arrangements, special signal storing intermediate devices have to be provided for this purpose in the selecting device which, owing to their number and size, complicate the construction of the selecting device and impair its certainty of operation. In order to be able to dispense with these special intermediate members and in order, in spite of this, to obtain a satisfactory full utilization of the line, it has already been proposed to use several receivers arranged for multiple operation over a line in such a way that the type selected in the selecting device through the signal code current impulses in the one receiver was printed while a type was being selected by the selecting device in the other receiver in dependence upon the signal code current impulses of a second message.

The object of the invention is to improve the construction of the selecting device of a receiver for signal code current impulses for selecting and setting up, printing, making and performing the operation on type characters in order to make the operation of the receiver faster and more certain than has hitherto been possible.

According to the invention, two or more sets of selecting members are provided so that successive sequences of current impulses corresponding to the various signals received are dealt with by a different set of selecting members. The selecting members of each of these sets are thus displaced so as to become available for making the contacts necessary for carrying out the desired operation on the type. One or more members are provided for contacting with the displaced selecting members and the contacting member or members has contacts arranged so that there is one and only one position of the displaced set of selecting members relatively to it or them in which the desired contact can be made.

By means of this provision, a new type can be selected while a selected type is being set up, printed or otherwise treated and the set selecting members are being restored to their inoperative position. The time interval allowed for this purpose is substantially longer than in any known arrangement having a single receiver and can be used more satisfactorily, for example, for printing from a stationary type wheel and without any too complicated setting up measures.

The setting up steps, that is to say, the steps for printing, setting, casting or the like of the type must be completed in the time taken by the current impulse transmission of a complete code signal. The return of the selecting members can be carried out at the same time or later. It is to be noted that the invention uses no special signal storing intermediate devices whatever, but allows an overlapping of the time allowed for the setting up and the time allowed for a further signal reception so that the current impulses of the new signal are used directly for setting the selecting device.

In order that the invention may be thoroughly understood and be more readily carried into effect, an example of construction in accordance therewith will now be described with reference to the accompanying drawings, in which:—

Figures 1 to 6 show in tabulated form and diagrammatically the data required for the construction of a selecting device having two adjustable units.

Figure 6*a* shows diagrammatically a selecting device and a type wheel.

Figure 7 shows a detail of the type wheel shown in Figure 6*a*.

Figure 8 shows the basic construction of an arrhythmically operated tape printing telegraph receiver having a selecting device in accordance with the invention.

Figure 9 is a perspective diagrammatic view of a tape printer in accordance with Figure 8, and showing details of construction.

Figures 10 is a diagrammatic front view of a selecting device of the tape printer shown in Figure 9.

Figure 1 gives the international table of code signals of the Baudot type in which each signal consists of five units. The first vertical column contains the numbers 1 to 32 and the second and third columns the letters of the alphabet and the corresponding figures and signs which are transmitted by like signals. The code signals opposite the numbers 27 to 32 are not used for the selection of a type but for carrying out special controlling steps of the receiver.

Thus, W*r* indicates "carriage return", ZL "fresh line", and are only necessary with sheet printers.

B*u* indicates "change from numerals and signs of the third column to letters of the second column"; Z*i* indicates "change from letters of the second column to figures and signs of the third column"; A*b* "space".

The following seven columns in Figure 1 indicate the sequence of current impulses for each signal. Each code sign consists of five current impulses. When operating arrhythmic receivers, each signal starts, however, with a "start" current impulse and ends with a "stop" current impulse. The absence of a dot in one of the seven squares indicates a current spacing impulse. Each "start" is, for example in closed circuit operation, characterized by a short interruption of the current which exists due to a "stop". As the "start" and "stop" are in no way typical of the five units code, they may be to some extent neglected in what follows.

In Figure 2, the numbers 1—32 appearing in the first column of Figure 1 again occur but in a different sequence, the corresponding code signals again being set out in the next five columns and five adjustable selecting members I to V are shown above these five columns.

If it is assumed that the table of Figure 2 represents a Baudot distributor such as that shown in British Specification No. 3096/1875, and that the selecting members I to V are set at right angles to each other so that, for example only the members 1 and 3 are in operation, it will be clear that on movement of the distributor in the direction of the arrow, a so called "key position", that is to say, a position in which a current circuit is set up by means of the selecting members for performing the desired operation on the type, is only obtained when the selector members I and III coincide with a horizontal row of squares in Figure 2 in which the corresponding dots occur only in the first and third columns, that is to say, the row 19. The type to be printed is selected by the setting up of this "key position". As can be seen from Figure 1, the code combination in row 19 corresponds to the letter S or the sign ', according to the setting of the machine.

The code combinations are arranged in Figure 2 so that the dots indicating current units lie along lines making an angle X with the horizontal. Baudot has already proposed (see British Patent No. 436/1882, Figures 13 onwards) to displace the vertical strips 1 to 5 of the table of Figure 2 so that the connecting lines between the points run horizontally and so that instead of the wide combination strip, it is possible to obtain a strip somewhat like that shown in Figure 3.

With Baudot's proposal, the displaced strip must always be lengthened by the amount of its displacement so that the finally obtained single strip has a greater length than the 32 spaces shown. The strip shown in Figure 3 is obtained if the five-column strip of Figure 2 is considered as the development of a helix, the pitch of which is equal to the pitch of the columns. In that case, the total length of the finally obtained strip is not altered. If the strip is wound round the circumference of a disc, the disc can be used for the selection of the type and, if need be, a type wheel can be rigidly connected to the spindle of the disc.

The displaceable selecting members I to V must now, of course, lie in the shown space parallel to the strips in Figure 3 and, in order to select a type, have to be displaced horizontally relatively to each other. Then, however, a "key position" can only be obtained, if next to the strip *c* shown in Figure 3 which may be called a "positive" strip, a corresponding strip (not shown) is placed which has a reversed arrangement of current units, and which will be called a "negative" strip.

Now the strips can be imagined to be in relief, so that the squares provided with dots are depressed relatively to the remaining squares, and the selecting members can be further imagined as feeler levers with a common mounting, which are displaced horizontally relatively to each other according to the received code current impulses. If the negative strip lies to the right of the positive strip and the selector members I and V are again so displaced that the members I and III are displaced to the left by the width of two strips, when the two strips move together in the direction of the arrow, a key position will only be obtained when the selecting member I reaches the square opposite the numeral 19. It is only at this point that the engagement of the two selecting members I and III is possible and the letter S or the sign ' thus selected.

In order to have a larger number of groups of contacting members, the strip shown in Figure 3 may be divided into two like parts *a* and *b* as shown in that figure. A larger number of groups can be used if desired. These parts *a* and *b* are oppositely disposed relatively to each other, that is to say, as seen in Figure 4. The strip *c* remains as it was in Figure 3 and the strip *d* consists of the parts *b* at the top and the part *a* at the bottom.

In Figure 5, the strips are shown as side views of developments of cam discs, in which the dotted squares are replaced by upraised or depressed portions. The cam discs *e* and *g* correspond to the strips *c* and *d* shown in Figure 4. Next to each of the cam discs *e* and *g*, a further cam disc *f* or *h* is arranged which corresponds to the appropriate already mentioned negative strip. Each positive disc *e* or *g* forms, together with its negative disc *f* or *h* a pair of combination discs, that is to say, a group of contacting members. A plan view of the strips *e*—*h* of Figure 5 is shown on the left of Figure 6 in which the hatched parts indicate grooves.

When the strips are subdivided into portions *a* and *b* as described, there are two sets of displaceable selecting members. The set A has selecting members I to V which cooperate with the combination discs *e* and *f* and the set B has selecting members I′ to V′ which co-operate with the combination discs *g* and *h*. These two sets of selecting members are spaced apart so as to co-operate with their associated pairs of combination discs at an interval of 180°. The amount *i* (Figure 6) by which the selecting members can be displaced corresponds to the spacing of the discs *e* and *f* or *g* and *h*. The selecting members are displaced individually to the left when

current impulses of corresponding type occur during the course of a sequence of current impulses. If a selecting member of the upper set A of Figure 6 is set so that the members I and III, as shown, can be moved to the left by the amount *i* while the remaining members remain at rest, then, after a given angular rotation of the combination discs relatively to the set of selecting members A, the position shown in Figure 6 is reached, in which each of the members of the set of selecting members A is engaged in a depression (hatched portion) in one of the discs *e* and *f*. From the table given in Figure 1 and that at the right hand end of Figure 6, it is clear that with the selecting members of the upper set A in the position shown, the signal having the number 19 is thus selected, that is to say, the letter S or the sign '.

With the combination discs in the position shown, it is clear that on displacement of the selecting members I' and III' of the set B, the selecting members I' and V' can engage in depressions in the circumference of the combination discs *g* and *h*. These discs are displaced 180° relatively to the discs *e* and *f* and reference to the tables shows that in this case the letter S or the sign ' is again selected. Thus it is immaterial whether the selection is carried out by the selecting members of the set A or of the set B.

Even if it were possible without considerable trouble to operate individually pivoted levers or the like provided with types for the purpose of printing the selected signal in accordance with the setting of the combination discs *e* to *h*, it is simpler for explaining the inventive idea of this invention to consider the case of a type wheel rigidly connected to the combination discs and rotated with them. The position of such a wheel would be controlled by the sets of selecting members A and B and their pairs of combination discs so that as indicated diagrammatically to the right of Figure 6, the selected type is printed at the fixed point *l*.

As there are 32 code combinations, the least distance between successive depressions in the circumference of the combination discs is equal to $\frac{1}{32}$ of their circumference. The circumference *k* of the type wheel is therefore sub-divided correspondingly so that all the types of one group of characters are formed thereon in succession at intervals of $\frac{1}{32}$ of the circumference. However, as figures and signs also have to be printed in addition to the letters, and these are prepared for printing in the usual way by small angular displacements of the type wheel, the type wheel is divided into 64 parts. Thus, there are also sections on the type wheel which correspond to signals which are not for the purpose of directly selecting types to be printed but for carrying out certain switching steps for preparing the machine for a particular mode of operation. The type wheel is shown diagrammatically at the right hand end of Figure 6 and the sections just referred to are heavily outlined. In order to prevent printing when the type wheel is set to these special sections, devices known in themselves have to be provided.

As shown in Figure 6, the type wheel preferably is set relatively to the combination disc that the fixed point *l* at which the printing takes place is displaced by 90° from the sets of selecting members A and B.

Figure 6*a* shows diagrammatically and in perspective the essential parts of an arrangement set up in accordance with Figure 6. The selecting members of the set A are again shown set for the selection of the letter S. The drawings show the conditions when a "key position" has been obtained by rotation of the set of combination discs and all five selector members I to V of the set A are engaged at the same time in the depressions in their positive and negative discs *e* or *f*. In this position, the letter S is ready to be printed on the paper tape P. The selecting members of the set B which co-operate with their combination discs *g*, *h* are not displaced at the instant visualized. They could, however, be set by current impulses during the rotation of the combination discs, that is to say, during the interval which extends from the setting of the selecting members of the set A to the conclusion of the printing of the letter S, due to the setting of the set of selecting members A, and, immediately after the return to the inoperative position of the selecting members A, be brought into operation for resetting the type wheel.

Figures 1 to 6 illustrate the conditions necessary for a selecting device gear with two type setting units. They can, however, be used as the basis for a selecting device with a large number of units, say, four or six.

The invention is particularly useful in that it allows signals of uniform length to be received relatively rapidly with a simple construction of receiver. This is due to the fact that all rapidly rotating parts and, in particular, the combination discs and the type wheel can be of small size and weight and small diameters and the remainder can be rotated slowly somewhat as in the parts moved in the "start-stop" system so as to reduce the acceleration forces. As the lower limit for the diameter of a type wheel is determined by the size of the type and the arrangement of the type carrying members, a type wheel of the kind shown in Figure 7 is found most suitable. The types are formed on the face of heads *k* resiliently connected to a hub 120 or of sectors cut out from a highly elastic type wheel disc. With such an arrangement a type head can be projected out from the type ring through the distance D by exerting a pressure in the direction of the arrow without having to displace the whole wheel or the whole printing installation at each printing step. If the sector shaped tongues *m* connecting the type heads to the hub of the type wheel are made long and elastic enough, the visible printing which is necessary in sheet printing can also be obtained and the printing can be controlled obliquely from above.

The spaces between the tongues *m* are of such a size when the type wheel is rotated, the matter already printed is visible through the type wheel due to the phenomenon of the persistence of vision. In the same way, the type wheel can also be made to serve directly as a stroboscope for controlling the speed of rotation of the receiver.

The selecting devices of Figures 6 and 6*a* could be used for multiple as well as arrhythmically operated receivers, that is to say, for "start-stop" printers.

The essential features of construction of a strip printing receiver working on the start-stop principle and having a selecting device in accordance with the invention is shown in Figure 8. A universal motor M is used for driving the shaft 100, its speed being maintained practically constant by a regulator which is not shown in the drawings. The motor drives the shaft 100 through a worm gear G which rotates in the direction of

the arrows. Toothed wheels 101 and 102 are keyed on the shaft 100 and drive the toothed wheels 103 and 104 continuously. The toothed wheel 103 is free to rotate on the shaft 105 and carries the toothed member 106 of a start-stop coupling. The other member of this coupling has a sleeve 107 which is displaceable along the shaft 105 and after each half revolution of the toothed wheel 103 can, by means of a projection 108 on it and a projection 140 on an arm 138, be uncoupled against the action of a spring 109. When the sleeve 107 is coupled, the shaft 105 is driven by the wheel 103 at a speed determined by the gear ratio of the toothed wheels 101 and 103.

The sleeve 107 also drives a collar 112 on which there is an arm 113 with a horizontal projection 114. The arm 113 is thus rotated with the sleeve 107 at each half rotation. The collar 112 is axially movable relatively to the sleeve 107 and can be moved in this way by the armature 110 of the receiving electro-magnet 111.

The selecting members I to V of the set A and I' to V' of the set B which are fixed to the selecting device W are displaced relatively to each other by 180° and are set with their ends in the path of the projection 114. According to the setting of the projection 114, rotation of the latter causes some or all the selector members I to V or I' to V' to be set for selecting in combination with the contacting i. e. combination discs *e* to *h* the signal to be printed. The combination discs are fixed on the shaft 115 on which the toothed wheel 104 is loosely mounted. This toothed wheel 104 tends to drive the shaft 115 constantly by means of a friction coupling consisting of a friction member 116' which is arranged between the toothed wheel 104 and a disc 117 keyed to the shaft 115 and subjected to the pressure of the spring 118.

The type wheel 120 is also fixed to the shaft 115 so that it assumes the same angular position as the combination discs.

The printing position is arranged at the top of the type wheel. When a character is to be printed, a type head which is on an elastic tongue is struck against the tape P lying on the block 123 by means of the hammer 119 which is under the influence of the spring 122 which is adjustable by means of the thumbscrew 121. After the printing, the strip is moved on in the direction of the arrow to provide the necessary space by a device 124 known in itself.

The hammer 119 is controlled by the cam wheel 125 fixed to the shaft 100 which has a number of notches 128 in its circumference. The printing hammer 119 is only released when a feeler lever pivotally mounted on the pivot 126 engages with its left hand end 127 in a notch 128. The time during which the feeeler lever 128 maintains the pressure depends upon the rate of rotation of the shaft 100 and the number of notches in the cam wheel 125.

The withdrawal of the hammer 119 is also controlled by the notches in the cam wheel 125; the faces 129 of the wheel 125 which is rotated in the direction of the arrow act on the feeler lever 127 in such a way that the printing hammer 119 is swung back about its pivot 130 and is latched at its lower end 131 by a pawl 133 pivotable about the pivot 132. The printing occurs at any time under the influence of this pawl after selection of the type to be printed.

The switching arrangement for bringing the receiver into action is also indicated in Figure 8. The winding of the magnet 111 lies in a circuit which includes an earthed battery B, a transmitting contact S*k* and the connecting line L which goes to earth in the transmitting device of another station. If a transmitter is connected to the illustrated receiver by means of the closed contact S*k*, the signals sent by the transmitter will be printed.

Figure 9 shows a different view of a receiving arrangement for tape-printing corresponding to that shown in Figure 8, in which further devices are shown, in particular for setting the selecting device W which is merely indicated in Figure 8, as well as for the shifting from one group of characters to another on the type wheel, and so forth. The same reference letters are used for the same parts in Figures 8 and 9.

The coil 111 of the receiving electro-magnet of the tape printer of Figure 9 lies in a circuit which is normally closed. The circuit in this case is under the control of a transmitting contact S*k* which is actuated in rapid sequence for sending a code signal on the Baudot system.

The armature of the electro-magnet is shown in the position taken up when the circuit is made for the stop sign, which consists of the attracted position. The extension 110 of the armature, as was earlier mentioned in the description of Figure 8, co-operates with the collar 112 and has a lateral extension 134 having an upturned end 135 which rests against the obliquely bent end 136 of a bell-crank lever 136*a* which is under the influence of a tension spring 137. The lever 138 has a pivot 139 and its end 140 can thus rest the sleeve 107 above the projection 108.

The shaft 105 carries at its forward end a disc 141 which has a cam surface extending over half its circumference. On the circumference of this cam disc slide two oppositely disposed projections 142 and 143 from the members A and B carrying the sets of selecting members. These members A and B are mounted to pivot about the shafts 144 and 145 and are respectively under the influence of a spring 146 and a spring 146' which is not visible. The spring 146 is connected to the frame R' which is mounted on the spindle 147 and which bears with its lever 148 against the member A. The frame R'' with its lever 149 is similarly mounted with respect to the member B. In addition to the levers 148 or 149 the frames R' and R'' also have correction and check pawls 150 and 151 which when the appropriate frame is pivoted, engage in one of the 32 teeth of the toothed wheel 152 which is rigidly connected to the combination discs *e* to *h* and the shaft 115, and, after predetermining the rotary displacement of the shaft 115, determine the exact key position and the stopping of the thus connected type wheel 120 connected therewith.

Each of the frames R' and R'' also has extentensions 153 and 154, the extensions 154 being mounted so as to be free to move in one direction on the extension 153. When one of the pawls 150 or 151 is in engagement with the toothed wheel 152, all the extensions of the appropriate frame R' or R'' move rigidly together.

Each of the extensions 154 lies on the arm 155 of a lever 157 pivotable about a pivot 156, the position of rest of which can be set by means of the screw 158. The lever is permanently under the influence of the spring 159. One end of the releasing pawl 133 for the hammer 119 which can be oscillated about a pivot 132 bears on the left hand end 160 of the lever 157 under the influence of the spring 161.

The angle of oscillation of the frames R' and

R'' is large enough so that when, for example, the pawl 150 is put into operation, the extension 154 slides over a tooth 163 of the transverse bar 155 and as it must move with the frame R' in this direction, it thus presses the right hand arm of the lever 157 downwards. In Figure 9, the frame R' is shown in the operative position. When the frame R' is moved out of the position shown, owing to the manner in which it is mounted the extension 154 snaps, without sliding over the tooth 163, directly into the rear position such as that shown occupied by the extension 154 of the frame R''.

As the members 154 pass over the teeth 162 and 163, the end of the lever 160 is raised somewhat and the pawl 133 is pivoted so as to release the hammer 119 which is mounted on the pivot 130 and is under the influence of the tension spring 122. The upper end 164 of the hammer 119 grips the forward springy end 165 of the feeler lever 127 which is pivotable about the pivot 126 and the rear end 166 of which lies as shown opposite the teeth of the cam wheel 125 which is rotated with the shaft 100 in the direction of the arrow.

If, when the hammer 119 is released by the pawl 133, the cam wheel 125 is exactly in a position in which a tooth 128 lies in front of the end 166, then the hammer can only be pivoted through the angle which is allowed by the elasticity of the member 165. This amount is large enough for the lower end 131 of the hammer to be unlatched when the pawl 133 returns under the influence of its spring 161. A short time later, however, the end 166 of the feeler lever 127 engages momentarily in a tooth space 128 and thus the hammer 119 releases its printing head 167 for printing the selected type. The strong tension spring 122 provides the accelerating force for the hammer 119. Immediately after the printing step, the feeler lever 127 is again swung back because its end 166 slides along a cam surface 129 and the hammer 119 is brought back into the latched position shown in the drawings by means of the front end 165 of the feeler lever. The tape P is then advanced but as this is effected by generally known means, the latter have not been shown.

The contacting members *e* to *h* could in combination with the selecting members I to V or I' to V' of the two sets A and B, have thirty-two positions corrected by the pawls 150 and 151. These positions correspond to one of the groups of type characters on the type wheel 120. A cam disc 168 is connected to the shaft 115 which serves when the type wheel is set to a section which corresponds to a code signal which is merely for the purpose of shifting the apparatus and not for effecting a printing step, to prevent any such printing and, if need be, to allow the necessary shifting steps to take place. If, for example, a signal for figure shift is received, the combination discs are displaced so that the cam disc 168 remains with its notch Z*i* opposite the lever 169. This lever, which is pivotable about the pivot 170 can engage in the notch under the pull of the spring 171 and lift its bent end 173 which extends vertically from the point 172. The rod 173 is thus brought behind a bend 174 in the feeler lever 127, and prevents this from engaging in a space 128 of the cam wheel 125. Printing is thus prevented if the character signal Z*i* (number 30) is received. In the same way, on receipt of the signals B*u*, WR, Z*l*, A*b* and so forth, printing is prevented each time through engagement of the lever 169 in the corresponding notch in the cam 168.

Two further discs 175 and 176 are also connected rigidly to the shaft 115. A pivoted lever 177 which is set at 90° to the lever 169 bears on the surface of the disc 175 and, under the tension of its spring 178, tends to engage in a groove Z*i* in its circumference. This groove is only opposite the end of the lever 177 when the character changing sign Z*i* is to be received. Then, the lever 177 pivots about its axis 179 and with its extension 180 lifts the holding pawl 181 which is pivotable about the pivot 181' against its spring 182 so that the bent lever 183 is released and pivots about its pivot 185 under the pressure of its relatively strong spring 184 so that its forward end 186 thus bears on a roughened cylindrical extension 187 of the type wheel 120. Further rotation of the type disc for setting the next signal to be printed is thus made difficult because it can only take place by overcoming the friction existing between the end 186 and the drum 187.

The type wheel 120 is not rigid with the shaft 115 but is torsionally and elastically connected by means of the spring 200. It can be set to a 1/64th part of its circumference relatively to the normal position determined by the spring 200. For this purpose, it is mounted with clearance about the pin 201 and is held in the illustrated position by the spring 200 which engages in an opening in the projection 202 to the drum 187. If, when the type wheel is moved in the direction of the arrow for the purpose of setting it, a braking force is set up by means of the lever 186 and the braking drum 187, the restoring force of the spring 200 is overcome and the type wheel always remains behind its normal position by a 1/64th part. This displacement, however, is that required for changing over from printing the letters shown in the second column of Figure 1 to printing the numerals and signs shown in the third column. Thus, when the signal Z*i* has been received, all subsequent code signals will be printed as numerals or special signs.

The disc 176 on the shaft 115 also actuates the forward end 189 of a lever 188 by means of a cam B*u* if, on receipt of the signal B*u*, the corresponding notch in the disc 168 is beneath the end of the lever 169. In this way, the lever 188 overcomes its return spring 190 and pivots about the pivot 179 so that its projection 191 strikes the double-armed releasing lever 192 and thus causes the nose 186 of the braking lever 183 to be lifted from the drum 187. The lever 183 now snaps back below the pawl 181 and remains in the position shown in Figure 9. Immediately after the removal of the braking lever 183, the spring 200 resets the type wheel in the normal position so that after receipt of the signal B*u* the code signals are again printed as letters.

The levers 177 and 178 can only be caused to pivot on receipt of the appropriate type character shift signals by setting the combination discs to the signals Z*i* or B*u*. The lower arms of these levers abut against the arm 193 of the lever 195 pivoted about the pivot 194. This lever 195 is under the influence of the extension 153 of the frames R' or R''. When these frames are not in operation, the pull of the spring 197 acting on the arm 196 of the lever 195 is large enough to overcome the forces exerted by the springs 178 and 190 on its other arm 193. On the other hand, the spring 146 on the frames R' or R'' is strong enough so that when one of these frames is

pivoted, it overcomes the action of the spring 197 and displaces the lever 195. When the frame R'' is pivoted, its movement is transmitted through the rods 198 and 199 to the lever 195. In this way, apparatus shift steps are only allowed to occur on selection of a character switching signal and by releasing the levers 177 and 188. Upon receipt of any other signal, no operating measures whatever could be undertaken during the setting movement of the combination discs with the discs 175 and 176 because, during this movement, these levers 177 and 188 cannot be pivoted by the arm 193.

The selecting members I to V and I' to V' and the members A and B are shown merely diagrammatically in order not to complicate the drawings. These selecting members are only lengthwise movable, and indeed, to the extent of the distance between two combination discs *g*, *h* or *e*, *f*. The separation of their left hand ends corresponds to the smallest spacing of successive depressions in the discs *e* to *h* indicated by hatched lines. The right hand ends are arranged over the circumference of a circle, the radius of which is the radius of the arm 113 measured to the projection 114. These conditions are clearly seen in the front view given in Figure 10 in which the angular amounts are indicated.

In Figure 9 the set of selecting members A is set and, as a key position is obtained, is shown in the operative position. The left hand ends of the selector members I to V engaging in the depressions in the appropriate contacting members *e* and *f* serve solely for testing the existence of the key position. The printing step follows this verification of the angular setting of the combination discs as a result of a pivotal movement of the frame R'. The shaft 115 is held in this particular angular position by the engagement of the correction pawl 150 in the teeth of the wheel 152.

The devices for returning the selecting members I to V and I' to V' once they have been set after selection of the type characters corresponding to the signals are not shown. It is preferable to carry out this return setting by releasing a force stored in springs during the setting so that the set of selecting members A is lifted out of the depressions in the contacting discs again by the cam shaft 141.

Above all, in the construction of the example described in Figure 9, it should be possible to use spring forces, especially where small setting forces are required. This is mainly so in the case of the parts set by the receiving magnet 111, such as the start-stop coupling and the selecting members. The re-tensioning of the springs is then effected by the driving motor, for example, through the medium of the cam shaft 141 or the like.

The steps in the printing of a type character by means of the telegraph printing receiver of Figure 9 will now be described.

The receiver responds to rapid closed circuit telegraph signals of the Baudot type. The usual maximum receiving speed is seven signals per second so that in the manner described earlier on, each signal consists of seven current impulses if arrhythmic operation such as start-stop operation is used.

For the purpose of receiving signals in a start-stop receiver of the known type, for example, of the Morkrum-Kleinschmidt and Creed types, it is necessary to rotate the setting receiving shaft for selectively influencing the selector members about 8% faster than the distributor shaft of the corresponding transmitter and to rotate the shaft of the type wheel about 40% faster than the setting shaft of the receiver. The device described in Figure 9 comprises two selecting sets in which the working positions for setting these sets lie on the circular path of the setting arm 113. The arm 113, however, only rotates about 8% faster than half the speed of the distributor shaft V of the transmitter S*k*. With a normal speed of rotation of the distributor of the transmitter of 6.48 revolutions per second, as the receiver runs 8% faster than the transmitter, 6.48 signals could be dealt with per second in the known receivers with a distributor speed of 7 revolutions per second. The receiver shown in Figure 9 also deals with 6.48 signals per second but with a distributor speed of only 3.5 revolutions per second. The preferred construction of the described receiver provides on the other hand for operation with a type wheel speed which is only about 18 to 20% faster in spite of which all the 6.48 signals per second have to be printed.

The seven current units which occur for each signal during a half rotation of the arm 113 operate for example in the sequence shown in Figure 10 on the left hand set of selecting members A. The rest position of the setting arm 113 shown dotted is, on receipt of a signal, the starting position for the rotation taking place in the direction of the arrow. In the first seventh part of the signal, a no-current unit occurs so that releasing steps can take place in the receiver. At the middle of each of the five following current units, each of the selecting members I to V is set in its operative position in front of the pin 114 on the arm 113.

The selector members of the set A are shown in Figures 9 and 10 in their operative position which they have assumed owing to a previously received signal. This code signal corresponds to the letter S, number 19, so that the members I to III lie in depressions in their positive disc *e* and the remainder in the depressions in their negative disc *f*. In the interval in which the setting arm 113 is removed from the position shown dotted in Figure 10, they are, however, returned together, for example, through the releasing of a spring force preferably during the following start current unit, into the rest position which is shown for the selector members of the set B on the right.

Suppose the distributor shaft V of the transmitter S*k* is caused to rotate for one revolution for the purpose of sending the letter S and printing it in the receiver. As is indicated in Figure 9, owing to the construction of the cam disc of the transmitter, contacts in the transmitter are operated for a short time at 1, 3, 5 and 6 sevenths of a revolution and at the corresponding instants the magnetic armature 110 in the receiver is released.

The first relapse of the armature on sending the start current unit results in the following operative steps.

The bent-up portion 135 of the extension 134 of the armature 110 slides lengthwise on the bent down portion 136 of the release lever 138 and lifts its controlling end 140 against the pull of the spring clear of the projection 108.

The member A is at this instant pivoted about its pivot 145 by the cam disc 141 against the action of its spring 146 to such an extent that the selecting members I to V are lifted out of the depressions in the combination discs *e* and *f* and

are returned to their position of rest. The shaft of the type wheel and of the combination discs is locked against rotation, however, through the engagement of the selector members I' to V' of the member B which are set by the previous receipt of a signal and by the engagement of the appropriate correction pawl 151.

Immediately after receipt of the fifth selecting current impulse, that is to say, the sixth current step, the member B is also lifted by means of the further rotation of the cam disc 141 so that for a short time, neither the member A nor the member B can engage and the shaft 115 is driven by the friction coupling 116, 117. The set selecting members of the member B thus return to their position of rest.

Further, before the shaft 105 is stopped by the receipt of the seventh current unit, that is to say, the stop current unit, the cam disc 141 makes the member A free to contact. The selector members I to V set in accordance with the received code signal, slide on the circumference of the contacting members *e* and *f* until the key position corresponding to the signal comes beneath the selecting members. At the same instant, the correction pawl 150 engages in the toothed wheel 158 and locks the type wheel 115 against further rotation.

The interval of time during which the two members A and B are lifted by the cam disc 141 can be made so small that no rotation of the type wheel 115 takes place during this interval. If, for example, the type wheel was set to the letter S by the previously received signal and, as assumed, the selecting members I' to V' are again set in accordance with this signal, then these selecting members and the correction pawl 151 immediately engage without the type wheel first making a revolution. For the sake of safety, however, as is indicated in Figure 9, the time interval for the lifting of the two members A and B is made so large that the type wheel shaft always starts.

As soon as the member A is released by the cam disc 141, the armature 110 is permanently attracted by the receipt of the stop current unit so that the end 135 of the projection 134 of the armature lies in the angle 136 of the control lever 138. The other end 140 of this control lever thus comes within the range of movement of a projection on the sleeve 107 which is 180° apart from the projection 108 and is thus not visible in the drawings. The coupling sleeve 107 then snaps to the right under the action of the spring 109 and couples the shaft 105 and the part 106 and the toothed wheel 103. The shaft 105 begins to rotate and the collar 112 also rotates in the direction of the arrow together with its arm 113. The collar 112 is directly controlled by the armature 110 and according to whether the magnet 111 is energized or not, the parts 112 and 113 are moved to the right or left in the setting movement which now takes place. During the start section, the arm 113 moves to the left and only moves to the right at the second and fourth current units, disregarding the stop unit.

During the pivotal movement of the frame R' when the key position for the letter S is obtained, the extension 154 which is moved with the frame R' during this swinging movement, slides over the tooth 163 of the transverse bar 155 and thus momentarily swings the lever 157 about its pivot 156. The end 160 of the lever is thus lifted, overcoming the return force of the springs 159 and 161 and the pawl 133 is pivoted and the hammer 119 released.

At the same time, the extension 153 of the frame R' by overcoming the force of the spring 197, pivots the lever 195 and thus releases the pair of levers 177 and 188 so that under the influence of their springs 178 or 190, these levers come into contact with their appropriate cam discs 175 and 176. On receipt of the signal S, these levers are not opposite a notch so that a shifting step cannot take place. Further, in this key position of the combination discs the lever 169 does not engage with any notch in the cam disc 163 so that the bar 173 remains in the illustrated lower inoperative position.

The cam wheel 125 is rotated by the shaft 100 which also drives the wheel 103 for setting the selecting device through the wheel 101 and the wheel 104 for driving the shaft 115 through the wheel 102. The wheel 125 has such a number of saw-shaped teeth which determine the instant of time and the interval of time for the printing of a type. When the end 166 of the lever 127 engages in a notch 128 of the cam wheel 125, the hammer 167 strikes the selected type of the type wheel 120 under the influence of its spring 122 and effects the printing. The hammer is then returned to its inoperative position, lifted by means of the lever 127 and the part 129 of the following teeth of the cam wheel.

These described steps for making the member A by means of the cam disc 141 free to engage until the hammer 119 is returned to the inoperative position could be carried out while a new code signal is being received and the selector members I' to V' of the set B are being set. It is only necessary for the steps to be completed when, at the beginning of the stop unit of the new signal, the member A is lifted by means of the cam disc 141 and the shaft 115 of the type wheel is made free to rotate. If it is assumed that the signals are to be given in direct succession at the highest speed of 6.48 signals per second, then the time available for each signal is 0.154 seconds less a period of about 0.007 seconds, during which both frames R' and R'' are lifted. A maximum period of 0.027 seconds is necessary for setting the hammer 119 into operation, because of the coupling with the continuously rotating cam wheel 125 so that 0.120 seconds are required for a single rotation of the type wheel shaft 115 for setting the key position for the received signal. This means that the type wheel shaft 115 must rotate at about 8.4 revolutions per second, that is to say, about 20% faster than the normal receiver distributor in which there is no second set of selecting members.

From the explanation of the manner of operation of the receiver shown in Figure 9, it is clear what special advantages are possessed by a type printing telegraph receiver having several selecting devices. The members actuated on the start-stop system can be made lighter and owing to the lower speed of operation are more easily operated and more certain in operation. The vibrations to which the apparatus is subjected on stopping the masses and the forces set free for the acceleration of the masses are thus relatively small. This also applies to the shaft 115 which is rotated at a substantially lower speed than is usual. The light type wheel and the combination discs which are preferably made of duralumin are, because of their small moment of inertia, much more certain in operation. The wear and tear of all parts is considerably decreased owing to the

low speed of operation and thus the life of such receivers is increased.

The use of separate groups of pairs of contacting combination discs in combination with separate sets of selecting members to form type selecting units working independently of each other makes it possible to arrange the control cams for the sets of selecting members separately from the combination discs and thus to obtain control discs of small diameter. If these control cams 141 are made separate from the type wheel 115 and are mounted on the slowly rotating shaft 105 of the receiving distributor, a further reduction in the moment of inertia of the type wheel shaft is obtained.

We claim:—

1. An apparatus for forming setting-up or printing type characters, comprising a selector device for determining a type corresponding to received code current impulses of the Baudot type comprising a type preparing device, at least one group of contacting devices adapted to control the type preparing device, a plurality of sets of selecting members, a rotary setting member and a magnet adapted to be influenced by the code current impulses and to control said setting member, said selecting members being adapted to be set by said setting member and the selecting members of all said sets of selecting members being disposed one after the other in the path of movement of said setting member.

2. An apparatus for forming setting-up or printing type characters, comprising a selector device for determining a type corresponding to received code current impulses of the Baudot type comprising a type preparing device, at least one pair of combination discs, a plurality of sets of selecting members, a rotary setting member and a magnet adapted to control said setting member under the influence of code current impulses, said selecting members being adapted to be set by the setting member and the selector members of all said sets of selecting members being arranged one after the other in the path of movement of said setting member.

3. An apparatus for forming setting-up or printing type characters, comprising a selector device for determining a type corresponding to received code current impulses of the Baudot type comprising a type preparing device, a rotary shaft, at least one pair of combination discs rigidly connected to said rotary shaft, a plurality of sets of selecting members, a rotary setting member and a magnet adapted to control said setting member under the influence of code current impulses, said selecting members being adapted to be set by said setting member and the selecting members of all said sets of selecting members being arranged one after the other in the path of movement of said setting member.

4. An apparatus for forming setting-up or printing type characters according to claim 2, in which the circumference of each of said combination discs is formed with cams and notches corresponding to the current impulses and solely in accordance with the number of the possible combinations of current impulses and cams.

5. An apparatus for forming setting-up or printing type characters according to claim 2, in which the circumference of each of said combination discs is formed with cams and depressions corresponding to the current impulses and solely in accordance with the number of possible combinations of current impulses, said cams and depressions forming combinations occurring only once in the circumference of each combination disc.

6. An apparatus for forming setting-up or printing type characters, comprising a selector device for determining a type corresponding to received code current impulses of the Baudot type comprising a type preparing device, a rotary shaft, two pairs of combination discs rigidly connected to said shaft, the circumference of each of said combination discs being formed with cams and notches corresponding to the current impulses, said cams and notches of one pair of combination discs being displaced by 180° to the corresponding cams and notches of the second pair of combination discs, two sets of selecting members, a rotary setting member, said sets of selecting members being set 180° apart in the path of movement of said setting member and a magnet adapted to control said setting member in accordance with the code current impulses.

7. An apparatus for forming setting-up or printing type characters, comprising a selector device for determining a type corresponding to code current impulses of the Baudot type, comprising a type preparing device, a rotary shaft, two pairs of combination discs rigidly connected to said rotary shaft, the circumference of each of said combination discs being formed with cams and notches corresponding to the current impulses, said cams and notches of one pair of combination discs being displaced by 180° to the corresponding cams and notches of the second pair of combination discs, two sets of selecting members, a rotary setting member, said sets of selecting members being set 180° apart in the path of movement of said setting member, a cam shaft for controlling said sets of selecting members connected to said rotary setting member and a magnet adapted to control said setting member in accordance with the code current impulses.

8. An apparatus for forming setting-up or printing type characters, comprising a selector device for determining a type corresponding to received code current impulses of the Baudot type comprising a type preparing device, a rotary shaft, two pairs of combination discs rigidly connected to said rotary shaft, the circumference of each of said combination discs being formed with cams and notches corresponding to the current impulses, said cams and notches of one pair of combination discs being displaced by 180° to the corresponding cams and notches of the second pair of combination discs, two sets of selecting members, a rotary setting member, said sets of selector members being set 180° apart in the path of movement of said setting member, a cam shaft for controlling said sets of selecting members connected to said rotary setting member and adapted to release at any time only one of said sets of selecting members for co-operation with one of said pairs of combination discs and a magnet adapted to control said setting member in accordance with the code current impulses.

9. An apparatus for forming setting-up or printing type characters, comprising a selector device for determining a type corresponding to code current impulses of the Baudot type comprising a type preparing device, a rotary shaft, two pairs of combination discs, rigidly connected to said rotary shaft, the circumference of each of said combination discs being formed with cams and notches corresponding to the current impulses, said cams and notches of one pair of

combination discs being displaced by 180° to the corresponding cams and notches of the second pair of combination discs, two sets of selecting members, a rotary setting member, said sets of selecting members being set 180° apart in the path of movement of said setting member, a cam disc for controlling said sets of selecting members, connected to said rotary setting member and adapted at any time to release only one of said sets of selecting members for co-operation with one of said pairs of combination discs and a magnet for controlling said setting member in accordance with the code current impulses and constructed and arranged so that immediately after controlling said setting member by the last code current impulse of a signal, the set of selecting members not set by said code current impulses is then separated from the corresponding pair of combination discs and the set set of selecting members is then released for co-operation with the appropriate pair of combination discs.

10. An apparatus for forming setting-up or printing type characters, comprising a selector device for determining a type corresponding to received code current impulses of the Baudot type, comprising a type preparing device, a rotary shaft, two pairs of combination discs, rigidly connected to said rotary shaft, the circumference of each of said combination discs being formed with cams and notches corresponding to the current impulses, said cams and notches of one pair of combination discs being displaced by 180° to the corresponding cams and notches of the other pair of combination discs, two pivotable carrying members, two sets of selecting members one set mounted on each of said jaws, a rotary setting member, said sets of selecting members being successively disposed in the path of movement of said setting member, a cam disc adapted to control said carrying members, said cam disc being connected to said rotary setting member and a magnet adapted to control said setting member in accordance with the code current impulses.

11. An apparatus for forming setting-up or printing type characters, comprising a selector device for determining a type corresponding to received code current impulses of the Baudot type comprising a type preparing device, a rotary shaft, two pairs of combination discs rigidly connected to said rotary shaft, the circumference of each of said combination discs being formed with cams and notches corresponding to the current impulses, said cams and notches of one pair of combination discs being displaced by 180° to the corresponding cams and notches of the other pair of combination discs, two pivotable carrying members, two springs, one acting on each of said jaws, two sets of selecting members one movably mounted on each of said carrying members, a rotary setting member, said sets of selecting members being arranged successively in the path of movement of said setting member, a cam disc adapted to control said carrying members, said cam disc being connected to said rotary setting member and a magnet adapted to control said setting member in accordance with the code current impulses.

12. An apparatus for forming setting-up or printing type characters comprising a selector device for determining a type corresponding to received code current impulses of the Baudot type, comprising a type preparing device, a rotary shaft, two pairs of combination discs connected to said type preparing device and to said rotary shaft, a correction wheel connected to said shaft, two pivotable carrying members, two springs one acting on each of said carrying members, two sets of selecting members one mounted on each of said carrying members, two pawls one connected to each of said carrying members, a rotary setting member for setting said selecting members, said sets of selector members being positioned at 180° apart in the path of movement of said setting member, a cam disc adapted to control said carrying members and connected to said rotary selecting member and adapted at any time to release only one of said carrying members and its selecting members, said correction wheel making possible the engagement of said pawl of one of said carrying members in any key position of one of said pairs of combination discs and a magnet adapted to control said setting member in accordance with the code current impulses.

13. An apparatus for printing type characters, comprising a type wheel, a printing device, a rotary shaft, a plurality of pairs of combination discs connected to the type wheel and to said rotary shaft, a plurality of sets of displaceable selecting members, a plurality of carrying members, each of said members carrying one of said sets of selecting members, springs acting on said carrying members, a rotary setting member for controlling said selecting members, said selecting members being arranged successively in the path of movement of said setting member, a cam disc adapted to control said carrying members connected to said rotary member, a magnet adapted to control said setting member in accordance with code current impulses and means for controlling said printing device, which means are controlled by said carrying members on engagement of said selecting members of one of said carrying members with a pair of said combination discs.

14. Apparatus for printing type characters, comprising a type disc with types on its outer circumference and having radial slits between the various types, a printing device, a rotary shaft, a plurality of pairs of combination discs connected to said type disc and to said rotary shaft, a plurality of sets of displaceable selecting members, a plurality of pivotable carrying members, each of said members carrying one of said sets of selecting members, springs acting on said carrying members, a rotary setting member for controlling said selecting members, said selecting members being arranged successively in the path of movement of said setting member, a cam disc for controlling said carrying members connected to said rotary setting member, a magnet for controlling said setting member in accordance with code current impulses and means for controlling said printing device, which means are controlled by said pivotable carrying members on engagement of said selecting members of one of said carrying members with a pair of said combination discs.

15. An apparatus for printing type characters, comprising a type disc with types on its outer circumference and having radial slits between the various types, a printing device, a rotary shaft, a plurality of pairs of combination discs connected to said type disc and to said rotary shaft, a cam disc connected to said rotary shaft, means controlled by said cam disc, for preventing the actuation of the printing device, a plurality of sets of displaceable selecting members, a plurality of pivotable carrying members each carrying one of said sets of selecting mem-

bers, springs acting on said carrying members, a rotary setting member for controlling said selecting members, said selecting members being arranged successively in the path of movement of said setting member, a cam disc for controlling said carrying members connected to said rotary setting member, a magnet for controlling said setting member in accordance with code current impulses and means for controlling said printing device, controlled by said pivotable carrying members on engagement of said selecting members of one of said carrying members with a pair of said combination discs.

16. An apparatus for printing type characters, comprising a type disc with types on the outer circumference and having radial slits between the individual types, a rotary shaft, means for torsionally and elastically connecting said type disc to said rotary shaft, means for rotating said type disc relatively to said rotary shaft by the amount of the pitch of said types on said type disc, a printing device, a plurality of pairs of combination discs connected to said rotary shaft, a cam disc connected to said rotary shaft, means for preventing the actuation of said printing device controlled by said cam disc, a plurality of sets of displaceable selecting members a plurality of carrying members each carrying one of said sets of selecting members, springs acting on said carrying members, a rotary setting member for controlling said selecting members, said selecting members being arranged successively in the path of movement of said setting member, a cam disc for controlling said carrying members connected to said rotary setting member, a magnet for controlling said setting member in accordance with code current impulses and means for controlling said printing device, which means is controlled by said pivotable carrying members on engagement of said selector members of one of said carrying members with a pair of said combination discs.

17. An apparatus for printing type characters, comprising a type disc with types on the outer rim of the disc and having radial slits between the individual types, the number of radial slits being twice as great as the number of possible combinations of current impulses, a rotary shaft, means for torsionally and elastically connecting said type disc to said rotary shaft, means for rotating said type disc relatively to said shaft through the angle included between two neighbouring radial slits, a plurality of pairs of combination discs connected to said shaft, a correction wheel connected to said shaft, a plurality of pawls, a driving device, a coupling device for connecting said shaft to a driving device, a printing device, means for actuating said printing device after bringing said type disc to rest controlled by said driving device, a cam disc connected to said rotary shaft, means controlled by said cam disc, for preventing actuation of said printing device in certain positions of said type disc, a plurality of sets of selecting members, each of said sets of selecting members being adapted to co-operate with a pair of said combination discs, springs acting on said sets of selecting members and urging them to press against said combination discs, each set of selecting members being connected to a device for controlling said means for actuating said printing device on engagement of said pawls in said correction wheel, a further rotary shaft, a rotary setting member connected to said further rotary shaft, for controlling said selecting members, a cam disc connected to said shaft of said setting member for controlling said sets of selecting members against the influence of said springs, a coupling device for connecting said shaft of said setting member to said driving device, means for controlling said coupling device for the time of a partial rotation of said setting member, a magnet for controlling said setting member and for actuating said means for controlling said coupling device.

18. An apparatus for printing type characters according to claim 17, comprising a current impulse transmitter, a distributor shaft and means for driving said shaft of said setting member on actuation of said coupling device at a speed about 8% higher than the speed of rotation of said distributor shaft, divided by the number of said sets of selecting members.

19. An apparatus for printing type characters according to claim 17, comprising a current impulse transmitter, a distributor shaft, means for driving said shaft of said setting device on actuation of said coupling device at a speed approximately 8% higher than the speed of rotation of said distributor shaft of a current impulse transmitter divided by the number of said sets of selecting devices and means for driving said shaft of said type disc on actuation of said coupling device at a speed approximately 18 to 20% higher than the speed of rotation of said distributor shaft.

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