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Index at acceptance: —Class 40(ii), H15b(1b: 1d: 4c).

COMPLETE SPECIFICATION

An Improved Telegraphic Printing System

I, EDGAR GRETENER, of 25, Ottenweg, Zurich, Switzerland, a Citizen of the Swiss Confederation, 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:—

This invention relates to improvements in a telegraphic printing system which operates with characters which are reproduced at the receiver by the consecutive printing of appropriate sign elements composing such characters, where each of said sign elements is transmitted by a current impulse of defined position within a sequence of current impulses of equal length.

The usual teletype machine based on the start and stop principle operates with the so-called five-unit code alphabet. Its chief advantage is its relatively high transmission speed of about seven characters per second. Such a machine involves the mechanical or electrical storing of the five transmitted unit-combinations and their conversion into print by some printing procedure. It is an object of the present invention to provide an apparatus in which the printing of the individual symbols such as letters, figures or the like is not done as a whole, but each character is built up from corresponding sign elements. This results in a very considerable simplification of the apparatus in that the printing of each individual symbol is effected without storing and in direct response to the corresponding transmitted current impulse. The storage elements of the apparatus are eliminated and the conversion or printing of the sign elements corresponding to the transmitted combination of current impulses is accomplished in an extremely simple manner.

It it well known, that the entire alphabet including numeral signs and essential supplementary signs, can be built up from a certain number, e.g. fourteen sign elements. In order to transmit a message it is only necessary to use a fourteen unit code. By such a code, each letter or sign is transmitted by a sequence of fourteen current impulses or " no current " impulses. Each sign element corresponds to one defined impulse of the sequence. Accordingly the impulse sequence transmits all the sign elements composing one particular letter. If the start-stop principle is used, two more impulses must be added for starting and stopping the machine. The speed of working is slower than that of a normal teletype machine, however, the simplifications effected are so extensive that this factor may be ignored in many fields of application where an expensive machine may be economically inadvisable.

It is a further advantage that in contra-distinction to a five unit code, where all unit combinations are used, with a fourteen unit code only a very limited number of the possible unit combinations is ever required. If with a five unit code alphabet one impulse is faultily transmitted e.g. a " current " impulse arrives instead of a " no current " impulse, this will result in the printing of a different letter. This may cause misunderstanding, especially if code words are used. In a fourteen unit code, however, the probability that a " complete " but incorrect symbol will be printed if the transmission is faulty is, therefore, much smaller than in the case of the five unit code alphabet. In most instances the transmission error clearly manifest itself in the form of a garbled symbol although usually the symbol can be identified, despite its garbled condition.

According to the present invention, therefore, a telegraphic printing system operating with characters built up from a combination of sign elements which are transmitted by an equal-length equal-unit

[Price 2/-]

Price 25p

Price 33p

code is characterised by the feature that a type wheel rotating synchronously with the transmitter is provided with types movable parallel with the axis of said wheel and arranged in such a way that for printing a complete character the requisite sign elements are impressed one after the other in their correct position during one revolution of the type wheel.

For a better understanding of the invention it will now be described with reference to the accompanying drawings, wherein:—

Fig 1 shows diagrammatically how a complete character is formed from the sign elements;

Fig. 2 is a diagrammatic layout of a telegraph printer in accordance with the invention;

Fig. 3 is a graph showing the sequence and relative duration of the various events of the several parts of the mechanism of Fig. 2.

In Fig. 1, 90 indicates fourteen sign elements in the order of the sequence of the corresponding impulses 91. For example, the letter " A," composed of the combination of the sign elements I, II, IV and V, is transmitted by the corresponding combination of impulses 92 and printed by the subsequent superimposition of said elements. The same process is shown for letter " E " at 93.

Referring to Fig. 2, the transmitter indicated schematically at 10 comprises a number of cam discs 11 equal to the number of letters and signs to be transmitted, each with suitable dwells and valleys corresponding to the combination of current and " no current " impulses necessary for the transmission of the appertaining letter or sign. As cam follower 12 closes or opens electric contacts 13, depending upon the arrangement of cams on cam disc 11, appertaining to the letter to be transmitted the electric circuit containing contacts 13 is made or broken constituting the appertaining current impulse combination which is transmitted to the receiver by the indicated electrical connections.

The receiver indicated broadly at 14, comprises a type carrying wheel or type revolver 15 consisting of two flat plates formed as one unit which mounts axially movable type bars 16 arranged in a circle around its periphery in the sequence of the appertaining impulses as shown in Fig. 1. Type bars 16 are provided with types 17 on their striking faces. A paper strip 18 rests against resilient support roller 19 in a position to receive imprints of types 17 which are inked by an inking roller, wiper or similar means. The journal portions of wheel 15, which mount type bars 16, may be of sintered metal soaked in oil which is self lubricating. Thus the expense of bronze bearings or bushings can be saved.

Axial movement of type bars 16 is produced by an operating lever or impulse hammer 20 pivoted at 21 and having a striking surface 22 arranged to give a quick sharp blow against the ends of projecting shanks 23 of type bars 16. Hammer 20 is provided with a projecting arm 24 which cooperates with notches 26 on operating disk 25. Notches 26 are adapted to receive the arm 24. The opposite end of hammer 20 is provided with a projection 27 cooperating with projection 28. A double ended **S**-shaped lever 29 is pivoted at 30 on hammer 20 and is biased in a clockwise direction by tension spring 31. Lever 29 is provided with oppositely extending projections 32 and 33. Projection 33 bears against arm 34 on hammer 20 and arrests the clockwise motion of lever 29. Projection or pawl 32 engages hook member 35 on one end of armature 36 which is pivoted at 37 and spring biased in a counter clockwise direction by the action of the tension spring 38 on end 39. Armature 36 has a flattened portion 40 on its lower side which cooperates with core 41 of magnet 42 connected to battery 43 by wires 44, having contacts 13 in their circuit.

On the side of armature 36 opposite flattened portion 40 is an upwardly projecting tooth 45 cooperating with notches 46 in wheel 47 which rotates in a counter clockwise direction on the same shaft as disc 25.

The result desired is achieved according to the invention by providing the receiver with a type carrying wheel 15 in the nature of the cylinder of a revolver, which carries in lieu of bullets fourteen movable type bars 16 bearing fourteen sign elements 17. The printing of the sign elements is effected by projecting the type bars 16 parallel with the axis of type wheel 15 on to the paper 18. The transmitted disc 11 and the disc 25 and wheel 47 mounted on shaft 48 rotate synchronously and in phase with each other. This provides a relationship between the phase position of the type carrying wheel 15 and the incoming control impulses. Consequently a type bar 16 carrying a sign element appertaining to a particular incoming impulse will be in the exact printing position, i.e. with its type 17 facing the paper strip 18 resting on the support roller and with its end 23 opposite the striking surface 22 of the hammer 20, when this impulse arrives. The type bars 16 carrying the sign elements are arranged along the circumference of the type wheel 15 in the

sequence of the corresponding impulses. The corresponding position of transmitter cam 11, disc 25 and wheel 47 can be ensured by means well known in teleprinting technique, either by ensuring continuous synchronism or synchronism by the start-stop principle. The current impulses are received by magnet 42 which with armature 36 converts them into mechanical operations. Thus the release of armature 36 by magnet 42 permits the armature 36 to move counter clockwise under the action of spring 38 when tooth 45 is opposite a notch 46 into which it can move. This action disengages hook member 35 and projection 32 of **S**-shaped member 29 which permits hammer 20 to move counter clockwise under the action of spring 49 when arm 24 is opposite a notch 26 into which it can move. Hammer face or striking surface 22 strikes the end of shank 23 a sharp blow. The movement of hammer 20 is arrested by stop 28 which engages projection 27. The type bar 16 momentarily positioned opposite the printing point is moved axially in translation and the proper sign element is printed. This action is dependent upon whether at that moment magnet 42 is energised by a current impulse or is unenergised by interruption of current flow at contacts 13 which have been opened by cam disc 11 and follower 12.

It is important that the operation of the printing system be effected without imposing any load on armature 36. This is achieved by providing suitable play between hook 35 and projection or pawl 32. As pawl 32 pivots counter clockwise it slides along the chamfered surface of hook 35 as hammer 20 is reset. Armature 36 is restored by the cam action of the walls of notches 46 on tooth 45 as control wheel 47 rotates. In the same manner the notches 26 restore hammer 20 by their action on projection 24. As hammer 20 and armature 36 both move clockwise under the action of operating disc 25 and control wheel 47, hook 35 engages pawl or projection 32 and the mechanism is ready for another striking action. The energy required for printing is derived from motor actuated shaft 48 and through the action of notches 26 and 46 of operating disc 25 and control wheel 47 is stored in spring 49, whilst the energy required to actuate the armature 36 is stored in spring 38. In this manner very rapid snap action is obtained and there is no danger of binding of the parts or a delay in the release of the movable parts.

Fig. 3 illustrates the periodic correlation of the transmitter 10, armature control system or receiver 14 and the printer. Any relative displacement or phase shift between the effects produced at the transmitter 10 and receiver 14 due to the time constant or lag of magnet 42 resulting from its inductance is ignored in this case. Graph 60 shows the square topped d.c. pulses from battery 43 due to the action of recesses 51, 53 and crests 52 of cam 11 through follower 12 on contacts 13 in battery circuit 44. The distance 61 may be taken as a unit of length in time. Graph 62 shows the gaps or notches 46 into which tooth 45 can move. It will be noted that from the standpoint of the time sequence of the events the duration of any notch 46 in a tooth receiving position is relatively small, as shown at 74, compared with unit steps 61. Testing of the armature system to determine whether current is flowing is therefore effected during a small fraction of the unit step 61, so that faultless transmission is assured even if the current impulses are very badly distorted. Graph 63 shows the movement of armature 36, the valleys 64 representing the time during which armature 36 is not attracted and tooth 45 has entered notch 46. During the major portion of the time however, the flattened portion 40 is held against the end of core 41 by the field of magnet 42. Graphs 65 and 66 illustrate the functioning of the printer operating mechanism. Graph 65 shows the effects of notches 26 of control disc 25 as sharp drops 67 with gradual rises 68. Graph 66 shows the functioning of hammer 20 with sharp hammer action at 69 and a relatively long recovery or resetting period shown by the slow rise at 70 and the dwell at 71. This, of course, greatly reduces the instantaneous demand load on shaft 48. Graph 72 shows by peaks 73 that the printing of the sign elements is effected by short sharp rebounding blows of hammer 20. When the type 17 strikes the paper 18, type bars 16 rebound very rapidly under the action of resilient support roller 19 and of the spring 81, thus producing an elastic blow not unlike that of the small felt hammers of a piano on striking a note. Over the last portion of its travel a type bar 16 moves freely, giving up a portion of its kinetic energy when it strikes paper 18. Stop 28 and projection 27 arrest hammer 20 before type 17 strikes paper 18. This action permits printing as the type carrying wheel 15 is rotating and eliminates the necessity of stopping it for printing. As the paper 18 is moved only during the intervals between the full revolutions of the type wheel 15, the exact superimposition of the sign elements is ensured. It is clear that this feature greatly simplifies the device. Lapse of time is indicated by the arrow as one proceeds along the

graphs from left to right in the normal manner.

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. A telegraphic printing system operating with characters built up from a combination of sign elements which are transmitted by an equal-length, equal-unit code, characterised by the feature that a type wheel rotating synchronously with the transmitter is provided with types moving parallel to the axis of said wheel and arranged in such a way that for printing a complete character the requisite sign elements are impressed one after the other in their correct position during one revolution of the type wheel.

2. A telegraphic printing system as claimed in claim 1, characterised by the feature that the types on said type wheel move in a self-lubricating bearings made of sintered metal soaked in oil.

3. A telegraphic printing system as claimed in claim 1 or 2, characterised by the use of a mechanical lever system incorporating an armature and disposed between a receiving magnet and the printing device, said system being controlled by the receiving magnet in such a way that the selection of the sign elements to be printed is effected by the receiving magnet corresponding to the sequence of current impulses.

4. A telegraphic printing system as claimed in claim 3, wherein the construction of the said system is such that the said armature operates in dependence upon the current in the winding of the magnet without being loaded mechanically by the printing system.

5. A telegraphic printing system as claimed in claim 3 or 4, wherein the armature operates in conjunction with a control wheel which is so shaped that only a small fraction of the duration of an impulse is required for testing for the presence of current in the magnet winding.

6. A telegraphic printing system as claimed in any of the preceding claims, characterised by the feature that the sign elements are printed by a blow of extremely short duration in comparison with the exciting current impulse during the continuous rotation of the type carrying wheel.

7. A telegraphic printing system as claimed in claim 6, wherein type bars carrying the sign element type are so mounted in the type wheel that they move freely over the last portion of their travel after having been struck by the printing hammer, said hammer being arrested by a stop before the type strikes a paper or like recording medium, thereby permitting the printing operation to be carried out without stopping the continuous rotation of the type wheel.

8. A telegraphic printing system constructed and arranged to operate substantially as hereinbefore described with reference to the accompanying drawings.

Dated the 15th day of December, 1947.
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Agent for the Applicant.

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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig.2

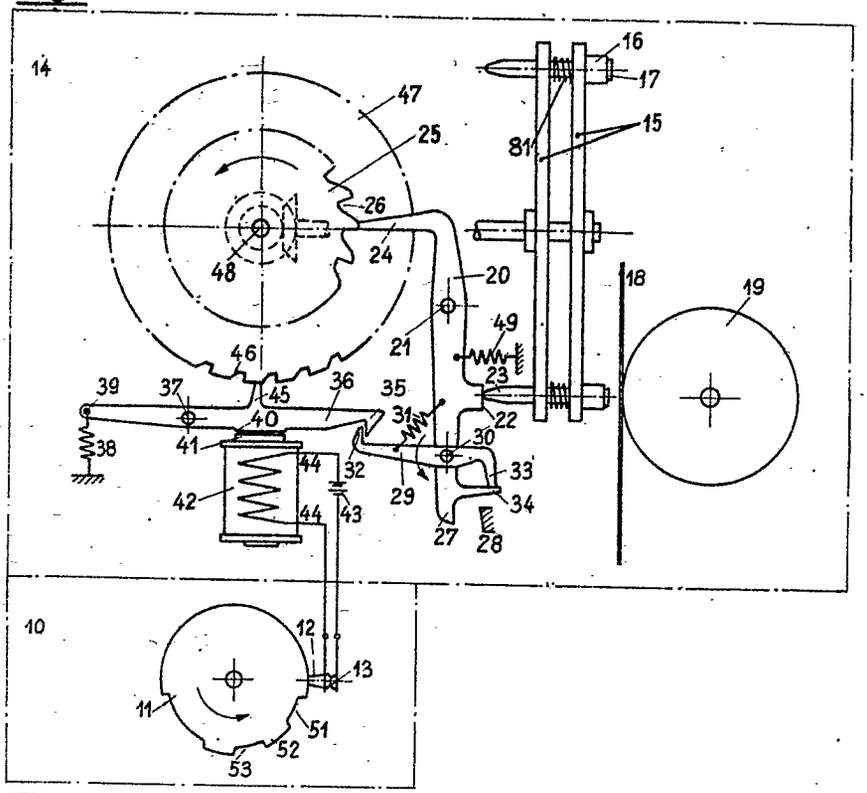


Fig.1.

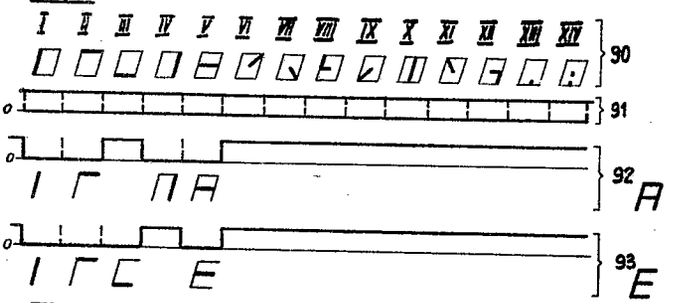
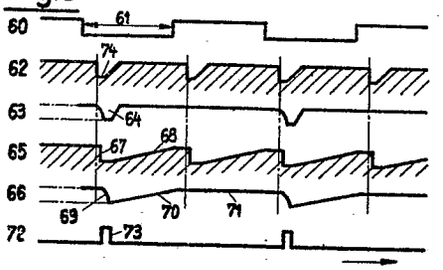


Fig.3



H.M.S.O.(Ty. P.)