April 10, 1951 E. GRETENER 2,548,720

TELEGRAPH SYSTEM

Filed Dec. 31, 1947

FIG. 1.

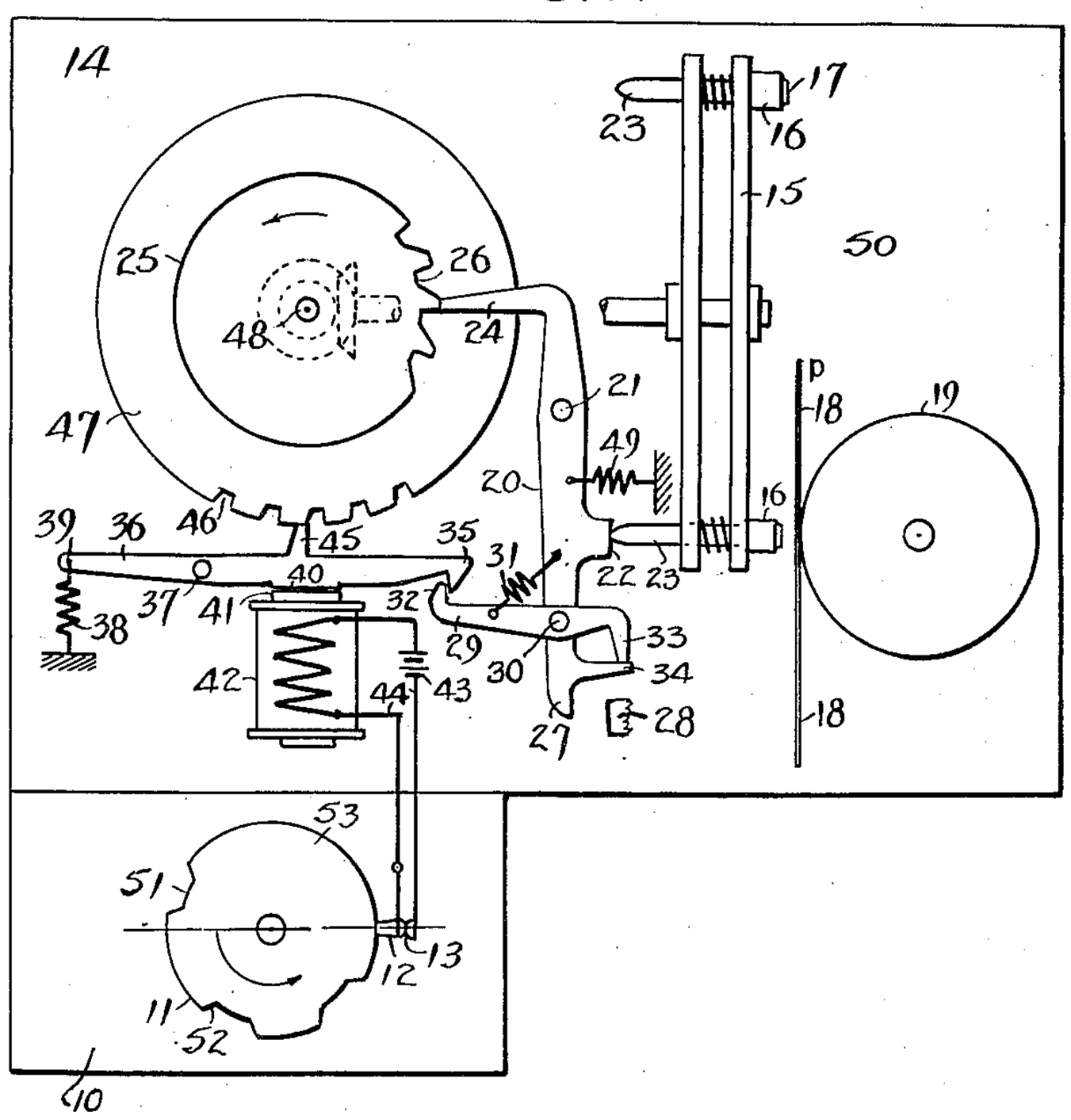
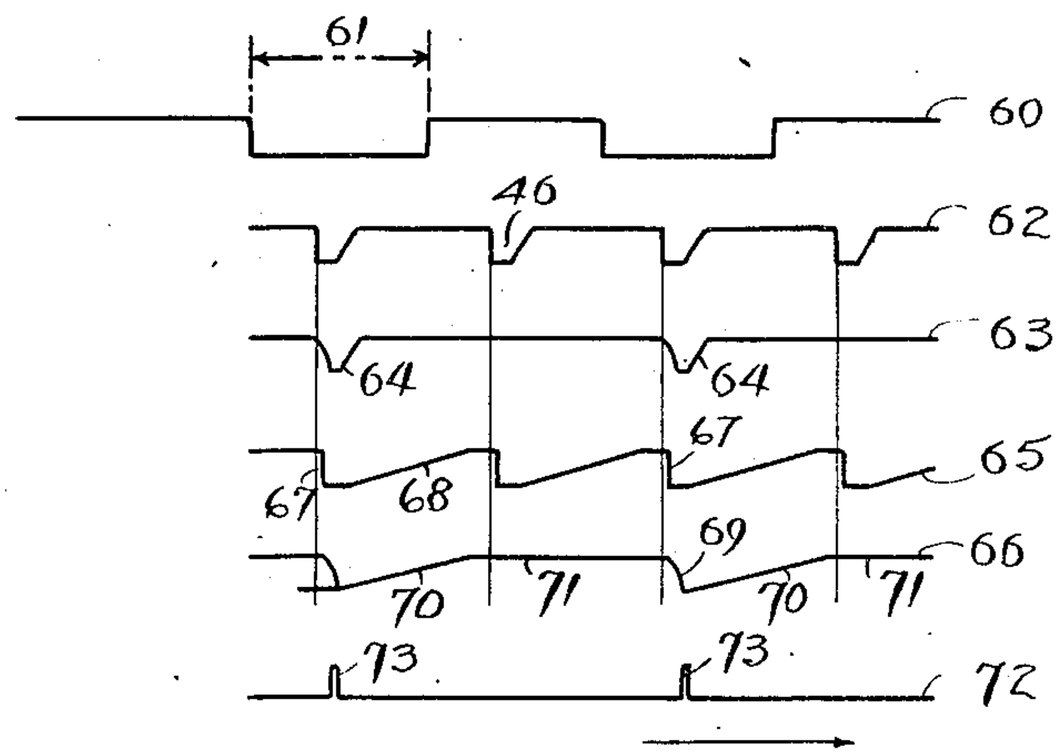


FIG. 2.



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TELEGRAPH SYSTEM

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In Switzerland May 2, 1946

6 Claims. (Cl. 178—30)

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The present invention is concerned with telegraph systems.

It is an object of the invention to provide means by which messages may be composed of a plurality of elementary symbols and transmitted by a series of impulses of constant length.

It is an object of the invention to provide elementary symbols disposed on axially movable stamps mounted peripherally on a type carrying disk which rotates synchronously with a transmitter.

It is an object of the invention to provide telegraph printing means by which the elementary indicia are printed in succession alongside each other during the rotation of the type carrying disk by axial movement of the proper stamp at the position where the printed elementary symbol is to appear.

It is an object of the invention to mount movable type carrying members in journals of self lubricating material such as oil soaked sintered metal.

It is an object of the invention to provide a telegraph system in which printing is effected by rebounding blows, during the continuous rotation of the type carrying disk.

It is an object of the invention to provide control means such that only a small fraction of the duration of an impulse is required for testing for the presence of current.

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 output of about seven strokes per second. Such a machine involves the mechanical or electrical storing of the transmitted five-unit combinations, their conversion and printing 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 rather as a combination comprising the corresponding elementary symbols. The results in a very considerable simplification 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 elementary symbols corresponding to the transmitted current impulse combination is accomplished in an extremely simple manner.

It is possible with the use of only fourteen elementary symbols to constitute an entire alphabet including figures and the essential supplementary

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characters. In order to transmit a desired message it is necessary to use a fourteen impulse-step combination code and if the start-stop principle is used, two more impulse steps must be added for starting and stopping the 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 as a practical matter with a fourteen symbol alphabet, only a very limited number of possible combinations is ever required. The probability that a "complete" but incorrect symbol will be printed if the transmission is faulty is, therefore, much less than in the case of the five point alphabet. In most instances the transmission error clearly manifests itself in garbled form although usually the symbol can be identified, despite its garbled condition. The present application is based upon patent application Serial Number 11,538 filed in Switzerland May 2, 1946.

Other objects will appear as the description proceeds. In the drawings like numerals refer to like parts throughout.

Fig. 1 is a diagrammatic layout of a telegraph printer in accordance with the invention.

Fig. 2 is a graph showing the sequence and relative duration of the various events of the several parts of the mechanism of Fig. 1.

Referring to the drawings, the transmitter indicated broadly at 10 comprises in principle a cam disk 11 with suitable dwells and valleys corresponding to the impulse combination to be transmitted. As cam follower 12 opens or closes electric contacts 13, depending upon the position of cam disk 11, the electric circuit containing contacts 13 is made or broken. A telegraph printer according to the invention has for instance fifty such cam disks and cam follower contact control arrangements, one for each of the complete letter and related symbols to be printed and one each to start and stop the machine.

The receiver indicated broadly at 14, comprises a type carrying wheel or type revolver 15 which mounts axially movable stamps 16 arranged in a circle around its periphery. Stamps 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 stamps 16, may be of oil soaked sintered metal which is self lubricating. Thus

the expense of bronze bearings or bushings can be saved.

Axial movement of stamps 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 stamps 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 stop 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 counterclockwise 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 counterclockwise direction on the same shaft as disk 25.

The solution of the problem presented by the invention consists in providing the receiver with a type carrying wheel 15 in the nature of a cylinder of a revolver, which carries in lieu of bullets fourteen movable stamps 16 bearing fourteen elementary symbols 17. The printing of the elementary symbols is effected by axially moving the stamps 16. The system is operated by rotating the transmitter disk 11 and the disk 25 and wheel 47 mounted on shaft 48 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. 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 rotate counterclockwise 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 rotate counterclockwise 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 stamp shank 23 a sharp blow. The rotation of hammer 20 is arrested by stop 28 which engages projection 27. Whichever stamp 16 is positioned opposite the printing point at the moment is moved axially in translation and the proper elementary symbol is printed. This action is dependent upon whether at that moment magnet 42 is energized by a current step impulse or is unenergized by stoppage of current flow at contacts 13 which have been opened by cam disk 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 counterclockwise 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 rotate clockwise under the action of operating disk 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 disk 25 and control 47 is stored in spring 49 and 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 hanging release of the movable parts.

Fig. 2 illustrates the periodic correlation of the transmitter 10, armature control system or receiver 14 and the printer 50. 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 neglected in this case. Graph 60 shows the square topped D. C. pulses from battery 43 due to the action of recesses 51, rises 52 and dwell 53 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 time sequence and relative duration of 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 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. The major portion of the time 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 events of notches 26 of control disk 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 pips 73 that the printing of the elementary symbols is effected by short sharp rebounding blows of hammer 20. When the type 17 strike the paper 18, stamps 16 rebound very rapidly under the action of resilient support roller 19 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 stamp 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. 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. As mentioned above a disc 11 with the requsite cam events thereon is provided for each letter or related symbol represented by a corresponding

actuating key on the key board of the telewriter. Each such letter, figure or the like is built up by the combination of from one to five of the elementary symbols 17. The letter R for example requires five elementary symbols or signs and the corresponding cam disc 11 for R will have five depressions 51 positioned to actuate hammer 20 and the five component stamps 16 in sequence as they are positioned by the bevel gearing on shaft 48. Paper strip 18 remains stationary during the rotation of each cam disc 11 and is imprinted with the required one to five elemental symbols 17 constituting a selected letter. On release of the letter key in the key board paper strip 18 is advanced in the normal manner well known in the type writer and tape machine art. Letter key interlock maintains the strip 18 in one position during the rotation of a selected cam disc 11.

The above description sets forth one form the invention may take and is presented as illustrative and not as limiting. The claims are intended to set forth in generic terms the specific structures described above.

I claim:

1. In a telegraph receiver, two synchronized control wheels, an armature adjacent one of said wheels mounted for movement relative thereto, a coil, said coil and one of said wheels jointly controlling the movement of said armature, printer actuating means adjacent the other of said wheels and mounted for movement relative thereto, interlock means releasably engaging said armature and said printer actuating means, said other of said wheels controlling the movement of said printer actuating means whereby intelligence may be caused to be printed.

2. In a telegraph receiver, two related control wheels, magnetic field producing means, an arm mounted for movement under the joint control of said means and one of said wheels, printer actuating means mounted for movement under the joint control of said arm and the other of said control wheels whereby intelligence may be caused to be printed stamping means having characters thereon, movable mounting means carrying said stamping means for presenting various characters to be printed by said printing actuating means.

3. The combination set forth in claim 1, said control wheels having notches therein of such character that the time for testing whether a given intelligence should be printed is of the order of five percent of the pulse duration for each intelligence unit.

4. The combination set forth in claim 1, means associated with said control wheels, said armature and said printer actuating means whereby the time for testing whether a given item of intelligence should be printed is less than twenty percent of the pulse duration assigned for each intelligence item.

5. The combination set forth in claim 1, movable indicia carrying means, a plurality of indicia bearing stamps movably mounted on said carrying means, said printer actuating means comprising hammer means positioned to strike said stamps sequentially a short sharp blow, stop means positioned to interrupt the action of said hammer means on said stamps and leave said stamps free to imprint indicia with a rebounding blow as they are carried along by said carrying means, means to restore said stamps to an initial position and synchronizing means connected to coordinate the positioning of said stamp carrying means and the action of said hammer means.

6. In printing means for a printing telegraph, movable indicia carrying means, a plurality of indicia bearing stamps movably mounted on said carrying means, hammer means positioned to strike said stamps sequentially a short sharp blow, stop means positioned to interrupt the action of said hammer means on said stamps and leave said stamps free to imprint indicia with a rebounding blow as they are carried along by said carrying means, means to restore said stamps to an initial position and synchronizing means connected to coordinate the positioning of said stamp carrying means and the action of said hammer means.

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