

Sept. 12, 1967

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3,340,984

INFORMATION STORAGE USING PLURAL CODED INKS

Filed Feb. 9, 1966

2 Sheets-Sheet 1

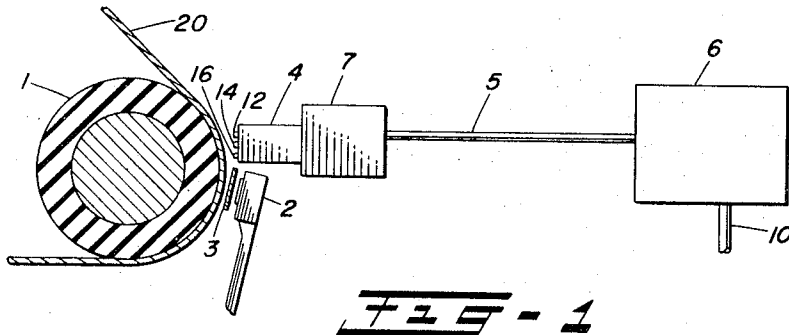


FIG. 1

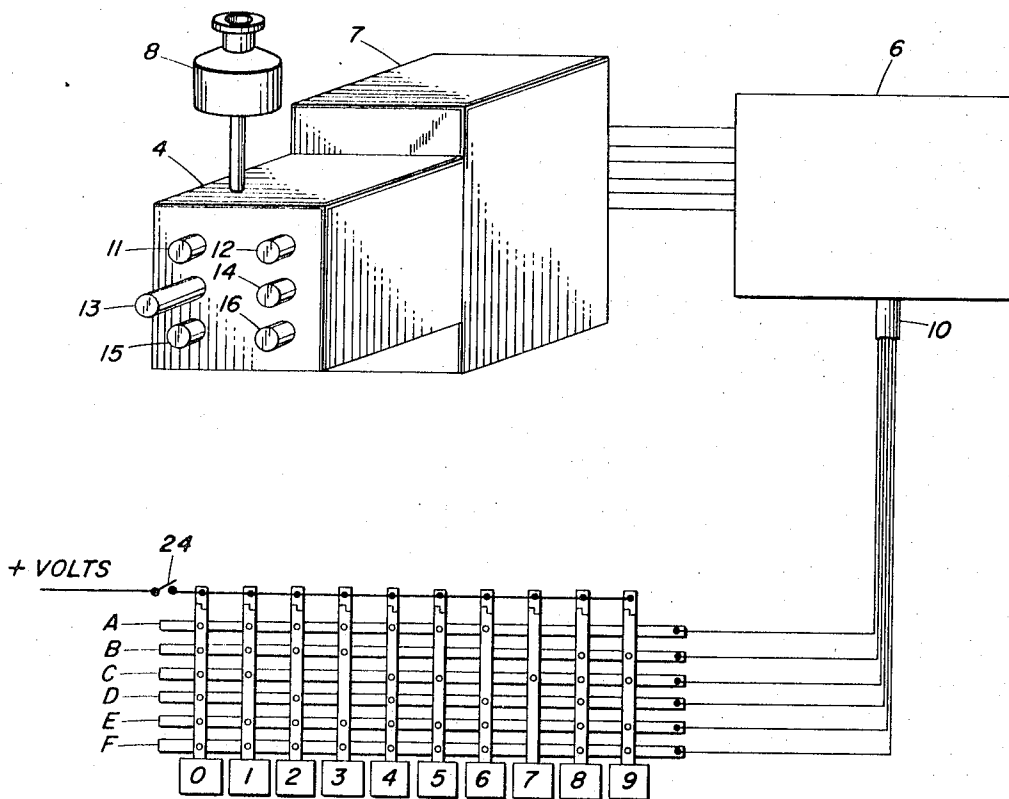


FIG. 2

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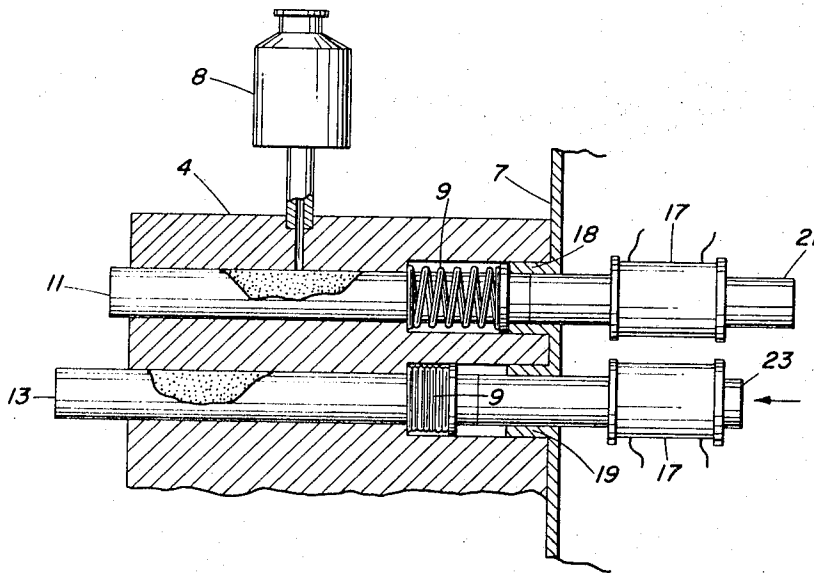


FIG - 3

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3,340,984 INFORMATION STORAGE USING PLURAL CODED INKS

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9 Claims. (Cl. 197—1)

ABSTRACT OF THE DISCLOSURE

A coding device is associated with a typewriter, consisting of a printing head located above or below the point where a type bar strikes through a ribbon onto a paper held by the typewriter platen. The head is provided with a plurality of printing heads, six for alphanumeric operation, each head actuated by solenoid and each head constituting a porous printing rod impregnated with or fed with an ink having a single and different component of the code. Striking a typewriter key makes electrical contact with one or more bars, each corresponding to a single hammer and thus to a single component of the code. The signals from the contacts cause actuation of one or more of the six printing hammers, depending on the number of components in the code corresponding to the symbol struck by the typewriter key. There is thereby imprinted on the paper one or more dots each in an ink carrying a different and single component of the code. The preferred coded inks have components which fluoresce under ultraviolet light and preferably have one or more of the components in the form of complexes of lanthanide ions, which fluoresce in extremely narrow bands.

Background of the invention

The problem of coding symbols or messages is becoming of increasing importance and is sometimes loosely referred to as a coded ink system, although symbols do not necessarily have to be formed of fluids which would properly be called inks. In the co-pending application of Freeman and Halverson, Ser. No. 596,366, filed October 19, 1966, which is a continuation-in-part of an application Serial No. 437,866, filed Mar. 8, 1965, and now abandoned, both applications having been assigned to the assignee of the present invention, there is described an information encoding and retrieving system in which inks having different combinations of components are used. The components are photoluminescent materials which under ultraviolet light or similar short wave radiation fluoresce in different colors. Ordinary organic fluorosceners are often not suitable, at least for the only type of component, because they fluoresce in too broad a band, and therefore in the Freeman and Halverson application it is preferred to have, as at least some if not all of the components, chelated lanthanide ions which under suitable ultraviolet illumination fluoresce in an extremely narrow band. If chelated lanthanide ions are used with one or at most two organic fluorescent compounds, it is possible to prepare inks in which the presence or absence of particular combinations of components constitute the code for a symbol. Basically when using such coded inks, the number of symbols which can be represented are $2^n - 1$, where n is the number of different components. It will be seen that if numbers only are needed, four components are sufficient as this gives the possibility for 15 different symbols. However, if letters of the alphabet are also to be included, it is necessary to have six components, which give 63 separate possibilities. With larger numbers of components an even greater number of symbols can be represented.

Summary of the invention

Essentially the present invention provides an improved device for printing symbols in one or more coded inks without any possibility of contamination of one ink having one component with another one. The present invention may be combined with an ordinary typewriter mechanism, thus forming an improved typewriter, such as an improved electric typewriter. It is also possible to operate the coded ink symbol formation without typing the symbols, but inasmuch as for most purposes the possibility of typing the symbols in ordinary type presents so many advantages, this is preferred and the invention will be described in conjunction with such a device, it being understood however that, in its broadest aspects, the coded ink part of the device may be used alone.

In the present invention there is provided a printing block or head with a plurality of porous printing rods, each one being impregnated with or fed with an ink having one of the components of the code. Means are provided for causing these porous rods to move forward and strike a suitable surface, such as paper on a typewriter platen, in accordance with instructions from the coded symbol. The block is rigid and firm and there is no possibility of displacement of the rods as they move in channels in the block and are kept well separated from each other. This device may be considered from one aspect as an improvement on the co-pending application of Siegel, Ser. No. 526,193 filed Feb. 9, 1966, assigned to the assignee of the present application, in which hammers strike through a ribbon with a plurality of different zones, each zone being impregnated with the ink of one particular component. While the ribbon of the prior application is cheap and simple, it does have the drawback that it is flexible and can sag or accidentally a component from one zone may contaminate that in another zone, thus presenting the possibility of spurious coded symbols. The present invention avoids entirely this possibility but at the cost of a somewhat more complicated mechanism.

Brief description of the drawings

FIG. 1 is a section, partly in semi-diagrammatic form, of a typewriter platen and coded symbol printer;

FIG. 2 is an isometric view on an enlarged scale of the printing block, and

FIG. 3 is an enlarged section through the block showing two rods.

FIG. 1 shows the application of the present invention to an ordinary electric typewriter with a platen 1 on which paper 20 can be placed with the conventional type bar 2 and conventional ribbon 3. Above the point where the type impresses its symbol on the paper, there is a head 4 provided with six channels in which there are six porous, rigid printing rods 11, 12, 13, 14, 15 and 16. This is best seen in FIG. 2. FIG. 1, of course, only shows three of the rods.

Description of the preferred embodiments

In operation a type key, let us say the numeral 7 is struck on the keyboard of the electric typewriter, shown diagrammatically. This causes the type bar 2 to swing up and strike the ribbon 3, printing the symbol on the paper 20. At the same time the key conveys a coded electrical signal to a simplified computer mechanism 6 through the cable 10. As the computer is of conventional design and extremely simplified, it is shown entirely diagrammatically in FIG. 1.

FIG. 2 shows 10 keys corresponding to the numerical digits. In an ordinary typewriter there would be a full keyboard but as this would only confuse the drawing, only ten keys are shown. Each key is connected through a switch 24 to a source of positive potential and each key carries one or more contacts represented by small circles,

each contact contacts with one of six bus bars A, B, C, D, E and F. The physical design of the contacts and keys is similar to that shown in FIG. 2 of the patent to Linger 2,751,433 except that in the patent there is no element corresponding to switch 24.

Each of the rods 11 to 16 is held normally in its retracted position by springs 9, as can be seen in FIGURE 3. After receiving the signal from the key, the computer sends out its orders through cable 5 to a set of transducers in a block 7, which is shown as mounted on the back of the block 4. Six transducers 21 to 25, of which two are shown in FIG. 3, are provided back of the rods 11 to 16 respectively. These transducers may be in any form, FIG. 3 showing them as solenoids with actuating coils 17. Let us assume that the code for the letter typed required only the presence of the component in rod 13. The signal from the computer would cause the solenoid coil 17 and that of the corresponding core 23 to move forward, striking the rod 13 and forcing it to move forward and print a small dot or other small shape on the paper 20 just above the typed symbol. This choice is shown in FIG. 3 at the moment that the solenoid has caused the rod 13 to strike. As soon as the key is released, the solenoid 17 is deactivated and a spring 9 causes the rod 13 to return to its normal position at rest and the printing block is then ready to receive the necessary signals when another key is depressed.

In order to illustrate the invention more clearly, the block 4 and its rods are shown very greatly exaggerated in the drawings. In fact the rods are quite small and are very close together so that the six possible component printings occupy a tiny space over the type bar at the point where it strikes to type its particular symbol.

Movement of the platen is of course effected by the conventional electric typewriter mechanism (not shown). When the next key is struck the proper signal is given to the computer 6, let us say that this is a code requiring the presence of components 1, 4 and 6, and in this case the computer passes signal to the solenoids 17 of transducers 21, 24 and 26. These move forward and cause the porous printing rods 11, 14 and 16 to make an impression.

The porous rods are of fair length even though the spacing and cross-sectional size is shown greatly exaggerated in the drawings. Therefore, they contain a supply of ink which is adequate for a reasonable number of symbols. When the ink is exhausted a new block 14 can be moved off, sliding into the sleeves 18 and 19 shown in FIG. 3 and the apparatus is then ready for further repeated use. Replaceable printing blocks constitute a very simple mechanism, but the amount of ink which can be stored is, perforce, somewhat limited, and though sufficient for a large number of impressions they will not last for many hours or days. If longer operation and a permanently installed block is desired, each rod is connected in the block with its own reservoir of ink of the proper component. In FIGS. 2 and 3 reservoir 8 is shown for a rod 11. Similar reservoirs are of course present for each of the other five rods, but in order not to obscure and confuse the drawings they are not illustrated. In this modification of course they are present. The reservoirs can contain ink enough for many days of operation and of course can be easily filled with the proper inks containing the particular components.

The representation in FIG. 1 of the computer and the transducer block 7 is deliberately made diagrammatic only because the particular design of computer or of transducer is not, per se, a part of the broader aspect of the present invention.

Solenoids, as illustrated in FIG. 3, are a very simple and satisfactory form of transducer and may be considered as preferred. However, the invention is in no sense limited thereto and any other suitable transducers, such as magnetostriuctive rods and the like, may be used. Transducers are standard electronic devices which are used in

ultrasonics and for many other purposes, and it is an advantage of the present invention that any standard form of transducer may be employed, the only requirements being that its physical size be suitable for mounting in a block of the proper size and corresponding in cross-section to the hollow printing rods 11 to 16. It is necessary also that the signals given to the transducer be of sufficient energy to move the transducer through a small but nevertheless finite length, because of course the rods must move out of the face of the blocks sufficiently to produce a satisfactory impression on the paper. This movement can be very short, but it is by no means infinitely small, and of course the transducers must be capable of operating through a sufficient distance to effect this printing. This is one reason why the solenoid modification, which can cause quite a considerable movement, presents certain practical advantages. When other forms of transducers are employed, if they are to move through a sufficient distance fairly respectable voltage pulses are required. These present no particular difficult problems, but there is some advantage in using the lower voltages which are practical with solenoids. It is this possibility of using lower voltage which is one of the reasons why for many purposes the solenoid modification is preferred. However, other transducers can be made extremely compact and so for certain purposes they are preferable. It is an advantage of the present invention that the best transducer for the particular operation can be chosen.

One of the important uses of the present invention is with the typing of messages which are both visually readable and coded. However, it is sometimes desirable either to omit the coding or to omit the visual typing. This is very easily done in the first instance by switching out the computer by opening switch 24 and in the second instance by throwing the electric typewriter mechanism into the stencil position so that when the type bar comes up it does not strike an inked ribbon. This added flexibility is a practical and useful advantage of the present invention.

I claim:

1. Printing means for printing in different coded inks, said coded inks comprising an ink composition including only a single coding component, comprising in combination,

- (a) a printing head provided with a plurality of closely spaced but separated porous printing rods,
- (b) each rod having a large number of interconnecting pores and a printing end surface, the pores interconnecting to the printing end surface,
- (c) each rod containing an ink of different composition and including only a single component of the code, the single component being different in each ink, and
- (d) means for causing at least one printing rod to move into printing position in accordance with the code for any particular symbol and means for returning printing rods to their rest position after printing.

2. An apparatus according to claim 1 in which the printing rods are held in retracted position by springs and are moved forward by transducers striking the rods at their rear ends.

3. A printing head according to claim 1 in which each rod communicates with a reservoir for its particular ink.

4. A printing head according to claim 2 in which each rod communicates with a reservoir for its particular ink.

5. An apparatus according to claim 1 in which typewriting means are provided to strike a given symbol in a line separated one line from the printing in the coded inks and means, actuated by the typewriter key, provide the signal for the means for causing predetermined printing rods to print.

6. An apparatus according to claim 2 in which typewriting means are provided to strike a given symbol in a line separated one line from the printing in the coded

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inks and means, actuated by the typewriter key, provide the signal for the means for causing predetermined printing rods to print.

7. An apparatus according to claim 4 in which type-writing means are provided to stroke a given symbol in a line separated one line from the printing in the coded inks and means, actuated by the typewriter key, provide the signal for the means for causing predetermined printing rods to print.

8. An apparatus according to claim 6 provided with switching means for deactivating the coded ink printing mechanism or for deactivating symbol typing.

9. An apparatus according to claim 7 provided with

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switching means for deactivating the coded ink printing mechanism or for deactivating symbol typing.

References Cited

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,340,984

September 12, 1967

Raymond John Dunsford Smith

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 57, strike out the heading "Description of the preferred embodiments", in italics, and insert the same as an italicized heading between lines 46 and 47, same column 2; column 3, line 68, "per se" should be italicized.

Signed and sealed this 11th day of February 1969.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

EDWARD J. BRENNER

Commissioner of Patents