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APPARATUS FOR CONCENTRATING FLUX IN MAGNETIC PRINTING

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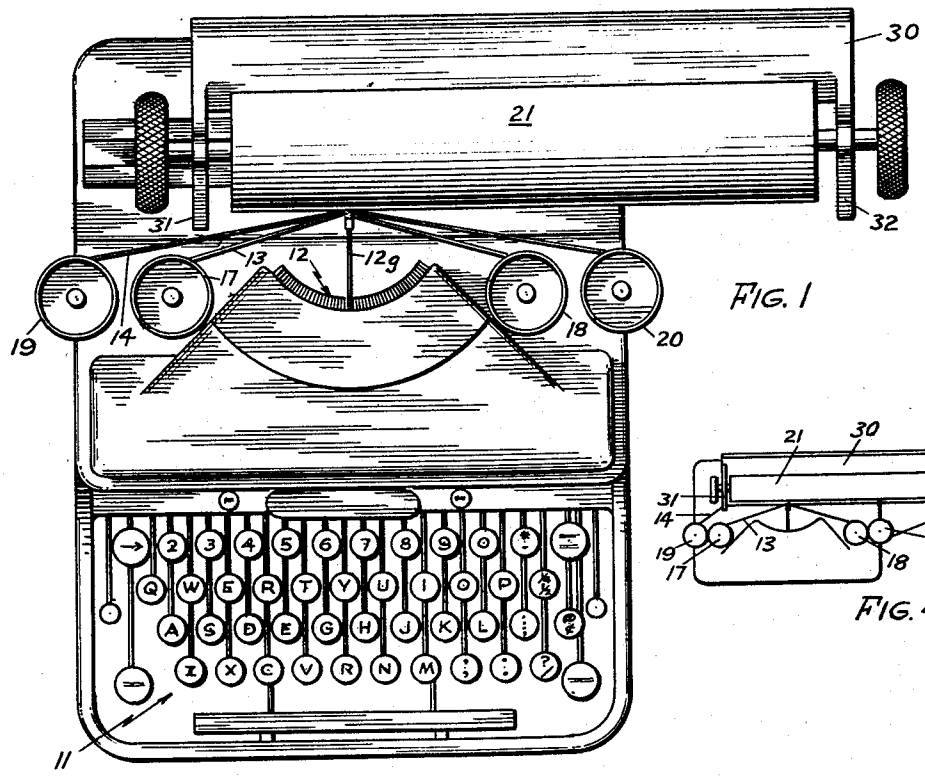


FIG. 1

FIG. 4

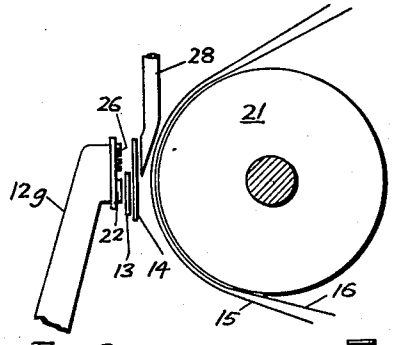


FIG. 3

FIG. 2

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APPARATUS FOR CONCENTRATING FLUX IN MAGNETIC PRINTING

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This invention relates to magnetic recording, and, more particularly, to the recording of messages on a magnetic tape.

The invention provides a method and apparatus for tape-recording a message simultaneously in at least two media, one of which media renders the message immedately and permanently visible on the tape itself without resort to a tangible reading aid of any kind, other than the human eye, while the other medium renders the message readable from the tape by conventional magnetic tape-reading means.

The invention also provides a tape-recording method and apparatus characterized by the application of a magnetic flux-concentrating catalyst to increase the tape magnetizing effect at selected areas along the tape concurrently with the entry of said selected areas of the tape into the zone of influence of the primary field-establishing element.

The invention further provides a method and apparatus for simultaneously printing a message in an immediately and permanently visible manner on at least two distinct backgrounds, superimposed one upon the other, one of said backgrounds being magnetic and the other nonmagnetic. More specifically, the printing apparatus includes the flux-concentrating catalyst above referred to, and also the primary field-establishing element above referred to, which apparatus records a magnetically readable message on the magnetic background concurrently with the printing of the visible message on said background. Additionally, the printing apparatus includes an assembly of selectively operable type bars comparable to the typebar assembly of a conventional typewriter, and the nonmagnetic background consists of one or more sheets of paper, or the like, mounted on a feeding roller to move with said roller into the path of operation of the printing apparatus, and progressively across said path, in a manner comparable to the operation of a conventional typewriter roller.

In the drawings:

Fig. 1 is a top plan assembly view of apparatus adapted for operation in accordance with, and embodying, the invention;

Fig. 2 is a side elevation view of the Fig. 1 assembly;

Fig. 3 is a side elevation view of certain of the components of Figs. 1 and 2, on a larger scale, and with interspacing of parts exaggerated, for clarity of illustration; and

Fig. 4 is a digrammatic view of a modified arrangement for controlling the magnetic tape feed.

In Figs. 1 and 2, a conventional typewriter key assembly is shown at 11, with each key having a lever operatively intermeshed with the appropriate one of the bank of typebars 12, one of which, designated bar 12*g*, is shown in Figs. 1, 2 and 3 as being shifted into operative engagement with the outer one of four different types of impressionable material, designated by reference numerals 13, 14, 15 and 16, respectively. Numeral 13 designates a conventional inked ribbon adapted to be wound upon and unwound from a pair of control spools 17 and 18; and numeral 14 designates a magnetic tape similarly related to a second pair of control spools 19 and 20, so that both ribbon 13 and tape 14 are advanced one type-space for each operation of a type bar 12. Carbon sheet 15 and paper sheet (or sheets) 16 are wrapped around roller 21 in conventional fashion, so that the operating pressure of type bars 12 upon the outer ribbon 13 will be transmitted to tape 14, carbon sheet 15, and paper sheet (or sheets) 16, to produce visible impressions on all of said materials 14, 15 and 16. These impressions will conform to the type character 22 (see Fig. 3) integrated with the end face of type bar 12*g*, or to the differentiating characters (alphabetic, numerical, or otherwise symbolic) correspondingly integrated with the other type bars 12, as the latter are selectively operated by their keys 11. Roller 21 is mounted conventionally in bearing elements 31 and 32 at opposite ends of the carriage 30.

Type bar 12*g*, as shown in Fig. 3, has the upper portion of its end surface delineated in such a manner as to present a plurality of projecting surfaces 26, each distinguishable from the others by reason of its spacing and contour, and the dividing recesses therebetween, so that the combined effect is that of an identifiable code character, constituting one of a series comprising a complete code pattern, whose other constituent characters are similarly delineated upon the end surfaces of the associated type bars 12. All of these type bars have their end portions fashioned out of iron or other magnetic material, to permit their serving as magnetic flux concentrating instrumentalities when a magnetic field is established adjacent thereto, as by the passage of electric current through the windings of an electro-magnet 27 (Fig. 2) whose depending magnetic polar extension 28 has its lower end surface disposed in horizontal alignment with the upper half of the magnetic tape 14, and directly behind said tape, so that it serves as both a magnetic and physical abutment to absorb the force applied to the tape 14 as the type bars 12 are successively brought into engagement with said tape, in the typing procedure. Thus there is obtained, simultaneously, a message recording in magnetic form along the length of the advancing tape 14, and two visible recordings of the same message, one being on the paper page (or pages) 16, and the other being upon the lower half of the magnetic tape 14. Alternatively, the magnetic field creating unit 27 may be a permanent (unwound) magnet, in which case a magnetic flux concentration will occur automatically each time a new type bar 12 is shifted into pressure-applying relation to the tape 14.

The use of the magnetic type bars 12 to complement the tape-magnetizing action of the magnet 27 is of paramount importance, as the strength of the magnetic circuit that could be maintained by the relatively small magnet 27, acting alone, would be inadequate to produce the necessary degree of concentration of magnetization in the magnetic tape 14, assuming such tape to be of conventional magnetic tape composition. In order to magnetize the tape strongly enough to insure accurate reception of pulse signals conforming to the code pattern entered into the tape by the successively actuated shift bars 12, when the tape is subsequently run past a conventional magnetic pick-up head, or equivalent signal-reading element, the magnetic field set up by magnet 27 must be reinforced and concentrated at those areas on the tape which coincide in contour, and spacing, with the contour and spacing of the code-representing projections 26 on key bar 12*g*, and the corresponding projections on the associated key bars. If these projections are of magnetic composition, the magnetic flux will concentrate at the spots on the tape that are actually struck

by the said projections as the successively shifted key bars come in contact with successively presented areas of the tape. While the desired message is thus being entered magnetically on the upper half of the tape (which message may, if desired, include synchronizing pulse-forming signals, to be entered by means of a particularly and uniformly positioned one of the several projections **26** on each type bar **12**) the same message will be entered in a visible manner on the lower half of the tape by the action of the characters **22** formed on the lower half of the end faces of all type bars **12**, which characters apply visible ink marks to the tape **14** by reason of pressing the inked ribbon **13** thereagainst. Concurrently, of course, the same message will be impressed upon the page (or pages) **16** by way of the intervening carbon sheet (or sheets) **15**.

Fig. 4 shows an alternate arrangement wherein successive lengths of the tape **14** are held taut against the surface of the carbon paper-covered roller **21** during carriage traverse. By this arrangement the tape **14** and carriage **30** move as a single unit, with no relative motion therebetween, as the carriage advances, space by space, to the left in the course of typing a full line of the message on the paper page **16**. At the end of each full-line typing cycle, the take-up spool **19** will receive the full page-width section of tape bearing the recorded characters typed thereon during the cycle just completed. Simultaneously, a new length of tape is paid out by spool **20**, and this new length of tape will take its position across the length of the carriage roller, where it will remain for the duration of the next cycle. When the take-up spool **19** (Fig. 1 or Fig. 4) is filled, or the message-typing operation has been completed, the spool **19** may be removed from the machine for rewinding, and the wound message-bearing tape may then be inserted into a computing machine or other magnetic signal-reading unit.

The Fig. 4 arrangement permits "back-spacing" of the carriage **30** and tape **14** as a unit, so that a correction may be made at a point of error at any time during the typing of a given line of the message. To prepare the tape for reception of the corrected code markings at such a point of error, the erroneous magnetic markings may be "erased," as by passing an R-F or other alternating current through the windings of magnet **27**, prior to retyping.

This invention is not limited to the particular details of construction, materials and processes described, as many equivalents will suggest themselves to those skilled in the art. It is accordingly desired that the appended claims be given a broad interpretation commensurate with the scope of the invention within the art.

What is claimed is:

1. Apparatus for recording intelligence which includes type bar means for simultaneously printing visibly and magnetically on a magnetic vehicle progressively passing within range of a magnetic field, and means for shifting the vehicle into a new message-receiving position in advance of each new printing stroke, or series of strokes, said first-recited means including a magnetic material having a plurality of code-representing projections directly engaging said magnetic vehicle, and a single magnetic flux-concentrating element engaging the other side of said magnetic vehicle opposite said code-representing projections.

2. Apparatus for recording intelligence which includes type bar means for printing a message simultaneously in at least two media, one of which media renders the message visible while the other medium holds the message in the form of magnetic lines of force, said means including a plurality of selectively operable type bars each provided with a type character and a plurality of magnetic code-representing projections, and a single magnetic field-concentrating bar forming a magnetic and a physical abutment in the path of movement of said magnetic code-representing projections and cooperating therewith to store magnetically the code represented by said magnetic projections simultaneously with the operation of said type bars.

3. Apparatus for recording a message simultaneously on a continuous tape, and on a letter-size page, comprising means for superimposing said tape and said page one upon the other, means for feeding the tape continuously in a single direction, while feeding the page in a plurality of directions successively, means for applying a plurality of code-representing magnets to one side of said magnetic tape, means for printing visual characters on said page and said tape simultaneously with operation of said latter means, and means for applying characteristic flux-concentrating bar to the opposite side of said magnetic tape adjacent to said code-representing magnets.

4. Apparatus for recording a message simultaneously on a continuous magnetic tape, and on a letter-size page, comprising means for superimposing said tape and said page one upon the other, means for feeding the tape continuously in a single direction, while feeding the page in a plurality of directions successively, means for applying a magnetizing force to successively fed sections of the tape, said latter means including magnetic material having a plurality of code-representing projections adapted to contact one side of said magnetic tape, and a field-concentrating magnet positioned on the opposite side of said magnetic tape to form a physical abutment at the point of contact of said code-representing projections to facilitate magnetic reading of the message.

5. In a typewriter, in combination with a paper-carrying roller, an ink-bearing ribbon suspended along the length of said roller, a plurality of keys, a separate type-bearing means movable in response to actuation of each of said keys into contact with said ribbon to press said ribbon toward the paper carried by said roller, each of said type-bearing means also carrying a plurality of magnetic code-representing elements, a magnetic tape interposed between said ribbon and said paper to receive an ink impression simultaneously with contact by said magnetic code-representing elements in response to operation of said type-bearing means, and a magnetic field-concentrating element positioned on the opposite side of said magnetic tape at the point of contact of said magnetic code-representing elements to magnetize selected areas of said tape.

6. In a typewriter, in combination with a paper-carrying roller, an ink-bearing ribbon suspended along the length of said roller, type-bearing means including a plurality of magnetic elements adapted to represent an information code and type characters movable into contact with said ribbon to press said ribbon toward the paper carried by said roller, and a magnetic tape interposed between said ribbon and said paper to receive an ink impression on one side thereof in response to operation of said type-bearing means, and a single magnetic field-producing element forming a striking surface on the opposite side of said magnetic tape cooperating with said magnetic elements simultaneously to store magnetically on said tape the same information as is represented by said ink impression.

7. In a typewriter, in combination with a magnetic tape and an ink-bearing ribbon in juxtaposed relation one to the other type-bearing means including type characters and magnetic code elements, said type characters movable into contact with said ribbon to press said ribbon against said magnetic tape, to record an ink impression thereon, said magnetic code elements movable into direct contact with one side of said magnetic tape, and a magnetic field-concentrating element forming a physical abutment and at the opposite side of said magnetic tape at the point of contact of said magnetic code elements.

8. In a typewriter, in combination with a magnetic tape and an ink-bearing ribbon in juxtaposed relation, one to the other, type-bearing means movable into contact with said ribbon to press said ribbon against one

side of said magnetic tape, to record an ink impression thereon, a plurality of magnetic code-representing projections carried by said type-bearing means to press against one side of said magnetic tape to store magnetically on said tape the same information as is represented by said ink impression, and a single magnetic field-concentrating element forming a magnetic and physical abutment at the opposite side of said magnetic tape at the point of contact of said code-representing projections.

9. In a typewriter, in combination with a magnetic tape, type-bearing means including a plurality of bars of magnetic material arranged to form a code movable into direct contact with one side of said tape to store said code thereon, and a magnet in contact with the opposite side of said tape cooperating with said bars of magnetic material to store magnetically on selected areas of said tape the information represented by the type carried by said type-bearing means.

10. In a typewriter, in combination with a magnetic vehicle and a type-bearing element having a plurality of magnetic code-representing projections and individual type characters, magnetic field-producing means forming a magnetic and physical abutment in the path of said magnetic code-representing projections and cooperating with said type-bearing element to store magnetically by direct contact with said vehicle the information readably represented by the type characters carried by said type-bearing element, said magnetic field-producing means also provided with an alternating current field coil for erasure of said stored information.

11. In a typewrite, in combination with a magnetic tape, type-bearing means including type characters and

code-representing projections of magnetic composition movable into direct contact with said tape, and a single magnetic field-producing means in contact with the opposite side of said tape and cooperating with said type-bearing code-representing projections simultaneously to store magnetically on said tape the information readably represented by the type characters carried by said type-bearing means.

12. In a typewriter, in combination, a plurality of selectively operable type bars each provided with a type character and a plurality of magnetic code-representing projections, a single magnetic field-concentrating bar forming a magnetic and physical abutment in the path of movement of said magnetic code-representing projections cooperating therewith, to store magnetically by direct contact therewith the coded information represented by said code-representing projections.

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