Sept. 2, 1958 W. J. RUEGER 2,850,348

SPIRAL PATTERN MAGNETIC DRUM PRINTING

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FIG. 1

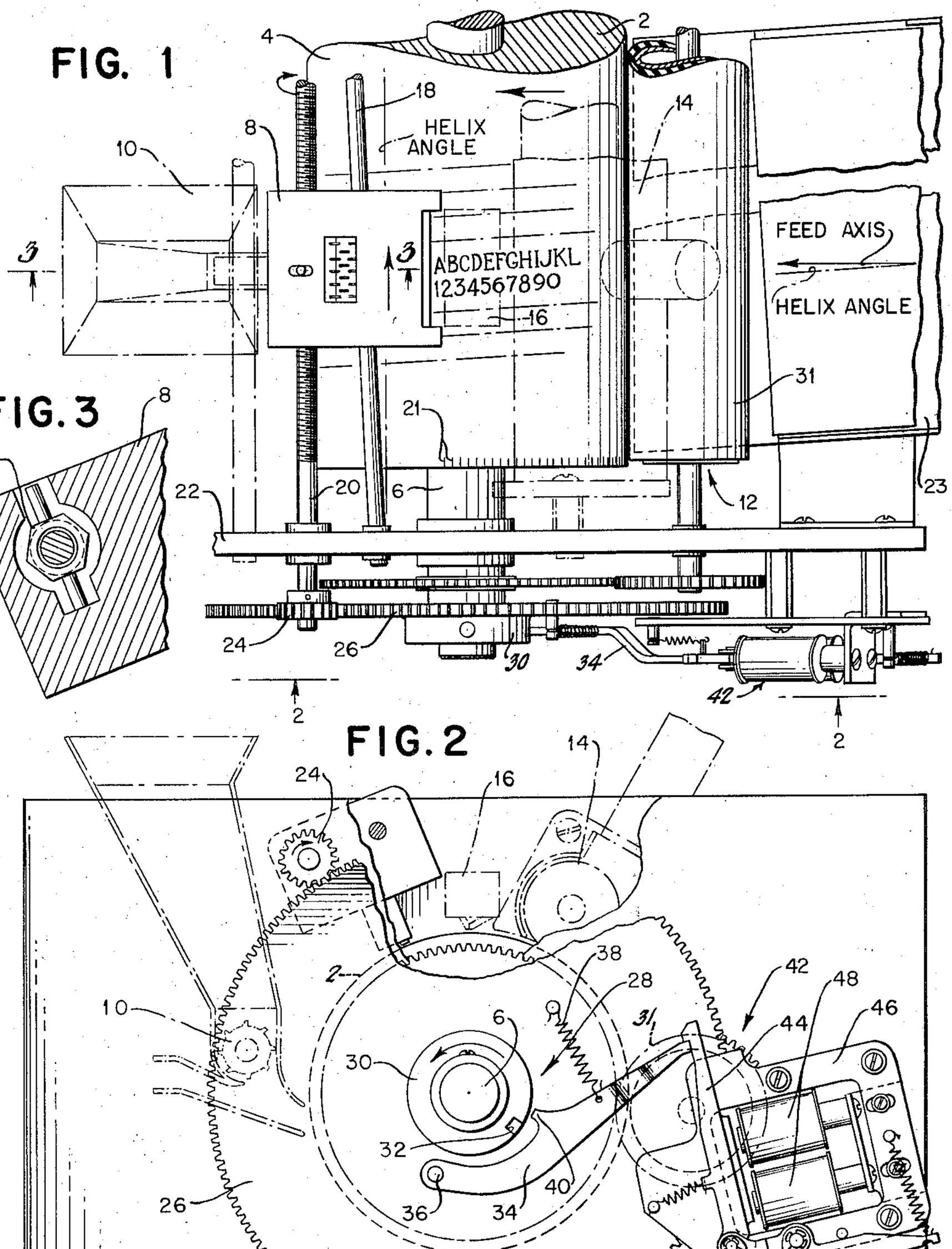

FIG. 3

FIG. 2

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SPIRAL PATTERN MAGNETIC DRUM PRINTING

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11 Claims. (Cl. 346—74)

This invention relates to a magnetic printing machine and more particularly to a spiral pattern magnetic printing machine.

By definition, spiral pattern magnetic printing describes a mechanism wherein a magnetic writing (or reading) head and a magnetic drum are moved relative to one another in such a fashion that the head is positioned to write along a spiral line formed on the peripheral surface of a magnetic drum. The head is shifted axially of the drum (or vice versa) during one revolution of the latter, a distance equal to a predetermined interline space. In this fashion, the head and the drum can be synchronized to permit continuous relative movement of the drum and head, while the head can be regulated electrically to control intermittent writing on each line.

Magnetic drum printing is, of course, old in the art and accordingly this invention is limited to a printing mechanism wherein printing is formed in a spiral pattern; that is, in the prior art the writing head was positioned to write on peripheral lines that were in planes perpendicular to the axis of the drum. The head, or drum was then shifted one line space after one drum revolution. This operation required time delay and erratic mechanical operation. Accordingly, it is a first object of this invention to provide an improved magnetic drum machine wherein the writing (or reading) head is always moved uniformly and synchronously relative to the drum.

It is a still further object of this invention to provide an improved magnetic printer wherein writing can take place while the head and drum move relative to one another both circumferentially and axially thereby permitting writing to be formed in a continuous spiral pattern.

It is a still further object of this invention to provide an improved magnetic printing machine wherein the writing head and the magnetic drum are always synchronized, but controllable for selective intermittent operation.

It is a still further object of this invention to provide an improved spiral pattern printing machine wherein the helix angle (or the interline spacing) for writing produced on the magnetic drum may be varied without destroying the synchronized relation between the writing head and the magnetic drum.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a top elevation of a spiral pattern line printing mechanism.

Fig. 2 is a front elevation taken along plane 2—2 of Fig. 1, showing the spiral pattern line printing mechanism.

Fig. 3 is a front elevation partly in section, showing the drive for the magnetic head.

Briefly, this invention relates to a mechanism for writing (or reading) an entire page of magnetic printing while a head and drum are moved relative to one another,

My copending applications Serial No. 575,830 filed April 3, 1956 and Serial No. 577,116 filed April 9, 1956 completely described a multi-element magnetic head and its operation for writing (or reading) characters on a magnetic surface. The subject application makes provision for the movement of the magnetic surface and/or the magnetic head relative to one another in such a manner that the lines of printing which are produced on a magnetic surface are in the form of a spiral wherein for one revolution of a magnetic drum surface, the head is shifted axially of the drum a distance sufficient to locate the second line of printing one line space from the first line.

With reference to the drawings, a magnetic drum 2, indicated as having a magnetic surface 4, is shown pinned, keyed or otherwise secured to a shaft 6 which is driven by some external power source (not shown).

In order to illustrate the principles of this invention in the proper perspective, the elements used in magnetic printing are shown (some in phantom) spaced peripherally about drum 2 and proximate surface 4; that is, a write head 8, a dusting mechanism 10, a paper feed roller 31, a cleaning mechanism 14, and an erase head 16 are spaced in order about the periphery of drum 2.

The write head 8 and its electrical operation is described in complete detail in copending applications Serial No. 575,830 and Serial No. 577,116. The other elements, except for one detail of the paper feed which will be hereinafter described, are well known in the art and no description of them is deemed necessary, since they are not a part of the present invention.

It is to be understood that through the operation of the elements mentioned above, magnetic printing is effected by first forming magnetic patterns via the head 8 on the magnetic surface 4; dusting the characters with a powder that is attracted to the magnetized portion of the magnetic surface 4; and transferring the dusted characters to a page at a print station 12 where paper is fed into printing contact with the drum 2.

In accomplishing the objectives of this invention, the write head 8 is mounted on a guide rod 18 to provide for guided axial movement (relative to the axis of drum 2) in response to the turning of a screw 20. Screw 20 passes through and threadedly engages a swivel or gimbal supported nut 19 (Fig. 3) in head 8 which permits the head to follow the path of rod 18. The latter is formed to lie in a surface concentric to the axis of drum 2 and yet at an angle to a true element in said concentric surface equal to the helix angle (the angle that a line of spiral printing makes with an element lying in the magnetic surface 4) of the spiral printing. The reason for forming rod 18 at an angle is that in copending application Serial No. 577,116, it has been described that the operation of the writing head is under control of a conventional drum timing track 21 located proximate one edge of magnetic surface 4. It becomes apparent then that if printing is formed in a spiral pattern, the left-hand margin of the page being written would tilt away from an element lying in magnetic surface 4 at an angle equal to the helix angle. Accordingly, provision is made for maintaining the left margin of the spiral printing parallel to the left edge of the page to be printed by veering rod 18 at an angle equal to the helix angle as above described. In this fashion, the head 8 writes at the exact left-hand margin irrespective of its axial displacement from the timing track 21.

The screw 20 also passes through a mounting plate 22 and is connected via a pin, key, etc. to a pinion 24, which is in mesh with (and hence synchronized with) a drive gear 26 mounted coaxially of shaft 6. Drive gear 26 is supported for selective interconnection with

the shaft **6**, by means of a clutch **28** (Fig. 2). More specifically, the shaft **6** has secured to it a collar **30** in which is provided a notch **32**. The collar **30** acts both as a bearing for the drive gear **26** and as an operative portion of clutch **28**. A dog **34** is pivotally supported by means of a pin **36** on the drive gear **26**. The dog **34** is biased counterclockwise about pin **36** by means of a spring **38** which urges a dog tooth **40** into engagement with the slot **32**. The dog **34** is held out of engagement from the notch **32** by means of an electromagnetically controlled latch device **42**; that is, a latch **44** is pivotally supported on an electromagnet frame **46**. Upon the energization of a coil **48**, latch **44** is pivoted clockwise thereby releasing the tail of the dog **34** permitting spring **38** to drop the tooth **40** into the notch **32**, to engage clutch **28**, and establish a driving relation between shaft **6** and gear **26**.

In order to write on the drum, in accordance with the teachings of this invention, the latch mechanism **42** is first unlatched by some suitable electrical circuit (not shown) to engage clutch **28** and interconnect gear **26** with shaft **6**. With this driving relation established, shaft **26** drives pinion **24** which turns screw **20** to move the writing head **8** axially while the drum **2** is rotated under the writing head.

By controlling the energization of the individual elements of the head **8** (as described in application Serial No. 577,116) characters may be written at each character position on the drum. The characters will be formed in an interrupted helical pattern; that is, if the circumference of drum is 12" and the selected inter-marginal spacing is 8", then writing would take place for 8" of circference and 4" would be blank. This interrupted pattern would be under control of the timing track **21** above described. The size relationship between the pinion **24** and the drive gear **26** is selected to move the write head **8** axially a predetermined distance per revolution of drive gear **26** whereby the pitch (or helix angle) of the helix will be equal to a preselected interline spacing of the drum. It follows that by changing the pitch size of the meshed gears **24**, **26** the interline spacing on the drum may be selectively varied.

In a preferred embodiment, a full page of magnetic printing would first be formed on the drum surface **4** and then magnetic images would be dusted or inked at the inking station **10** (shown in phantom in Fig. 2) whereupon print paper would be fed into engagement with the drum. In this respect, it will be recognized that since the characters have been printed in a helical fashion in the drum, provision is made for feeding the print paper into contact with the drum at an angle equal to the helix angle (see Fig. 1). In this manner, even though the writing on the drum is helical, the printing will be parallel to the edges of the page after transfer.

In this respect, the paper may be fed by any conventional paper feeding mechanism acting through feed roller **31** (which has an axis parallel to shaft **6**) while the paper is fed at an axis which is perpendicular to the axis of the drum **2**, compensation must be made for the fact that printing has been produced along a spiral path having a helix angle. The compensation is brought about by cocking the paper with respect to the feed axis at an angle equal to the helix angle. The paper may be cocked by placing it in a chute **23** having an axis tilted at an angle equal to the helix angle away from the feed axis.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A mechanism for effecting magnetic print operation along a spiral pattern path having a predetermined helix angle comprising a cylindrical drum having a magnetic surface, a magnetic head, means including a guide rod for positioning said head and for guiding its movement along a path proximate said drum, said rod arranged at said helix angle with respect to an element of said drum, screw thread means for advancing said head axially relative to said drum, and meshing gear means for synchronizing the turning of said screw thread means with the turning of said drum to move said head a predetermined axial distance during each revolution of said drum thereby determining the interline spacing of said spiral pattern print operation.

2. A mechanism for effecting magnetic print operation along a spiral pattern path having a predetermined helix angle comprising a cylindrical drum having a magnetic surface, a magnetic head, means including a guide rod for positioning said head and for guiding its movement along a path proximate said drum, said rod arranged at said helix angle with respect to an element of said drum, screw thread means arranged parallel to a drum element for advancing said head axially relative to said drum, and meshing gear means for synchronizing the turning of said screw thread means with the turning of said drum to move said head a predetermined axial distance during each revolution of said drum thereby determining the interline spacing of said spiral line printing.

3. A mechanism for effecting magnetic print operations along a spiral pattern path having a predetermined helix angle comprising a cylindrical drum having a magnetic surface, a magnetic head, means including a guide rod for positioning said head and for guiding its movement along a path proximate said drum, said rod arranged at said helix angle with respect to an element of said drum, screw thread means arranged parallel to a drum element, a complementary gimbal nut in said head, engageable with said screw thread means for advancing said head axially relative to said drum, and meshing gear means for synchronizing the turning of said screw thread means with the turning of said drum to move said head a predetermined axial distance during each revolution of said drum thereby determining the interline spacing of said spiral line printing.

4. A mechanism for effecting magnetic print operations along a spiral pattern path having a predetermined helix angle comprising a cylindrical drum having a magnetic surface, a magnetic head, means including a guide rod for positioning said head and for guiding its movement along a path proximate said drum, said rod arranged at said helix angle with respect to an element of said drum, screw thread means arranged parallel to a drum element for advancing said head axially relative to said drum, and meshing gear means for synchronizing the turning of said screw thread means with the turning of said drum to move said head a predetermined axial distance at a uniform velocity during each revolution of said drum thereby determining the interline spacing of said spiral line printing.

5. A mechanism for effecting magnetic print operations along a spiral pattern path having a predetermined helix angle comprising a cylindrical drum having a magnetic surface, a magnetic head, means including a guide rod for positioning said head and for guiding its movement along a path proximate said drum, said rod arranged at said helix angle with respect to an element of said drum, screw thread means arranged parallel to a drum element, a complementary gimbal nut in said head engageable with said screw thread means for advancing said head axially relative to said drum, and meshing gear means for synchronizing the turning of said screw thread means with the turning of said drum to move said head a predetermined axial distance at a uniform velocity during each revolution of said drum thereby determining the interline spacing of said spiral line printing.

6. A mechanism for effecting magnetic print operations along a spiral pattern path having a predetermined helix angle comprising a cylindrical drum having a magnetic surface, a magnetic head, means including a guide rod for positioning said head and for guiding its movement along a path proximate said drum, said rod arranged at said helix angle with respect to an element of said drum, screw thread means arranged parallel to a drum element for advancing said head axially relative to said drum, meshing gear means for synchronizing the turning of said screw thread means with the turning of said drum to move said head a predetermined axial distance during each revolution of said drum thereby determining the interline spacing of said spiral line printing, a drive shaft, and clutch means for engaging said drive shaft with said drum to drive the latter and thereby effect the synchronous operation of said drum and head.

7. A mechanism for effecting magnetic print operations along a spiral pattern path having a predetermined helix angle comprising a cylindrical drum having a magnetic surface, a magnetic head, means including a guide rod for positioning said head and for guiding its movement along a path proximate said drum, said rod arranged at said helix angle with respect to an element of said drum, screw thread means arranged parallel to a drum element, a complementary gimbal nut in said head engageable with said screw thread means for advancing said head axially relative to said drum, and meshing gear means for synchronizing the turning of said screw thread means with the turning of said drum to move said head a predetermined axial distance at a uniform velocity during each revolution of said drum thereby determining the interline spacing of said spiral line printing, a drive shaft mounted coaxially of said drum, and clutch means for engaging said drive shaft with said drum to drive the latter and thereby effect the synchronous operation of said drum and head.

8. A mechanism for effecting magnetic print operations along a spiral pattern path having a predetermined helix angle, comprising a cylindrical drum having a magnetic surface, a magnetic head, means including a guide rod for positioning said head and for guiding its movement along a path proximate said drum, said rod arranged at said helix angle with respect to an element of said drum, screw thread means arranged parallel to a drum element for advancing said head axially relative to said drum, meshing gear means for synchronizing the turning of said screw thread means with the turning of said drum to move said head a predetermined axial distance at a uniform velocity during each revolution of said drum thereby determining the interline spacing of said spiral line printing, a drive shaft mounted coaxially of said drum, and clutch means for engaging said drive shaft with said drum to drive the latter and thereby effect the synchronous operation of said drum and head.

9. A mechanism for effecting magnetic printing along a spiral pattern path having a predetermined helix angle comprising a cylindrical drum having a magnetic surface, a magnetic head, means including a guide rod for positioning said head and for guiding its movement along a path proximate said drum, said rod arranged at said helix angle with respect to an element of said drum, screw thread means arranged parallel to a drum element for advancing said head axially relative to said drum, meshing gear means for synchronizing the turning of said screw thread means with the turning of said drum to move said head a predetermined axial distance during each revolution of said drum thereby determining the interline spacing of said spiral line printing, means positioning printing sheets so that they are cocked at said helix angle relative to a perpendicular plane transverse to said drum axis, and roller means having an axis parallel to that of said drum for moving said cocked sheets into engagement with said drum thereby effecting the alignment of said spiral pattern printing with the edges of said printing sheets during a printing transfer operation.

10. A mechanism for effecting magnetic printing along a spiral pattern path having a predetermined helix angle comprising a cylindrical drum having a magnetic surface, a magnetic head, means including a guide rod for positioning said head and for guiding its movement along a path proximate said drum, said rod arranged at said helix angle with respect to an element of said drum, screw thread means arranged parallel to a drum element for advancing said head axially relative to said drum, meshing gear means for synchronizing the turning of said screw thread means with the turning of said drum to move said head a predetermined axial distance at a uniform velocity during each revoluton of said drum thereby determining the interline spacing of said spiral line printing, a drive shaft mounted coaxially of said drum, clutch means for engaging said drive shaft with said drum to drive the latter and thereby effect the synchronous operation of said drum and head, means positioning printing sheets so that they are cocked at said helix angle relative to a perpendicular plane transverse to said drum axis, and roller means having an axis parallel to that of said drum for moving said cocked sheets into engagement with said drum thereby effecting the alignment of said spiral pattern printing with the edges of said printing sheets during a printing transfer operation.

11. A mechanism for effecting magnetic printing along a spiral pattern path having a predetermined helix angle comprising a cylindrical drum having a magnetic surface, a magnetic head, means including a guide rod for positioning said head and for guiding its movement along a path proximate said drum, said rod arranged at said helix angle with respect to an element of said drum, screw thread means arranged parallel to a drum element, a complementary gimbal nut in said head engageable with said screw thread means for advancing said head axially relative to said drum, and meshing gear means for synchronizing the turning of said screw thread means with the turning of said drum to move said head a predetermined axial distance at a uniform velocity during each revolution of said drum thereby determining the interline spacing of said spiral line printing, a drive shaft, clutch means for engaging said drive shaft with said drum to drive the latter and thereby effect the synchronous operation of said drum and head, means positioning printing sheets so that they are cocked at said helix angle relative to a perpendicular plane transverse to said drum axis, and roller means having an axis parallel to that of said drum for moving said cocked sheets into engagement with said drum thereby effecting the alignment of said spiral pattern printing with the edges of said printing sheets during a printing transfer operation.

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