CORE PATCH STRINGING METHOD

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References Cited

UNITED STATES PATENTS
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ABSTRACT

A method for facilitating the manufacture of magnetic core memory arrays. A plurality of miniature toroidal cores are mounted on patches with the apertures therethrough aligned along parallel rows and columns. A plurality of wires equal in number to the number of columns of cores on the patch, and unwound from a supply spool for an extended distance and the leading end is manually threaded through the aligned apertures, such that only a short length of wire extends beyond the last row of cores. These ends are then clamped and a motor driven belt is used to transport the patch along the extended lengths of wires toward the supply spool. When the first patch has been moved by the belt a relatively short distance, another patch of cores can be manually threaded on the same wires and again transported by the motor driven belt and this process repeated until the extended length of wires is filled with core patches.

2 Claims, 1 Drawing Figure
CORE PATCH STRINGING METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a division of application Ser. No. 401,469 filed Sept. 27, 1973, entitled "Core Patch Stringing Apparatus" and now U.S. Pat. No. 3,849,861.

BACKGROUND OF THE INVENTION

Toroidal magnetic cores have long been used in the computer industry as an addressable information storage media. The cores may be arranged in a rectangular array and a plurality of strands of fine wire, such as AWG 42 having a diameter of 0.00249 inches, are threaded through the core apertures in the array. A typical array may comprise 128 rows and 128 columns or a total of 16,384 individual cores. Each core may have an outside diameter of 0.023 inches and an inside diameter of 0.015 inches.

In the past, when manually stringing core arrays, it has been the practice for the operator to utilize relatively short individual lengths of pre-cut wire having a threading needle butt welded thereon. As such, each typical array might require 256 individual wires, each equipped with a threading needle.

We are also aware of various prior art automatic or semiautomatic core stringing machines wherein the array to be threaded is held in a fixed position and the wires to be threaded are removed from spools and advanced through the core array by means of drive rollers. For examples of these prior art machines, reference is made to the Fielder et al U.S. Pat. No. 3,331,126; the Raickle U.S. Pat. No. 3,587,160 and the Shaw et al U.S. Pat. No. 2,958,126. Because of the close tolerances involved, the complexity and attendant cost of these machines are relatively high. The manual method outlined above tends to be slow and is wasteful in terms of material costs in that a needle assembly can be used only once in stringing a single array.

The present invention provides a relatively simple, inexpensive, semiautomatic machine for facilitating the manufacture of magnetic core memory arrays in which the threading needles employed can be used repeatedly for threading multiple arrays. In carrying out the method of the present invention an array of cores affixed to a backing sheet (hereinafter referred to as a core patch) is located at an operator's work station. A plurality of wires, equal in number to the number of columns of cores in the array and each having a threading needle butt welded to the end thereof, are unwound from a spool located a substantial distance from the work station. These wires are maintained in a parallel relationship with one another and are positioned overlapping by a motor driven conveyor belt which extends from the spool location to the work station. An operator manually guides the needles through the cores on the core patch and slides the patch onto the belt, which thereafter transports the patch along the wires and away from the work station. When the first patch is out of the way, the operator threads the same wires through additional patches, one-by-one, and allows them to be transported by the moving belt towards the spool location. After the extended length of wires has been filled with core patches, the wires may be severed at predetermined locations and the resulting groups of patches, with wires extending therethrough, can be removed to another work station for additional manufacturing operations.

OBJECTS

It is accordingly an object of the present invention to provide an improved method for manufacturing magnetic core memory arrays.

Yet another object of the invention is to provide an assembly method for stringing magnetic cores wherein the threading needles employed can be used for stringing more than a single array.

The novel features of this invention as well as the invention itself, both as to its organization and method of operation, will best be understood from the following description when read in connection with the accompanying drawing which illustrates by means of a mechanical schematic the novel apparatus used to carry out the method of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Before describing the novel method for facilitating the manufacture of magnetic core memory arrays, consideration will first be given to a description of the apparatus employed in carrying out the method.

As shown in the FIGURE, there is provided a supply reel 10 on which is wound a plurality of individual strands of fine wire 12 which is to be threaded through a corresponding plurality of columns of toroidal magnetic cores. For example, the reel 10 may contain 128 separate strands. The leading end of each of the plurality of fine wires 12 has a stiffened member 14 (hereinafter termed a threading needle) butt welded thereto. In the practice of this invention, the threading needle may be approximately 12 inches long and the wire 12 attached thereto may be in the range of from four feet to one-hundred feet, although limitation to this range is not intended and should not be inferred.

In leaving the spool 10, the wires are passed between a pair of oppositely driven friction rollers 16 and over the upper leg of a conveyor belt 18 which is motor driven in a direction indicated by the small arrows 20 and 22. Located directly beneath the upper leg of the conveyor belt 18 is a rubber or flexible plastic sheet of material which is impregnated with magnetic particles.

The magnetic field produced by the underlying strip 24 passes through the upper leg of the conveyor belt 18 so as to exert a magnetic attractive influence on the magnetic core patches, thus increasing the frictional force between the core patches and the top surface of the upper leg of the conveyor belt 18. A limit switch 26 is located near the end of the conveyor belt 18 and serves to interrupt the power to the conveyor belt drive motor when a core patch has traversed the entire length of the conveyor.

Located at the operator's work station at the end of the conveyor belt 18 remote from reel 10 is an air bearing plate 28 comprising a chamber 30 having an upper surface 32 a perforated plate through which air can pass. The chamber 30 is connected to a regulated air pressure source (not shown) by means of a flexible plastic tube 34. This fixture serves to float a core patch such as patch 36 in position as the operator inserts the threading needles through the aligned columns of apertures in the cores mounted on the patch.

To transfer a core patch from the air bearing plate 28 to the conveyor belt 18, a second motor driven conveyor belt 42 is provided. This second belt is substan-


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tially shorter in length than the belt 18 and may have a sprocket-to-sprocket distance of only 8 to 10 inches (approx.). This short belt is needed to avoid damage to the insulative coating on the wires and to the magnetic cores which might otherwise occur if the core patch is tipped or distorted during the transfer operation. The belt drive motor control circuits are such that upon depression of a start switch (not shown) the short belt 42 will run for approximately six seconds whereas the long belt is driven for only about four seconds. The difference in operating times insures that a core patch leaving the work station air bearing plate 28 will be transferred to the long belt and will be spaced relative to adjacent patches as desired.

Also located in proximity to the work station are first and second sets of solenoid operated clamps 38 and 40. A push-button control panel (not shown) is provided which allows the operator to selectively energize the clamps 38 and 40 as well as to control the conveyor belt drive motors and the motor driving the tension rollers 16.

Now that the apparatus has been described in detail, consideration will be given to the details of the method employed for stringing multiple core patch arrays. The operating sequence is as follows:

1. The operator unreefs the needle-wires 12 from the spool 10, threads them through a set of tension rollers 16, routes them over the conveyor belts 18 and 42 and secures them under the two sets of solenoid operated clamps 38 and 40. The machine is now set up for operation.

2. A first core patch is positioned on the air bearing plate 28, clamp 38 is released (opened) and the core patch 36 is positioned onto the needles 14 and is slid between the open jaws of the clamp 38 to a position between clamp 38 and the closed clamp 40 and rests on the short conveyor belt 42. Another core patch is mounted on the needles 14 but this second patch temporarily remains to the right of the clamp 38. Clamp 38 is then again energized and closed.

3. The operator presses another control button which causes the solenoid clamp 40 to open and the conveyor belt drive motors and the drive motor for the tension rollers 16 to be energized. The control circuit for the conveyor belt drive motors is such that both motors are energized simultaneously, but the motor for the short conveyor belt 42 is allowed to run approximately two seconds longer than the drive motor for the long conveyor belt 18. Thus, the core patch located on the short drive belt will pass between the now open clamp 40 and onto the long conveyor belt 18 without being tipped or twisted. The motor driving the friction rollers 16 is energized and de-energized in synchronism with the drive motor for the short conveyor belt 42 such that whenever the patches are being moved by the short conveyor belt 42, tension will be maintained on the plural electrical conductors threading through the multiple core arrays.

4. Clamps 38 and 40 are again energized to clamp the wires and steps 2 through 4 above are repeated until the wires overlaying the long conveyor belt 18 are filled with the desired number of core patches.

5. The individual patches are then grouped as desired and the wires are maintained in alignment by adhesive tape or other suitable means and then a group of patches and wire segments threading through them are cut out and transferred to another work station for further stringing operations dictated by the design of the magnetic core array.

Thus it can be seen that there has been shown and described a novel method for facilitating the construction of magnetic core memory arrays. It is to be understood, however, that various changes, modifications and substitutions in the form and details of the described method can be made by those skilled in the art without departing from the scope of the invention as defined by the following claims.

What is claimed is:

1. A method for stringing magnetic core arrays comprising the steps of:
   a. locating a core patch having a plurality of toroidal shaped cores mounted thereon, on edge, with the apertures of said cores aligned along a plurality of rows and columns at a work station;
   b. manually threading a first end of each of a plurality of wires individually through the apertures of a respective one of said columns;
   c. clamping said first end of said plurality of wires to maintain them in a taut condition; and
   d. sliding said core patch away from said work station along said plurality of wires for an extended, predetermined distance.

2. The method as in claim 1 and further including the steps of:
   a. repeating steps a), b) and c) while step d) is in progress.

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