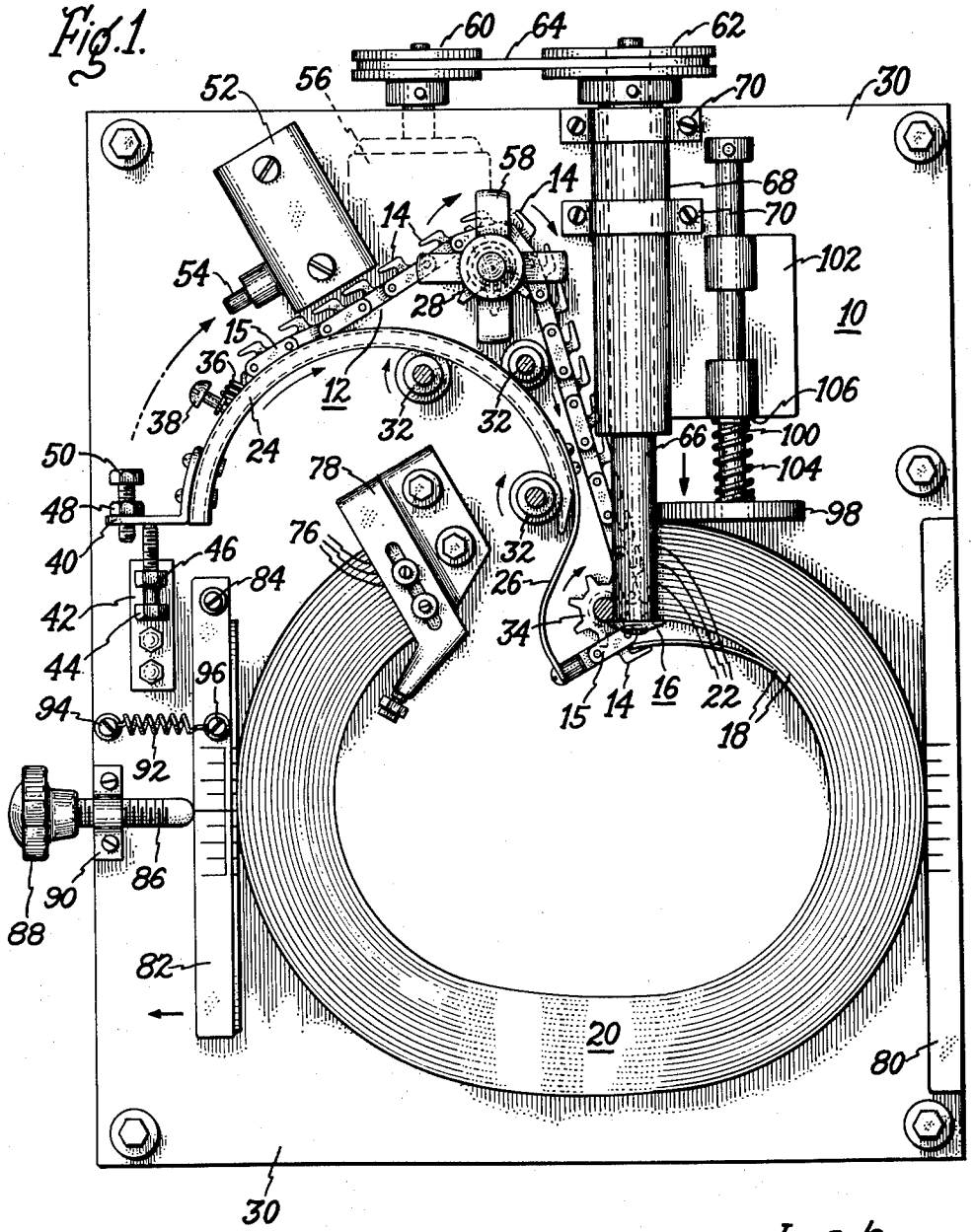
Dec. 10, 1963 G. G. SOMERVILLE ETAL 3,113,375

MECHANISM FOR SPACING SEPARATED LAMINATIONS OF A CUT CORE

Filed Oct. 1, 1962 2 Sheets-Sheet 1

Fig. 1.



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Filed Oct. 1, 1962 2 Sheets-Sheet 2

Fig. 2.

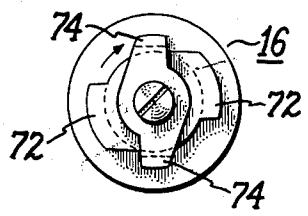
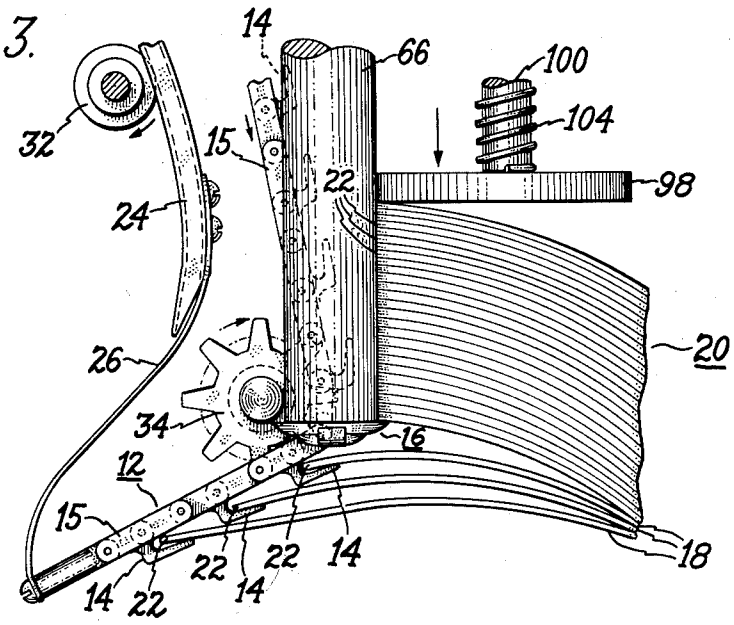


Fig. 3.



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United States Patent Office 3,113,375 Patented Dec. 10, 1963

3,113,375
MECHANISM FOR SPACING SEPARATED LAMINATIONS OF A CUT CORE

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Filed Oct. 1, 1962, Ser. No. 227,152
4 Claims. (Cl. 29—239)

This invention relates to a spacing device and more particularly to a mechanism for spacing separated laminations of a cut core.

In making pre-formed, single turn magnetic cores it has been found desirable to space the cut or joint of the various laminations of the core in order to stagger the various joints of the final core. One method of making such pre-formed, single turn magnetic cores is described and claimed in co-pending application Serial No. 227,193 filed concurrently herewith, in the name of Gareth G. Somerville, one of the inventors herein, for Method of Making Pre-Formed Single Turn Magnetic Cores and assigned to the same assignee as this invention. As noted in that application, a single turn magnetic core is one in which each core lamination has been cut such that the lamination extends for approximately a single turn of the core. The invention herein described finds specific application in the method described in that application.

As described in the aforementioned application, after a core has been cut along a single plane it is desirable to separate the various laminations of the core, then to space the ends of the separated laminations, so as to form the ends into staggered joints. Inasmuch as it is desirable that the method be performed with as much automatic equipment as possible, it is desirable to provide a mechanism to substantially automatically space the separated laminations from each other. Since all of the laminations are cut along a single plane, it is necessary that a mechanism be provided which will space each of the separated laminations, or group of laminations, a predetermined distance from the subsequently separated lamination or group of laminations. Since the core may be made from a large number of laminations, it is also desirable that the mechanism be such that it may be used to space the laminations into a plurality of equally spaced packets of laminations. The number of packets will depend on the particular type of core being constructed.

It is, therefore, an object of this invention to provide a novel mechanism for spacing separated laminations of a single turn magnetic core.

A further object of this invention is to provide a spacing mechanism for spacing lamination ends of pre-cut laminations a predetermined distance from each other.

A still further object of this invention is to provide a novel mechanism for spacing the laminations of a cut core into a plurality of equally spaced packets of laminations.

In carrying out this invention in one form thereof, a spacing mechanism is provided comprising a driven member, driven in synchronism with a driven separating member. The driven member is provided with a plurality of spacer members, the spacer members being located at predetermined points along the driven member, such that as laminations are separated from a stack of laminations the end of such separated laminations are removably received by different ones of the spacer members to thereby space such separated laminations from each other.

The invention which it is desired to protect will be clearly pointed out and distinctly claimed in the claims appended hereto. However, it is believed that this invention and the manner in which its various objects and advantages are obtained, as well as other objects and advantages thereof, will be better understood from the following detailed description of a preferred embodiment thereof when taken in connection with the accompanying drawings, in which:

FIGURE 1 is a top view of a preferred embodiment of a spacing mechanism made according to this invention;

FIGURE 2 is a front view of a preferred form of separating device useable in the spacing mechanism of this invention; and

FIGURE 3 is an enlarged top view of a portion of the spacing mechanism shown in FIG. 1, showing details of the operation of the mechanism.

Referring now to the drawings, in which like numerals are used to indicate like parts throughout the various views thereof, and referring particularly to FIG. 1, a preferred embodiment of a spacing mechanism according to this invention is shown. As shown in FIG. 1, the spacing mechanism 10 comprises a driven member 12, the driven member being provided with a plurality of spacing members 14, spaced along the driven member. The driven member 12 is driven under a separating device 16 in a position to receive laminations 18 of a single turn core 20 as the laminations are separated by the separating device 16. As the laminations 18 of the core 20 are separated they are received by the spacing members 14, thereby spacing the cut ends 22 of the various laminations 18. Of course, it will be understood that the various spacing members 14 may be spaced along the driven member 12, in the manner desired, to obtain the desired spacing between the cut ends 22 of the core 20. It will be apparent to those skilled in the art, since each of the spacing members receives a single lamination or a small group of laminations that the spacing between the various members 14 will determine the spacing between the various ends 22 of the separated laminations and thus will determine the spacing between the various joints of the finally closed core, in the manner more clearly specified in the aforementioned application Serial No. 227,193 to Gareth G. Somerville.

In the embodiment shown in FIG. 1, the driven member 12 is in the form of a roller chain with one spacing member 14 being mounted in each link 15 of the roller chain 12. As shown, the spacing members 14 are in the form of L-shaped hooks with the distance between the leg of the hook, which is parallel to the chain link, and the top of the link being approximately equal to the thickness of the number of laminations to be carried by each hook 14. Of course, it will be understood, as earlier mentioned, that the spacing of the hooks will be determined by the desired spacing of the various joints of the final core. Therefore, while the hooks 14 are shown as being mounted in each of the links 15, it will be understood that where desired the hooks could be mounted in every other link, or the size of the links changed with the hooks mounted in each link to provide the desired separation. Obviously, other spacing could be provided, as desired. Further, as will be obvious to those skilled in the art the distance between the leg of the hook and the top of the link will be set to receive the number of laminations which are separated during each separation. This will be more clearly detailed with reference to the separator in a later portion of this specification.

The roller chain 12 is connected at one end to an arcuate member 24 which may be made of metal or plastic or other material, as desired. The arcuate member 24 is provided with a leaf-type spring 26, made of steel or other spring material, at one end thereof which is connected to the other end of the roller chain 12 as shown. A driving sprocket 28 is rotatably mounted on a mounting plate 30 of the spacing mechanism 10. The roller chain 12 is connected in driving relation with the

sprocket 28 such that on rotation of sprocket 28 the roller chain 12 will be driven thereby. The arcuate member 24 and the steel spring 26 cooperate with roller chain 12 to hold the roller chain 12 in driving relation with the sprocket 28, as will be clearly apparent from FIG. 1 of the drawing. To maintain this relation the arcuate member 24 moves through guide rolls 32 during the course of the driving movement of the roller chain 12. Further, the roller chain 12 extends around a guide sprocket 34 which is rotatably mounted in the mounting plate 30 below and near the front end of the separating means 16 in the manner shown in FIG. 1. From the above it will be apparent that as the sprocket 28 is rotated in a clockwise direction that the roller chain 12 is driven around the guide sprocket 34 in front of and below the separating means 16.

As the roller chain moves in a clockwise direction about the drive sprocket 28 and the guide sprocket 34 the arcuate member 24 is pulled through guide rolls 32 by the driven roller chain 12. As the member 24 moves through the guide rolls 32 the spring 26 is driven in an angular direction so as to pull the forward end of the roller chain 12 around guide sprocket 34 and to present successive spacing members 14 to the front of the separating means 16. In this manner it will be apparent that by proper synchronism between the driving of the roller chain 12 and the action of the separating means 16 that as each spacing member 14 is presented to the front of the separating means 16 a lamination or group of laminations 18 may be separated from the core 20 and dropped in the spacing member 14.

The roller chain 12 is connected to the arcuate member 24 by means of a spring 36 and a screw member 38. The spring member 36 provides the desired flexible connection between the roller chain 12 and the arcuate member 24 such that the roller chain may pull the arcuate member 24 as it is driven by the sprocket 28, and will provide a constant driving pressure on the roller chain 12 to maintain it in driving relation with the sprocket 28. The end of the arcuate member 24 adjacent the connection to the roller chain 12 is provided with a stop member 40 which limits the movement of the roller chain in both a clockwise and a counterclockwise direction.

As is shown in FIG. 1 of the drawing, the stop member 40 is adjacent a fixed stop 42 which is mounted on the mounting plate 30. The fixed stop 42 is provided with a screw member 44 threadedly mounted in a nut 46, which is secured to the fixed stop 42. In this manner, as will be apparent, by threading the screw member 44 into and out of the nut 46 the exact stopping position of the arcuate member 42 may be adjusted to correspond to the desired position of the first spacing member 14 on roller chain 12. In a similar manner the stop 40 on the arcuate member 24 is provided with a fixed nut 48 and a screw member 50 which is threadedly received by the nut member 48. Also mounted on the mounting plate 30 is a second fixed stop member 52 which is provided with a micro-switch 54. The micro-switch 54, as can be seen, is mounted in the path of movement of the screw member 50 on stop member 40. As will be apparent, by movement of the screw member 50 into and out of fixed nut 48 the exact contact position between the threaded member 50 and the microswitch 54 may be adjusted, as desired. As will be obvious, when the threaded member 50 contacts the micro-switch 54, the micro-switch 54 is actuated to stop the electric motor which drives the driven sprocket 28. Thus by means of the adjustable threaded member 44 the exact starting position of the roller chain 12 may be determined, and by use of the adjustable stop member 50 on arcuate member 24 the exact stopping position of the roller chain 12 may be determined.

An electric motor 56 is provided mounted below the mounting plate 30, as indicated in FIG. 1. The electric motor 56 is connected by a gearing means and a friction clutch (not shown) to the sprocket 28 so as to rotate

sprocket 28 in a clockwise direction, as indicated by the arrows. Thus as the motor 56 is energized the sprocket 28 is rotated in a clockwise direction by means of a friction clutch (not shown) so as to drive the roller chain 12 in the direction indicated by the arrows. When the roller chain 12 has reached the desired limit of its movement in the direction of the arrow, the stop member 50 contacts the microswitch 54 to thereby de-energize the motor 56 and stop the rotation of the sprocket 28. After the various separated laminations, which have been received by the spacer members 14 and thereby spaced in a desired fashion, have been removed from the spacer members 14 on the roller chain 12 the roller chain 12 is re-set by means of a knob 58 which is fixedly connected to the sprocket member 28. The knob 58 is rotated in a counterclockwise direction to thereby drive the roller chain 12 and arcuate member 24 back to the starting position wherein the stop member 40 contacts the threaded screw stop member 44. Of course, as will be understood, in rotating the sprocket member 28 by the knob or handwheel 58 in a counterclockwise direction, the end of roller chain 12 connected to the spring 26 will aid in driving the arcuate member 24 back to the desired starting position.

As can be seen from FIG. 1, the motor 56 is also connected to drive a pulley 60, the pulley 60 driving a second pulley 62 by means of a belt 64. The pulley 62 is connected to a rotatable member 66 which is rotatably mounted in a fixed bearing 68 which is fixed to the mounting plate 30 by means of straps 70. On the opposite end of rotatable member 66 is mounted the separating means 16 which separates the laminations 18 from the core 20.

The separator means 16 is best shown in FIG. 2 of the drawing where it is shown as comprising a pair of separating members 72 and a pair of holding members 74. As will be understood, as the separator 16 is rotated by rotatable member 66 the separating member 72 will be driven into the core 20, the edge of the separating member 72 extending between the laminations to thereby separate one or more laminations from the group of laminations in the core 20. After the lamination has been separated the holding means 74 will then rotate over the laminations of the core 20 to hold them in the stacked position until the next separating member 72 is driven into contact with the stacked laminations to thereby separate the next lamination or laminations from the core 20. The exact separating means which is shown in FIG. 2 of the drawing forms no part of this invention herein, and is described and claimed in Application Serial No. 227,185 filed concurrently herewith for Mechanism for Separating Core Laminations, in the names of Gareth G. Somerville and Aldo C. Blasioli, inventors herein, and Russell D. Wheeler and is assigned to the same assignee as this invention. Of course it will be obvious to those skilled in the art that other types of separating means may be utilized in place of the separating means 16 herein shown. However, in the preferred embodiment of the invention, it is preferred to utilize the separating means 16 which forms the basis of the aforementioned application Serial No. 227,185.

As can be seen from FIG. 1 of the drawing, an expanded core which has been cut through on a single plane is placed on the mounting plate 30 with one group of ends 76 being placed in contact with a stop member 78. The other ends 22 of the cut core 20 are placed in contact with the rotatable member 66, as shown in the drawing. Further, stop members 80 and 82 are provided to maintain the core 20 in the desired relation to the stop 78 and rotatable member 66. To provide this desired relation the stop member 80 is a fixed stop mounted on the edge of mounting plate 30. However, stop member 82 is pivotally mounted on the mounting plate 30 by means of the pivot member 84 and is pivoted as desired by means of the threaded member 86 actuated by the knob 88. The threaded member 86 is mounted into a fixed

threaded nut 90 which is fixedly attached to the mounting plate 30. As can be seen from FIG. 1, a spring member 92 is mounted with one end connected to a fixed screw 94 on mounting plate 30 and other end attached to a screw 96 on the movable stop 82. The spring member 92 tends to pull the movable stop 82 towards the edge of the mounting plate in the direction of the arrow while the threaded member 86 moves the member inwardly of the mounting plate against the tension of the spring 92. In this fashion the member 82 may be placed in a desired position to hold the core member 20 on mounting plate 30 with the ends contacting stop 78 and rotatable member 66 in the desired position.

In order to constantly force the core member 20 firmly against the separating member 16, a spring actuated plate 98 is provided. Plate 98 is firmly attached to a movable shaft 100 which fits into a bearing 102 mounted on the plate 30. A spring member 104 is mounted about the shaft 100 in contact with a shoulder 106 on bearing 102 and contacting at the other end the movable plate 98. As will be apparent from FIG. 1 of the drawing, plate 98 is forced into contact with the outer lamination of core member 20 forcing the edges 22 which are in contact with rotatable member 66 against the separating mechanism 16. As separating member 16 operates to separate laminations 18 of the core 20 the plate 98 forces the remaining laminations into contact with the separating member 16, thereby enabling the separating member 16 to continually separate laminations from core member 20 in the manner explained in application Serial No. 227,185.

It is believed that the operation of the spacing mechanism of this invention will be clearly understood from the previous description of the mechanism. However, in order to more clearly set forth the exact operation of the mechanism of this invention reference will now be made to FIG. 3 of the drawing. When the motor 56 (FIG. 1) is energized in any desired manner, such as by a foot switch (not shown), the sprocket 28 (FIG. 1) and the shaft 66 begin to rotate in synchronism being driven by motor 56, as previously explained. The sprocket 28 drives the roller chain 12 about guide sprocket 34 thus presenting the spacer members 14 sequentially in front of the separating means 16. As previously explained, the arcuate member 24 and spring 26 maintain the roller chain 12 in driving and guiding relation with the sprockets 28 and 34.

As the roller chain 12 is driven about guide sprocket 34 the separating means 16 rotates thereby separating the inner lamination 18 from the core 20. As lamination 18 is separated it slides over the separating means 16 and into spacer member 14 in the manner shown in FIG. 3. The roller chain 12 continues to move forward about the sprocket 34 and the separating means 16 continues to rotate. As the separating means 16 separate the next lamination 18, the following spacer member 14 is moved into position to receive the end 22 of this lamination. As each of the laminations 18 is removed or separated from the core 20 the spring bias plate 98 pushes the core 20 forward against the separating means 16, in order to position the core 20 for the proper separation of the next lamination 18. As will be understood, as the spacing mechanism continues to operate further laminations are separated from the core 20 and dropped into the spacer members 14, thereby spacing each of the ends 22 of laminations 18 a predetermined distance apart, depending upon the distance set between the various spacer members 14. Thus it will be apparent that the spacer mechanism of this invention will provide a novel means for spacing the various cuts of a single turn pre-cut core such that even though the core is cut along a single plane that the finally assembled core may be provided with staggered joints within the core, in the manner set forth in the previously mentioned application Serial No. 227,193 to Gareth G. Somerville.

As has been previously mentioned, in many instances, depending upon the number of laminations provided in the core 20, it is desirable to form the final core into a plurality of packets, each of the packets having a small number of laminations per packet. For example, ten to fifteen laminations per packet. In order to provide this type of core, it will be apparent that the spacer mechanism of this invention may be set such that the separating means 16 will separate any given number of laminations and space such laminations by means of the spacer members 14 attached to the roller chain 12. When the desired number of laminations to make up a given packet have been spaced into the various spacer members 14, the motor 56 will then be stopped by the proper setting of the stop mechanism 50 contacting the microswitch 54. This packet may, of course, then be removed from the core 20 and the mechanism re-set and re-energized, for example by means of a foot switch (not shown) to thereby space a second packet of laminations. Obviously this action will continue until the entire core 20 has been spaced into the desired packets; the core then can be re-assembled in the manner discussed in the previously mentioned Somerville application.

From the above it will be obvious that the spacing mechanism of this invention provides a novel spacing mechanism that meets all of the previously mentioned objects and provides a number of advantages in providing an automatic spacing operation to provide a single turn, pre-cut core having the desired staggered joints within the core. Obviously, the utility of this invention is not limited to single turn cores, but may also be used with cores having more than one cut per turn. While there has been shown and described the present preferred embodiment of this invention it will be understood by those skilled in the art that various changes and modifications may be made in the preferred embodiment without departing from the invention herein set forth. The claims appended hereto are not to be considered as limited by the particular embodiment shown, but are intended to cover all such modifications thereof as fall within the true spirit and scope of such claims.

What is claimed as new and which it is desired to secure by Letters Patent of the United States is:

1. A spacing mechanism for spacing laminations comprising a driven member, a separating means, driving means driving said driven member in synchronism with said separating means, a plurality of spacer members, said spacer members being mounted on said driven member at predetermined points therealong, guide means guiding said driven member adjacent said separating means whereby as said separating means separates laminations the separated laminations are received by said spacer member, each spacer member receiving the laminations separated during a single separation.

2. A spacing mechanism for spacing laminations comprising a driven member, a separating member, driving means driving said driven member and said separating means in synchronism, a plurality of spacer members, said spacer members being mounted on said driven member, each spacer member being spaced from adjacent spacer members by a predetermined distance, said driven member being driven adjacent said separating member whereby as laminations are separated by said separating member said laminations are received by said spacer members.

3. A spacing mechanism for spacing laminations comprising a driven member, said driven member being in the form of a roller chain, separating means, driving means driving said driven member and said separating means in synchronism, said driving means driving said roller chain through a driven sprocket, a guide sprocket adjacent said separating means, said roller chain being driven about said guide sprocket, spacing members, said spacing members being mounted on said roller chain at predetermined points along said roller chain, said separating means separating laminations and said laminations being received by said spacer members.

4. A spacing mechanism for spacing laminations comprising a driven member, a separating member, driving means driving said driven member and said separating means in synchronism, a plurality of spacer members being mounted on said driven member at predetermined points along said driven member, stop means holding stacked laminations adjacent said separating means, spring means forcing said stacked laminations into contact with said separating means, guide means guiding said spacer members adjacent said separating means whereby as said separating means separates laminations from said stack said laminations are received by said spacer members.

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