

July 15, 1958

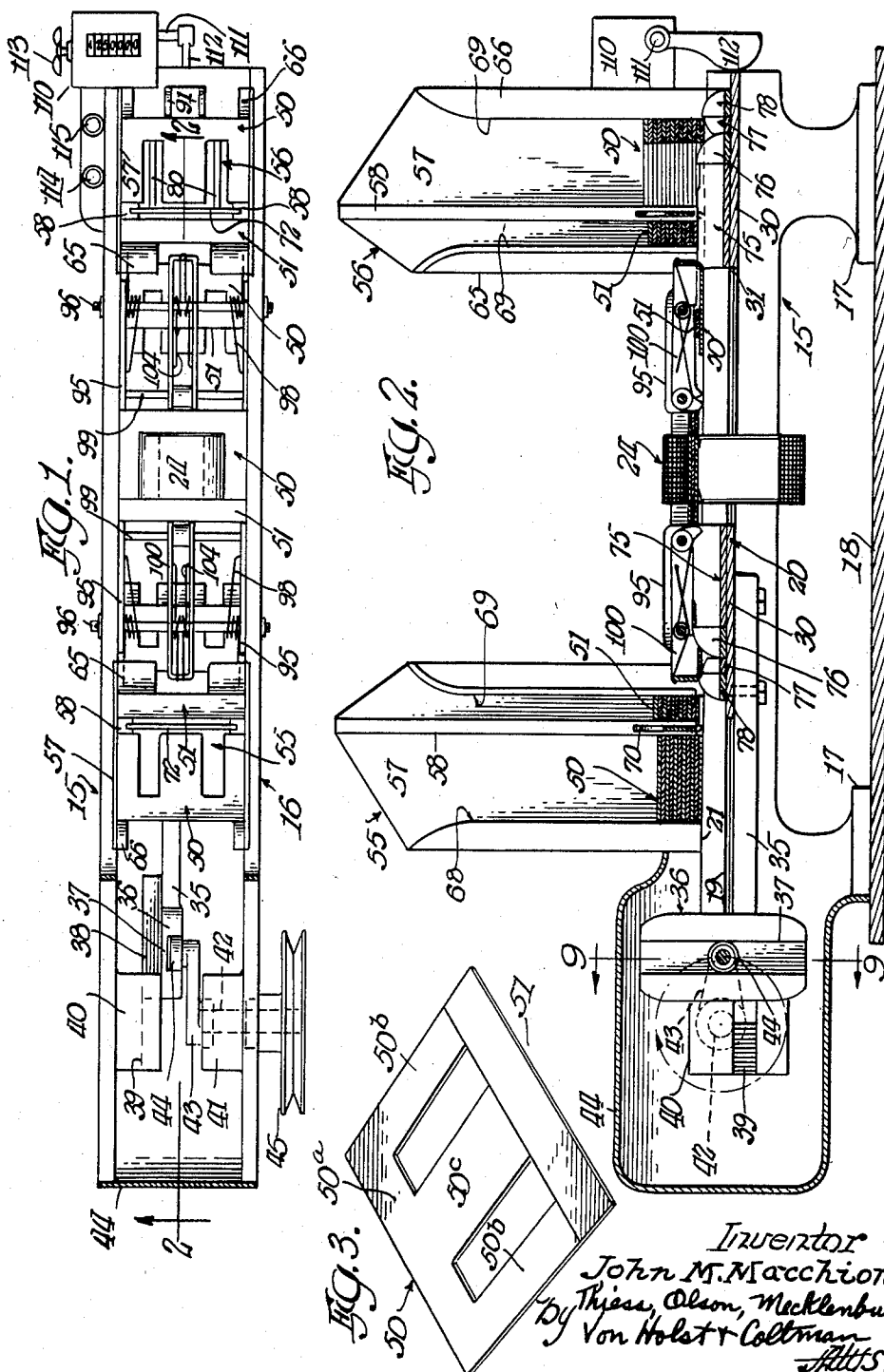
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APPARATUS FOR APPLYING LAMINATIONS

Original Filed Sept. 21, 1949

3 Sheets-Sheet 1



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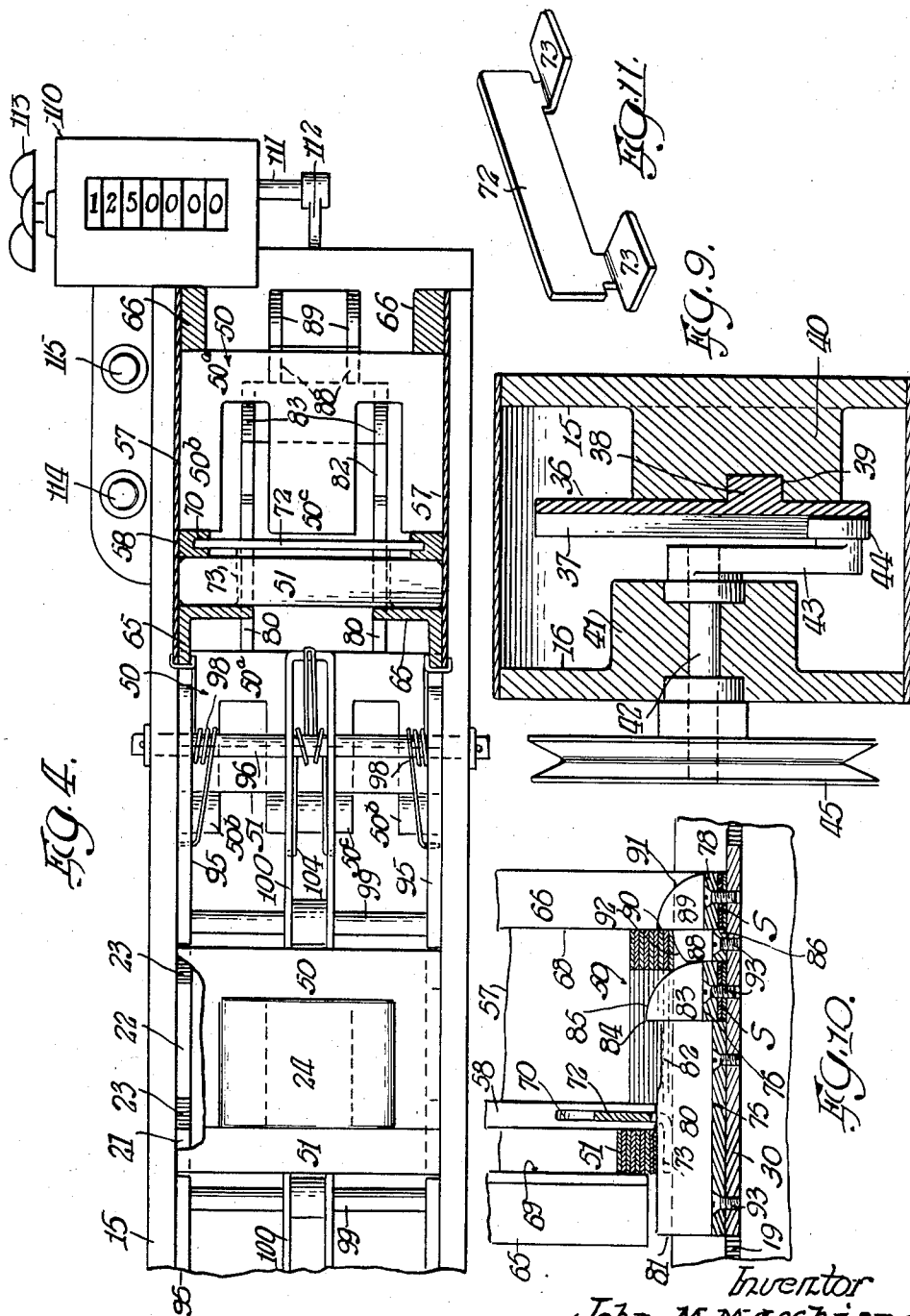
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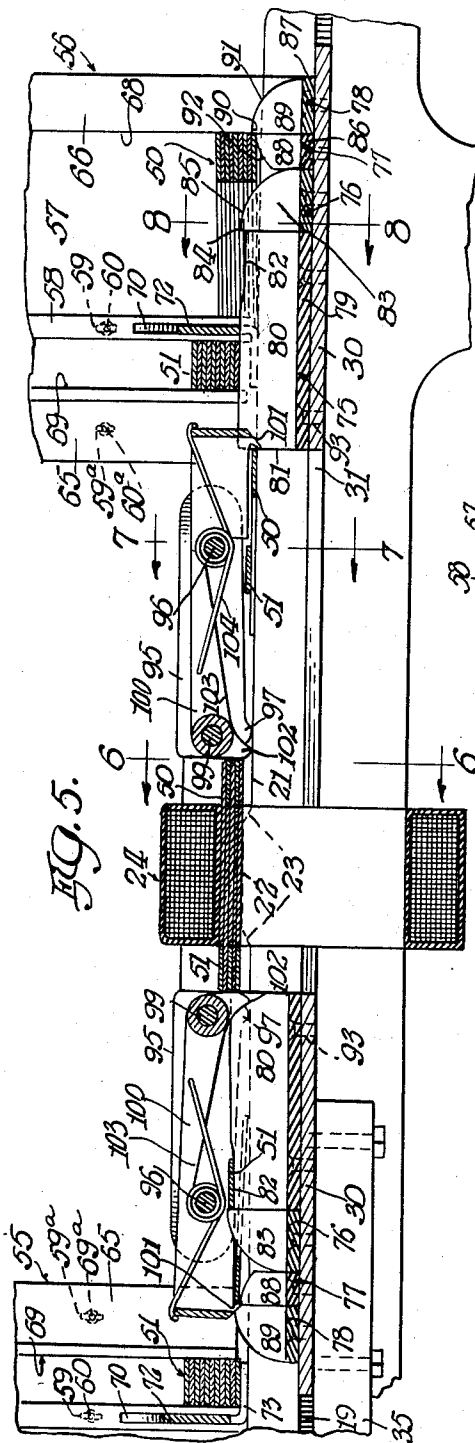


Fig. 5.

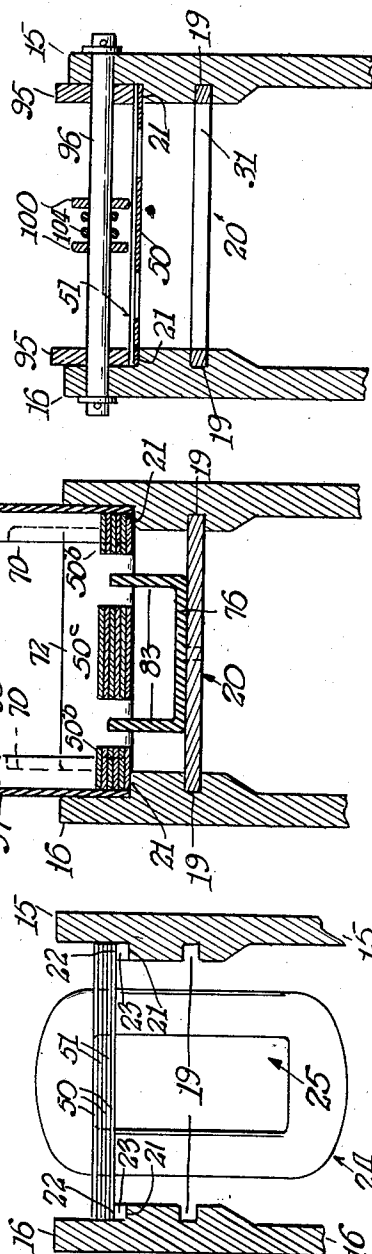


Fig. 7.

Fig. 8.

Fig. 6.

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APPARATUS FOR APPLYING LAMINATIONS

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Division of application Serial No. 484,051, January 25, 1955, which is a continuation of application Serial No. 116,935, September 21, 1949. This application October 24, 1955, Serial No. 542,274

15 Claims. (Cl. 29--203)

This invention relates to apparatus for applying laminations and is a division of my pending application Serial No. 484,051, filed January 25, 1955, which in turn is a continuation of my application Serial No. 116,935, filed September 21, 1949, now abandoned.

This invention relates to improvements in apparatus for applying laminations, such as the conventional E and I shaped plates or laminae in interleaved relation to or upon a coil in the building or assembling of magnetic cores for transformers, chokes or other electrical devices requiring a laminated core.

I am not aware of apparatus capable of simultaneously applying both the E and the I plates to a coil but I am aware of apparatus devised for the application of the E plates alone to the coil, the I plates being applied between the E plates of the partly finished coil as a hand operation and which, of course, increased the cost of such cores.

Sheet iron plates or rolled strips from which such plates are made are not uniform in thickness as they come from the mill. This is true between plates or strips in the same lot and between different parts of the same strip. For instance, in making plates from sheet iron plates or strips .019" thick, the latter may vary a few thousandths of an inch either way.

Apparatus or machines heretofore devised for interleaving a stack of E plates upon a coil have not proven entirely satisfactory in operation with such plates, especially when they are of nonuniform thickness because they stick and jam to such an extent as to require service for freeing them for a new start and, therefore, they are not well received in the industry.

It is known that the most efficient coil, having the least energy leakage, is produced by interleaving individual plates in alternation in and to a coil. However, in many instances, efficiency in the finished coil is sacrificed for speed in production by interleaving more than one individual plate at a time, as for example two superposed plates and even as many as three of such superposed plates at a time. This is termed in the industry as laminating or interleaving "double" or "triple" with E plates. The I plates are thereafter inserted "double" or "triple" as the case may be and this is generally done by hand.

Core plates laminated in the fashion mentioned, i. e. "double" or "triple," can be laminated or interleaved with greater speed, but with a sacrifice in efficiency. However, due to the nonuniformity of thickness in E plates for reasons before mentioned, it is indeed difficult, if not impossible, to obtain uniformity in the finished coils either in structure, appearance or operating efficiency.

One of the objects of the present invention is to provide an apparatus for laminating core plates in an interleaved relation upon a coil and which apparatus is of a simple, strong, and rigid construction, fast and accurate in operation, and which will not be jammed and stopped by core

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plates which are over or under a predetermined thickness or not perfectly flat.

Another object of the invention is to provide apparatus of this kind which operates to simultaneously interleave both E shaped and I-shaped core plates, thus avoiding the necessity of applying the I-shaped core plates as a hand operation.

Also, it is an object of the invention to provide an apparatus of this kind, wherein the core plates are applied to the coil one after and under the other in successive alternations from opposite open ends of the coil, whereby the coil and assembled plates move upwardly as a unit until the last core plate is applied in place.

Again, it is an object of the invention to provide apparatus of this kind, which may be operated to interleave E and I plates jointly with respect to the coil or to interleave E plates alone, either individually or in "doubles" and "triples."

Furthermore, it is an object of the invention to provide apparatus of this kind that includes means for alternately removing plates from magazine stacks and to position them upon a coil, which means, though reciprocating in character, is so constructed as to afford a uniform slow down to its minimum speed at each end of its stroke, when simultaneously selecting a plate from one stack, and inserting another plate into the coil, and a uniform acceleration to its maximum speed between the ends of the stroke.

Another object of the invention is to provide apparatus of this kind wherein each plate, as it is removed from its stack, is moved in stages toward the coil, that is from a stack to a position between the stack and the coil, and then from said position into the coil, thereby affording a better handling of the plates and a more even movement thereof.

Also, it is an object of the invention to provide apparatus of this kind which can carry out the improved method with accuracy and speed.

The above mentioned objects of the invention, as well as others, together with the advantages thereof, will more fully appear as the specification proceeds.

In the drawings:

Figure 1 is a top plan view of apparatus for applying laminations or core plates to a transformer coil embodying the preferred form of the invention.

Fig. 2 is a longitudinal vertical sectional view through the apparatus shown in Fig. 1 as taken on the line 2--2 thereof.

Fig. 3 is a perspective view of a pair of standard coacting E and I-shaped core plates or laminae, in the relative position they occupy in connection with the coil of a transformer or the like, on a scale enlarged of that wherein they appear in Figs. 1 and 2.

Fig. 4 is a view partly in elevation and partly in horizontal section, on an enlarged scale, of those parts of the apparatus at the right hand end of Fig. 1.

Fig. 5 is a view on an enlarged scale of those parts of the apparatus appearing at the right hand end of Fig. 2.

Figs. 6, 7, and 8 are transverse vertical sectional views through parts of the apparatus as taken on the lines 6--6, 7--7 and 8--8, respectively, and on the scale of Fig. 5.

Fig. 9 is another transverse vertical sectional view through a part of the apparatus as taken on the line 9--9 of Fig. 2, on the scale of Figs. 6, 7 and 8, respectively, with the crank arm moved through an angle of 90° beyond the position appearing in said Fig. 2.

Fig. 10 is a view of parts at the right hand end of Fig. 5, showing said parts when adjusted to select or pick a group of three plates from the magazine for simultaneous assembly upon the coil.

Fig. 11 is a perspective view of a certain gate member associated with the I plate magazine at each end of the apparatus.

Referring now in detail to that embodiment of the invention illustrated in the accompanying drawings, 15 and 16 indicate respectively the two upright elongated side frame members, each provided at the bottom with feet 17—17 that are attached to a baseplate 18 which appears only in Fig. 2.

In the inner face of each side frame is a longitudinal groove 19 in which the lateral margins of a reciprocating plate 20 have sliding guided engagement. A suitable distance above each groove, each side frame is formed to provide an upwardly facing rail 21. At the central part of each rail 21 is a longitudinal rail portion 22 which is disposed at an elevation above the associated rail 21 and at its ends joins the same by short inclined surfaces 23 which best appear in Fig. 5 in dotted lines. This elevated rail portion has a length somewhat less than the axial length of the coil 24 to which the core plates are to be applied in the direction of the length of the opening 25 through the coil and which will be mentioned in more detail later on.

The plate 20 is provided at each end with a platform 30 and between said platforms is an opening 31 of a length somewhat greater than either platform 30.

This plate has a reciprocating stroke in the operation of the machine and in this instance reciprocating motion is imparted thereto by means of the following construction. Fixed to the underside of the left hand platform, as viewed in Fig. 2, is a bar-like connecting rod 35 which extends longitudinally from said platform. This rod, which is positioned substantially centrally between the frames 15 and 16, carries a cross head 36 at its outer end and in that face thereof facing the frame member 16 is a vertical groove 37. On that face of the associated end of the rod 35 facing the frame member 15 is a longitudinal rib 38 which has sliding guided engagement in a longitudinal groove 39 in the inner face of a boss 40 projecting inwardly from said frame member 15. On the inner face of the associated end of the frame member 16 is a boss 41 and journaled in this boss is a transversely extending shaft 42. A crank arm 43 is fixed to the inner end of said shaft and the free end thereof has a roller 44 journaled thereon which is operatively engaged in the groove 37 in the cross head 36. On the outer end of the shaft 42 is fixed a pulley 45 (see Fig. 2) which may be driven in any suitable manner by a motor (not shown) and preferably disposed on the base 18.

The movement of the plate 20 is equivalent to the throw of the crank 43. The mechanism mentioned is of the "Dutch yoke" type and it provides a uniform movement for said plate so that it decelerates evenly at each end of each stroke and accelerates evenly at the beginning of each new stroke, and attains its maximum acceleration midway between the ends of each stroke, the plate passing through zero motion in each reversal of its stroke. The crank arms 43 and associated parts are enclosed in a suitable casing 44, as best appears in Figs. 1 and 2.

In Fig. 3 is illustrated a pair of coacting sheet iron core plates 50 and 51, respectively, which may be simultaneously applied to the coil 24 in the operation of the apparatus. The plate 50 is shaped like a conventional block-type capital letter E and the plate 51 is shaped like a conventional block-type capital letter I, and because of which said plates are known as E and I plates, respectively. The E plate comprises a stem 50a and end and intermediate strips 50b, 50b and 50c, respectively, the latter strips being of the same length and which is the length or depth of the coil 24 through its opening 25. The E plate is of such length as to approximate the distance between the side frames 15 and 16 above the rails 21. The I plate is the same length as the E plate and it has the same width as the stem 50a of the E plate. Thus the plates 50 and 51 are designed to engage and be slid along the rails 21 and

will not skew into a binding position when so slid along said rails.

Spaced longitudinally an equal distance from each open end of the coil 24, when it is in its operative position within the apparatus, are duplex magazines 55 and 56 respectively. As the structure of each magazine is the same, a description of one will suffice for both. Each magazine includes upright side plates 57, the bottom end of which is so fixed to an associated side frame 15 and 16 that the inner faces thereof are spaced apart a distance equal to the length of the stem of the E plates as well as of the I plates. The inner face of each plate 57 is flush with the inner face of each side frame 15—16 above the rails 21—21 thereof.

On the inside of each plate 57 there is secured an intermediate upright guide bar 58 which is capable of a limited vertical adjustment thereon. In this respect each guide bar 58 has short vertical slots 59 therein and through which screws 60 extend from outside the plate for a threaded engagement in holes provided therefor in the guide bar. Spaced in each direction from said intermediate guide bar are parallel guide bars 65 and 66 respectively. The bar 66 is spaced from the bar 58 a distance approximately the length of the parts 50b and 50c of the E plates 50 and the bar 65 is spaced from said bar 58 a distance equal to the width of the I plates 51. The bars 65 receive screws 60a that extend through slots 59a in the plate 57 (see Fig. 5) from the outside thereof in the manner mentioned in connection with the bars 58. Thus the bars 58 and 65 may be vertically adjusted on the side plates 57, to provide that space on opening between their bottom ends and the associated rails 21, which will permit the feeding of either one, two or three of the E and I plates at a time from each duplex magazine before mentioned.

The plates 57 in connection with the bars 58 and 65 and 66, respectively, define upright channels 63 and 69, respectively, as best appears in Fig. 2, each to receive the ends of the E and I plates arranged in a stacked relation. When said plates are so stacked in the magazine, the outer edges of the stems 50a of the E plates engage the bars 66 at opposite sides of apparatus.

On the inner face of the bottom end of each guide bar 58 of each magazine, is a vertical groove 70 in which engages, with a sliding fit, the ends of the upright body 72 of a gate that appears in perspective in Fig. 11. At each end of the body is a right angled extension 73 and the corner where said extension 73 joins the body is rounded, as best appears in Fig. 10. Each extension is as wide as the channels 69 of the associated magazine and in which said extensions have sliding bearing, so as to have a limited floating movement due to the engagement of the ends of the body 72 in the grooves 70.

On each end platform 30 of the reciprocating plate 20 is mounted both the I plate selector or picker member and the E plate selector or picker member, as well as the lifter members for said plates, as will soon appear.

These members are each indicated as a whole by the numerals 75, 76, 77 and 78 respectively. The members 75 and 76 are of a transverse channel cross section and the member 75 includes a base 79 and upright longitudinal flanges 80 that are spaced apart laterally to line up centrally with the longitudinal spaces in the E plates between the strips 50b, 50b thereof. The inner end 81 of the flanges 80 of each member 75 constitutes the edge whereby both the E and I plates are fed from their intermediate position to the assembled position in the core. The outer end of the top edge of said flange has a recess 82 of a length approximating the width of the I plates therein to receive I plates as the plate 20 moves toward the left from its position in Fig. 5, and under the associated stack of plates 51. The member 76 has upright side flanges 83 and the inner or front edges thereof extend above the rear end of the flanges 80 of the member 75 and defines an I plate selector point 84 that termi-

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nates above surface 82 of the member 75. The rear edges 85 of the flanges 83 are curved downwardly and outwardly to the rear end of the base flange and this surface provides lifting surfaces for the I plates on the back stroke of the plate. The flanges 83 of member 76 are in line with the flanges 80 of member 75.

The members 77 and 78 each include a base 86 and 87, respectively, and upright laterally spaced side flanges 88 and 89. These flanges are spaced closer together than the flanges 80 and 83, as best appears in Fig. 4. The inner edge of the flanges 89 project above the outer edge of the flanges 88 and forms E plate selector or picker points 90. The top edge 91 of the flanges 89 curve downwardly toward the rear and constitute the edges which lift the E plates on the back stroke of the plate 20. That is, toward the associated magazine. The top edges 92 of the flanges 88 are curved downwardly and forwardly and the rear edge of this surface is disposed in a plane above the rail surfaces 21 a distance corresponding to the thickness of an E plate. Thus, after the plate 20 has completed its stroke to the right, as in Fig. 5, the rear margin of the stem of the bottommost E plate in the associated magazine, engages upon the rear end of the surfaces 92 of the flanges 88 and as the front end of said plates engage on the rail surfaces 21 the whole stack is tilted downwardly and forwardly and the rear edge of the stem of the bottommost E plate is engaged by the picker points 90 of the flanges 89.

All of the members 75, 76, 77 and 78 in each set are secured to the associated platform 30 of the plate 20 by means of screws 93 which best appear in dotted lines in Fig. 5. Assume now that it is desired to apply triple E and I plates to the coil 24 for each movement of the plate 20. The screws 93 for the members 76 and 78 are loosened and two shims S—S are disposed between the bases of these members and the associated platform 30 and the screws 93 are again tightened up. These shims are pieces of stock, the same as that of the E and I plates and have holes therein for the passage of said screws. Said shims best appear in Fig. 10 and it will be noted therefrom that the picker points 84 and 90 of the members 76 and 78 will pick off three of such E and I plates from each stack in the associated magazine and will carry them toward the coil as the plate moves to the left. Of course the bars 58 and 65 have to be adjusted upwardly to permit the triple plates to move thereunder and this is done by loosening the screws 60 and 60a and moving the bars upwardly as limited by the slots 59 and 59a.

Arranged between each magazine 55, 56 and the elevated surface portions 22 of the rail surface 21 is mechanism for holding down the core plates fed to the intermediate position. Each mechanism includes laterally spaced side arms 95, 95 mounted for a limited rocking movement on a cross shaft 96 journaled in the frame members 15 and 16 above the rail surfaces 21. These arms are disposed in the plane of said rail surfaces and that end thereof facing the coil 24 terminates in a presser point 97 that normally rides on the associated rail surfaces 21. A spring 98 surrounds the end part of the shaft 96 near each side arm and so engages the associated arm and part of the associated bar 65 as to yieldingly press the last mentioned end of said arms toward the rail surfaces 21. A cross shaft 99 connects one end of said arms together and centrally of the apparatus a duplex arm 100 is pivoted on said shaft. That end of said arms 100 facing the adjacent member 75 is made to provide a downwardly facing retainer hook 101, see Fig. 5, disposed substantially in the plane of the upright edges 81 of the flanges 80 of the associated member 75. The other end of said arms are made as presser points 102 and these arms are cut away on their underside at 103 so as to pass over the cross shaft 96.

A spring 104 surrounds that part of the shaft 96 between said duplex arms and the ends of said spring so engage parts of said arms 100, to either side of said shaft,

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as to yieldingly press the hook end 101 of said arm downwardly.

At the right hand end of the side frame member 15 is a reset counter 110 and a shaft 111 thereof carries an arm 112 so disposed that each time the plate 20 moves toward the right as in Figs. 2 and 5, it engages the arm and actuates the counter one stroke. After a run of the apparatus, to build up or interleave a predetermined number of E and I plates upon the coil 24, said counter stops the motor (before mentioned) which drives the pulley 45. By means of a key 113 the counter may be reset to zero for the next operation of the apparatus. Adjacent the counter are switch buttons 114 and 115 for stopping the motor and for starting the same at any point in building up the stack of E and I plates on the coil.

Assume that the operation of laminating or interleaving a stack of E and I plates upon or to a coil has been completed. The finished coil may then be lifted upwardly out of the apparatus. The operator then takes another coil in one hand and with the other hand places an associated E and I plate into each open end of said coil and then places the coil in position with the ends of the last applied E plate engaged upon the elevated rail surface portions 22, 22. This supports the coil in a pendent position with the major portions of the coil extending through the plate opening 31 and disposed below said plate. By pressing the proper buttons 114 and 115 the machine is started into operation, the plate 20 and members 75, 76, 78 and 79 on each platform 30, 30 reciprocating back and forth. When a coil laminating operation has been finished, there will be an E plate with an I plate thereon left in an intermediate position, between the associated magazine and open end of the coil, and these plates will be held against movement toward the associated magazine by the arms 95 and 100. In Fig. 5 the plate 20 is at the right hand end of its stroke. In the next started operation the plate 20 (toward the left) will move forward a distance equal to the throw of the crank 43 and this distance is considerably less than the distance between the coil 24 and the E plate in each magazine 55—56.

As the plate moves toward the left with reference to Fig. 5, the picker points 90 immediately pick up the bottom E plate in the stack in the magazine 56 and moves it toward the left and as the recesses 82 in the flanges 80 of the member 75 pass under the stack of I plates in said magazine, the bottom one thereof drops into said recess and is engaged by the picker points 84 of the member 76 and is carried along therewith.

It is to be noted that at the time the recess 82 reaches the stack of I plates, the bottommost one thereof rests upon the top edges of the flanges 80 of the member 75 and not upon the parts 73 of the associated gate 72. However, as the E plates reach the gate, the advancing edges of the E plate slides under the gate and lifts it upwardly to float in the grooves 70 in the bars 60 so as to pass the gate.

In this movement of the plate 20 toward the left, the edge 81 of the member 75, which is in engagement with the edge of the stem of the E plate in the intermediate position and the I plate thereon, pushes said E plate, which rests upon the rail surfaces 21 at this time, toward the associated open end of the coil 24, the advancing edge sliding under the points 97 of the arms 95 which arms yield upwardly to permit this movement.

As the advancing edge of the E plate reaches the portions 23 of the rail surfaces 21, it will slide upwardly thereof onto the surface portion 22 of the rail surfaces 21, under the last applied pair of E and I plates and then lift the entire assembly of coil and plates a distance equal to the thickness of the E plate last entered into the stack.

In the movement of the slide plate to the left, at the time one E plate is moved into position on the coil, the plates E and I removed from the stack are moved into the intermediate position. As said one of said E plates is

moved into position on the coil, the I plate carried thereby engages the end of the last E plate in place and is moved into a position upon the stem of the E plate just inserted.

In the next movement of the plate 20 toward the right the hook 191 of the arms 190 retains that E plate and I plate which was moved to intermediate position, in that position.

It is to be understood that the parts 75, 76, 77 and 78 on the other end of the plate functions just as described above.

From the above it will be obvious that the coil 24 when positioned in place is supported from its upper portion and that the plates are applied to the coil, one after and under the other in successive alternation from its opposite open ends until the number of such plates, for which the counter has been set, have been assembled into interleaved relation upon the coil when the apparatus stops.

In the operation of the apparatus it is to be noted that the E and I plates removed from a magazine in one stroke of the plates are moved into the intermediate position, as the plates previously in this position are moved into assembled relation upon the coil. Thus, the interleaving of the plates is accomplished with a shorter stroke and whereby it is possible to use a shorter throw crank arm for reciprocating the plate 20. Therefore, it is not necessary to employ a long stroke from the plate 20 with such a high speed of movement between the ends of the strokes, and which consumes more time so that it was not so fast in operation.

If it is desired to apply only the E plates, to leave the insertion of I plates as hand operation, no I plates are placed in either magazine 55—56 and the apparatus will operate as before.

Also, if it is desired to apply the E and I plates as "doubles" and "triples" the apparatus may be adjusted therefor by the application of the shims as before mentioned.

While in describing the invention I have referred in detail to the form, construction and arrangement of the parts thereof, the same is to be considered in the illustrative sense only and therefore I do not wish to be limited thereto except as may be specifically set forth in the appended claims.

I claim:

1. An apparatus for automatically laminating core plates in interleaved relationship in an open ended coil comprising means providing a coil station where an open ended coil is adapted to be supported, a pair of first and second magazines at each side of the coil station, said second magazine of each pair being positioned between the coil station and the first magazine of the same pair, the first magazine being formed to hold core plates of one shape and the second magazine being formed to hold core plates of a different shape, reciprocable transfer means operatively associated with each pair of magazines, means for causing reciprocation of each said reciprocable transfer means toward and away from the coil station, said means including structure synchronizing movement of the transfer means associated with the pairs of magazines on opposite sides of the coil station whereby as either transfer means moves toward the coil station the other transfer means moves away from the coil station, said transfer means associated with each pair of magazines including core plate pick off means engageable with the lowermost core plates of said first and second magazines for removing said lowermost core plates from the respective magazines and assembling said removed plates as an associated pair at a location spaced from assembly position in said coil with the core plate removed from said second magazine overlying the core plate removed from said first magazine.

2. The combination set forth in claim 1 in which the means for causing reciprocation of each said reciprocable transfer means toward and away from the coil station in-

cludes means operable to move each said reciprocable transfer means at a variable rate of speed in going toward and away from the coil station, the rate of speed being higher when each said reciprocable transfer means is in a position intermediate the length of a reciprocation stroke than the rate of speed when each said reciprocating means is adjacent the end of the length of a reciprocation stroke.

3. An apparatus for automatically laminating core plates in interleaved relationship in an open ended coil comprising means providing a coil station where an open ended coil is adapted to be supported, a pair of first and second magazines at each side of the coil station, said second magazine of each pair being positioned between the coil station and the first magazine of the same pair, the first magazine being formed to hold core plates of one shape and the second magazine being formed to hold core plates of a different shape, reciprocable transfer means operatively associated with each pair of magazines, means for causing reciprocation of each said reciprocable transfer means toward and away from the coil station, said means including structure synchronizing movement of the transfer means associated with the pairs of magazines on opposite sides of the coil station whereby as either transfer means moves toward the coil station the other transfer means moves away from the coil station, said transfer means associated with each pair of magazines including core plate pick-off means for engaging the lowermost core plates of said first and second magazines for moving them toward the open end of the coil positioned at the coil station, with a core plate removed from the second magazine positioned in a plane overlying the plane in which the core plate removed from the first magazine lies, thereby constituting said core plates an associated pair for concurrent assembly with the coil from one of the open ends of the coil, means for retaining each pair of associated plates, prior to assembly with the coil, in a position intermediate the second magazine from which one of the plates of the associated pair was removed and the coil station, part of each transfer means being formed and adapted on an additional movement of the transfer means in a direction toward the coil station to shift a pair of core plates on one side of the coil into the coil whilst a pair of associated core plates on the opposite side of the coil station is retained in said intermediate position.

4. An apparatus for automatically laminating core plates in interleaved relationship in an open ended coil comprising means providing a coil station where an open ended coil is adapted to be supported, a pair of first and second magazines at each side of the coil station, said second magazine of each pair being positioned between the coil station and the first magazine of the same pair, the first magazine being formed to hold core plates of one shape and the second magazine being formed to hold core plates of a different shape, reciprocable transfer means operatively associated with each pair of magazines, means for causing reciprocation of each said reciprocable transfer means toward and away from the coil station, said means including structure synchronizing movement of the transfer means associated with the pairs of magazines on opposite sides of the coil station whereby as either transfer means moves toward the coil station the other transfer means moves away from the coil station, said transfer means associated with each pair of magazines including core plate pick-off means for engaging the lowermost core plates of said first and second magazines for moving them toward the open end of the coil positioned at the coil station, with a core plate removed from the second magazine positioned in a plane overlying the plane in which the core plate removed from the first magazine lies, thereby constituting said core plates an associated pair for concurrent assembly with the coil from one of the open ends of the coil,

means for retaining each pair of associated plates, prior to assembly with the coil, in a position intermediate the second magazine from which one of the plates of the associated pair was removed and the coil station, part of each transfer means being formed and adapted on an additional movement of the transfer means in a direction toward the coil station to shift a pair of core plates on one side of the coil into the coil whilst a pair of associated core plates on the opposite side of the coil station is retained in said intermediate position, and means at the coil station for moving the core plates upwardly as a pair, thereby raising the previously assembled plates a distance equal to the thickness of one plate.

5. An apparatus for automatically laminating core plates in interleaved relationship in an open ended coil comprising means providing a coil station where an open ended coil is adapted to be supported, a pair of first and second magazines at each side of the coil station, said second magazine being positioned between the coil station and the first magazine, the first magazine being formed to hold core plates of E shape and the second magazine being formed to hold core plates of I shape, reciprocable means operatively associated with each pair of magazines, means for causing reciprocation of each said reciprocable transfer means toward and away from the coil, said means including structure synchronizing movement of the transfer means associated with the pairs of magazines on opposite sides of the coil station whereby as either transfer means moves toward the coil station the other transfer means moves away from the coil station, said transfer means associated with each pair of magazines including core plate pick-off means engageable with the lowermost core plates of said first and second magazines for removing said lowermost plates from the respective magazines and assembling the removed plates as an associated pair at a position spaced from assembly position in said coil with the removed I shaped plate overlying the removed E-shaped plate.

6. Apparatus for laminating core plates in interleaved relationship in an open ended coil, comprising means for positioning a coil, a core plate supply station spaced from said coil and including a first core plate supply magazine and a second core plate supply magazine located between said first core plate supply magazine and said coil, guide means extending from said coil to said supply station for guiding core plates in passage from said supply station into assembled relationship with said coil, and reciprocating transfer means for transferring core plates from said supply station along said guide means into assembled relationship with said coil, said transfer means including a first removal means operable upon movement of said reciprocating transfer means in a first direction to remove a core plate from said first core plate supply magazine and to move said removed core plate to a position adjacent said second core plate supply magazine, second means operable to remove a core plate from said second core plate supply magazine and to superpose said last mentioned core plate upon the core plate removed from said first core plate supply magazine, means located at a position intermediate with said supply station and said coil for engaging said superposed core plates and retaining said superposed core plates at said intermediate position during the reciprocation of said transfer means in a direction opposite to said first direction, and means on said transfer means operable on the next movement of said reciprocating transfer means in said first direction to move said superposed core plates along said guide means into assembled relationship with said coil.

7. Apparatus for laminating core plates in interleaved relationship in an open ended coil, comprising means for positioning the coil, a core plate supply magazine spaced from and in substantial alignment with the opening in said coil, means for guiding the movement of core plates in passage from said magazine into assembled relation-

ship with said coil, said magazine containing a plurality of stacks of core plates spaced along said guide means, said stacks having open ends adjacent said guide means from which core plates are removed, and reciprocating transfer means for moving core plates in superposed relationship from said magazine to said coil, said reciprocating means including first means for successively withdrawing core plates from the respective ends of said stacks in timed relationship to locate the successively withdrawn core plates in superposed relationship with each other, means adjacent said guide means at a position intermediate said magazine and said coil for disengaging core plates from said first means, and second means adapted to move said superposed core plates along said guide means from said intermediate position into laminated assemblage in said coil.

8. Apparatus for laminating core plates in interleaved relationship in an open ended coil comprising a coil station for locating an open ended coil with which the core plates are to be assembled, means for holding a first stack of core plates, said means being spaced from the position which one of the open ends of the coil occupies at said station, means positioned between said first core plate stack holding means and the coil station for holding a second stack of core plates, means for periodically withdrawing a core plate from said first core plate stack holding means and for advancing it to a position adjacent the coil station, means operating in timed relation to said last mentioned means for periodically withdrawing a core plate from said second core plate stack holding means and for locating it in overlying relationship with respect to the core plate previously withdrawn from said first core plate stack holding means to thereby assemble an associated pair of core plates at a location spaced from assembly position in said coil, and means for moving said associated pair of core plates into assembled relationship with the coil whilst maintaining said overlying relationship of one core plate with respect to the other, said last mentioned means also including means at the coil station for moving the core plates as a pair in a direction substantially normal to the path of movement of the plates prior thereto and in the direction in which the core plates are to be accumulated.

9. Apparatus for laminating core plates in interleaved relationship in an open ended coil comprising a coil station for locating an open ended coil with which the core plates are to be assembled, means for holding a first stack of core plates, said means being spaced from the position which one of the open ends of the coil occupies at said station, means positioned between said first core plate stack holding means and the coil station for holding a second stack of core plates, reciprocating means for periodically withdrawing a core plate from said first core plate stack holding means and for intermittently advancing it to a position adjacent the coil station, means operating in timed relation to said reciprocating means for periodically withdrawing a core plate from said second core plate stack holding means and for locating it in overlying relation with respect to the core plate previously withdrawn from said first core plate stack holding means to thereby assemble an associated pair of core plates, and means for moving said associated core plates as a pair into assembled relationship with the coil whilst maintaining said overlying relationship of one core plate with respect to the other.

10. Apparatus for laminating core plates in interleaved relationship in an open ended coil comprising a coil station for locating an open ended coil with which the core plates are to be assembled, means for holding a first stack of core plates, said means being spaced from the position which one of the open ends of the coil occupies at said station, means positioned between said first core plate stack holding means and the coil station for holding a second stack of core plates, reciprocating means for periodically withdrawing a core plate from said first

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core plate stack holding means and for intermittently advancing it to the coil station, means fixed to said reciprocating means for periodically withdrawing a core plate from said second core plate stack holding means and for locating it in overlying relation with respect to the core plate previously withdrawn from said first core plate stack holding means to assemble an associated pair of core plates at a location intermediate with said first plate stack holding means and said coil station, and means for moving said associated pair of core plates into assembled relationship with the coil whilst maintaining said overlying relationship of one core plate with respect to the other.

11. In apparatus for stacking core plates in assembled relation with an open ended coil, a coil station for locating an open ended coil, means spaced from the position which one of the open ends of the coil occupies at said station for holding a first stack of core plates, means positioned between the means for holding the first stack of core plates and the coil station for holding a second stack of core plates, means spaced from the position which the other open end of the coil occupies at said coil station for holding a third stack of core plates, means positioned between the means for holding the third stack of core plates and the coil station for holding a fourth stack of core plates, first means for assembling a core plate withdrawn from each of said first and second core plate stack holding means into an associated pair in which the plate from the second core plate stack holding means overlies that withdrawn from the first core plate stack holding means, and second means for assembling a core plate withdrawn from each said third and fourth core plate stack holding means into an associated pair in which the plate from the fourth core plate holding means overlies that from the third core plate holding means, means for alternately moving associated pairs of plates assembled by said first and second assembling means into assembled relationship in said coil, and means at the coil station for moving each associated pair of plates during assembly into said coil into a position in which the overlying plate of the pair currently being assembled, is located in a plane which is common to that of the underlying core plate of the previously assembled pair and with the other core plate of the pair currently being assembled located in underlying supporting relation to the assembled stack.

12. Apparatus for simultaneously applying E and I core plates to the opposite open ends of a coil, a magazine spaced longitudinally from each open end of said coil, each magazine being adapted to receive opposite ends of a stack of E plates and a stack of I plates, laterally spaced upwardly facing rail surfaces upon which the opposite ends of the E plates engage for sliding movement, a plate-like member having guided longitudinal movement from a position under an associated magazine to a position intermediate said magazine and said coil, bars carried at opposite sides of the magazine and dividing the same into channels to receive the ends of the respective plates and being arranged for vertical adjustment to define gate spaces between the bottom ends of said bars and the associated rail surface, means on said plate-like member and operative in one direction of its movement to first pick off the lower E plate and then pick off the lower I plate from the bottom of said stack and for moving said E plate with said I plate supported thereon as a pair through said gate spaces toward said intermediate position, and for moving another pair of said plates previously moved to said intermediate position into assembled position in the coil under the pair of E and I plates last applied to the coil, and means coacting with parts of said last mentioned means for adjusting them to pick off from each stack a number of plates corresponding to the depth of the gate spaces.

13. In apparatus for applying core plates to a coil from the opposite open ends thereof in alternation and embodying therein, parallel longitudinal rails therebe-

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tween for the coil to be operated upon, a magazine spaced longitudinally from each open end of the coil and adapted to hold a stack of E-shaped core plates and a stack of I shaped core plates with opposite margins thereof supported upon said rails, means disposed below said magazines and having guided reciprocating movement parallel with said rails in strokes of a length less than the distance between said coil and each magazine, sets of mechanisms, one for each stack of core plates in each magazine, carried by said reciprocating means for movement in alternation toward and away from said coil, each mechanism including parts operative in the movement thereof toward said coil for engaging and removing the bottom E and I shaped core plates in the associated stacks and for moving the same and with the I-shaped plate supported on the E-shaped plate as a pair along said rails to a position intermediate said stack and said coil, each mechanism also including parts operative in the next movement of the same mechanism toward said coil for moving the pair of core plates in said intermediate position into applied position in the coil while moving another pair of said plates into said intermediate position.

14. In apparatus for applying core plates to a coil from the opposite open ends thereof in alternation and embodying therein, parallel longitudinal rails with a space therebetween for the coil to be operated upon, a magazine spaced longitudinally from each open end of the coil and adapted to hold a stack of E-shaped plates and a stack of I-shaped core plates with opposite margins thereof supported upon said rails, means disposed below said magazine and having guided reciprocating movement parallel with said rails in strokes of a length less than the distance between said coil and each magazine, plate guiding and elevating parts on said rails at the sides of said coil, sets of mechanisms, one for each stack of core plates in each magazine, carried by said reciprocating means for movement in alternation toward and away from said coil, each mechanism including parts operative in the movement thereof toward said coil for engaging and removing the bottom E and I-shaped core plates in the associated stacks and for moving the same with the I-shaped plate engaged on the E-shaped plate as a pair along said rails to a position intermediate said stack and said coil, each mechanism also including parts operative in the next movement of the same mechanism toward said coil in connection with said plate guiding and elevating parts for moving the pair of core plates in said intermediate position into applied position in the coil under the core plate previously applied in the coil by the other mechanism in its movement toward said coil.

15. In apparatus for applying core plates to a coil from the opposite open ends thereof and embodying therein, parallel longitudinal rails with a space therebetween for the coil to be operated upon, a magazine spaced longitudinally from each open end of the coil and each adapted to hold stacks of E and I-shaped core plates, with the I plates closer the coil than the E plates, the stacks of E plates in both magazines having supporting engagement on said rails, means associated with each magazine for supporting the stack of I plates thereof in a plane above said rails, means disposed below said magazine and having guided reciprocating movement parallel with said rails in strokes less than the distance between said coil and each magazine, plate guiding and elevating parts on said rails at the sides of the coil, sets of mechanisms, one for the stacks of plates in each magazine, carried by said reciprocating means for movement in alternation toward and away from said coil, each mechanism including parts operating in the movement thereof toward said coil for first engaging the bottom E plate and then the bottom I plate and removing them jointly from the associated magazine and for then jointly moving them with the I plate superposed upon the E plates to a position intermediate said magazine and said coil, means for yieldingly holding said superposed E and I

plates down upon said rails, each mechanism also including parts operative in the next movement of the same mechanism toward said coil in connection with said plate guiding and elevating parts for moving the superposed E and I plates in said intermediate position, 5 against the action of said yielding means, into the applied position in the coil.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,842,838

July 15, 1958

John M. Macchione

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

Column 4, line 31, for "on opening" read -- or opening --; column 6, line 31, for "with", first occurrence, read -- will --; column 8, line 3, for "way" read -- away --.

Signed and sealed this 7th day of October 1958.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents