United States Patent

Smith

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[54] **APPARATUS FOR INSERTING COIL SIDE TURN PORTIONS AND INSULATORS INTO THE SLOTS OF A MAGNETIC CORE**

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[52] **U.S. Cl.** ....**29/205 R**
[51] **Int. Cl.** **H02k 15/00**
[58] **Field of Search** .29/205 R, 205 D, 205 E, 205 C, 29/596

[56] **References Cited**

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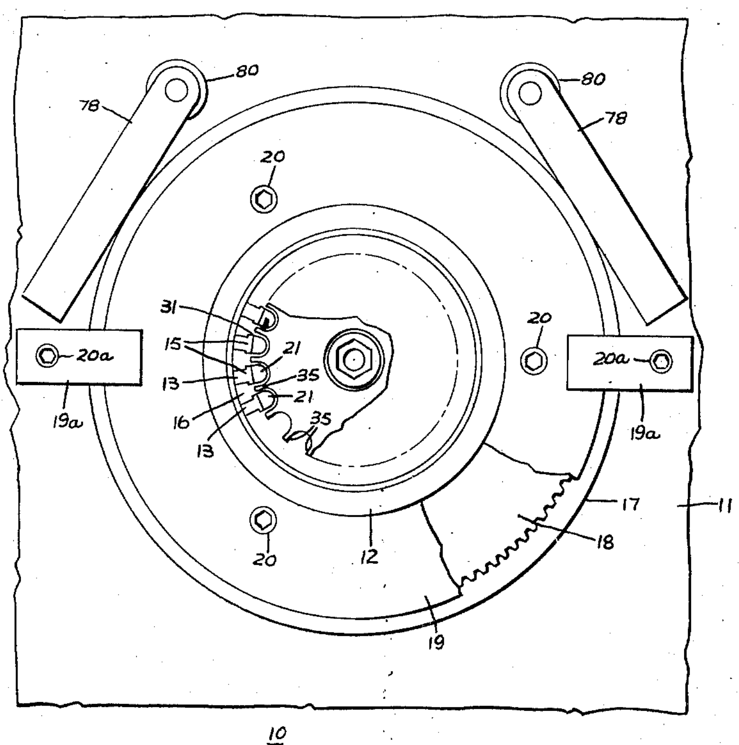
[57] **ABSTRACT**

Apparatus for inserting coil side turn portions, and insulators when desired, into axially extending slots of a magnetic core having a given stack height within a predetermined range of stack heights. The apparatus has a turn inserting device including coil turn feeder blades and a support for mounting the coil turn feeder blades and a core for relative axial movement. A drive effects an increment of relative movement of the turn feeder blades and core for inserting the coil side turn portions. A control is adjustable through the turn inserting device at a location remote from the drive for setting the selected increment of travel to conform to the given core stack height. The apparatus also has divider blades forming turn-receiving gaps and movable relative to the core during a selected portion of the selected increment of movement of the coil turn feeder blades. There is another control, adjustable concurrently with the control that is adjustable through the turn inserting device, for setting the selected portion of the selected increment of movement to conform to the given core stack height.

12 Claims, 9 Drawing Figures



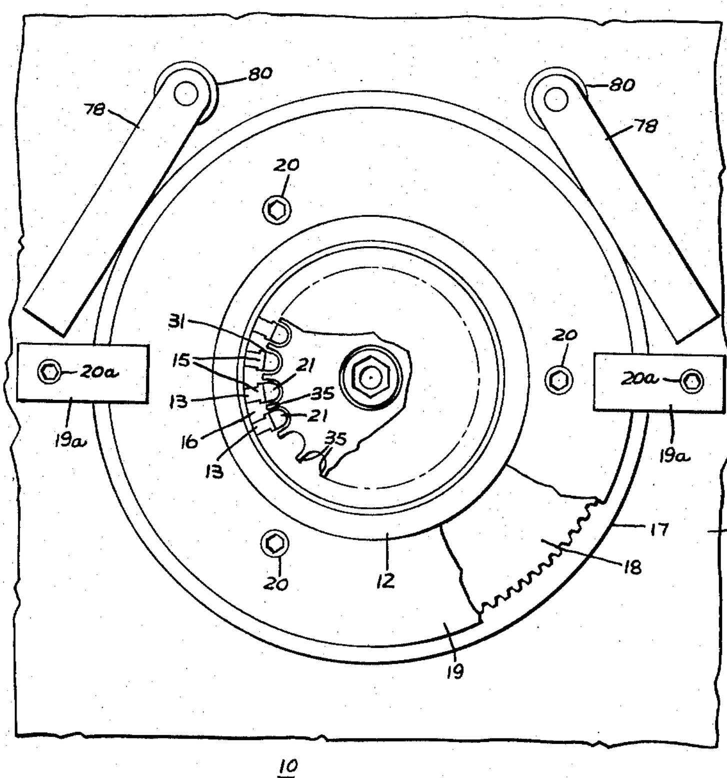


FIG.1

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FIG.2

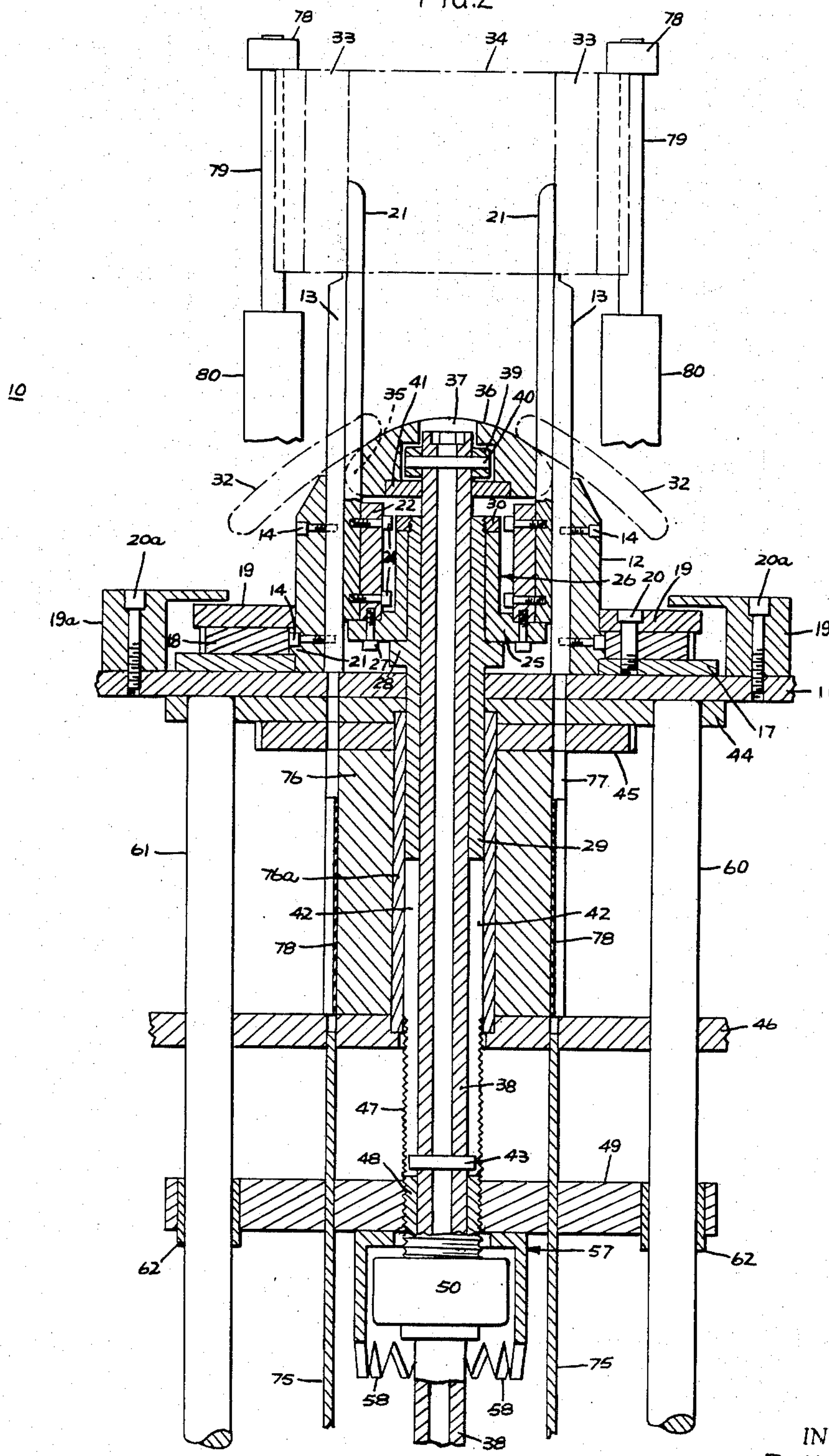

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FIG. 3

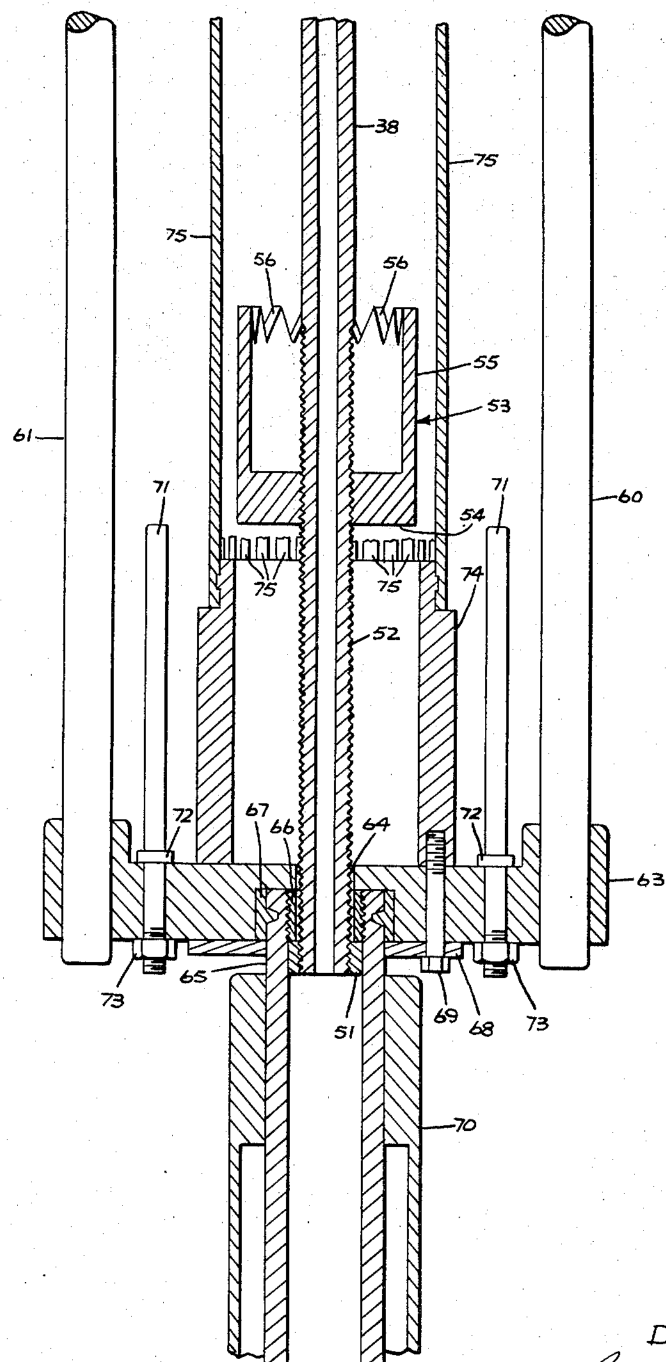

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FIG. 4

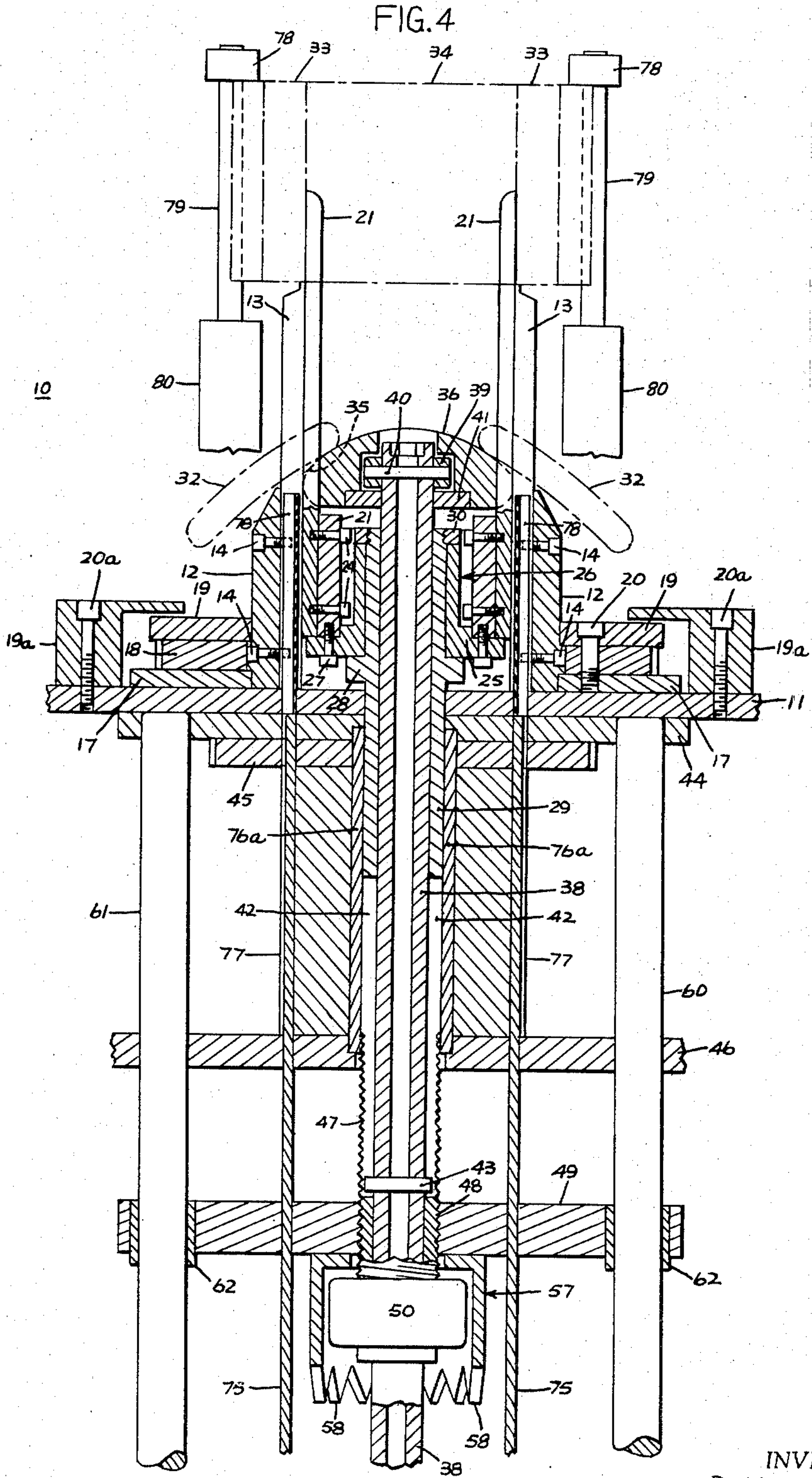

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FIG.5

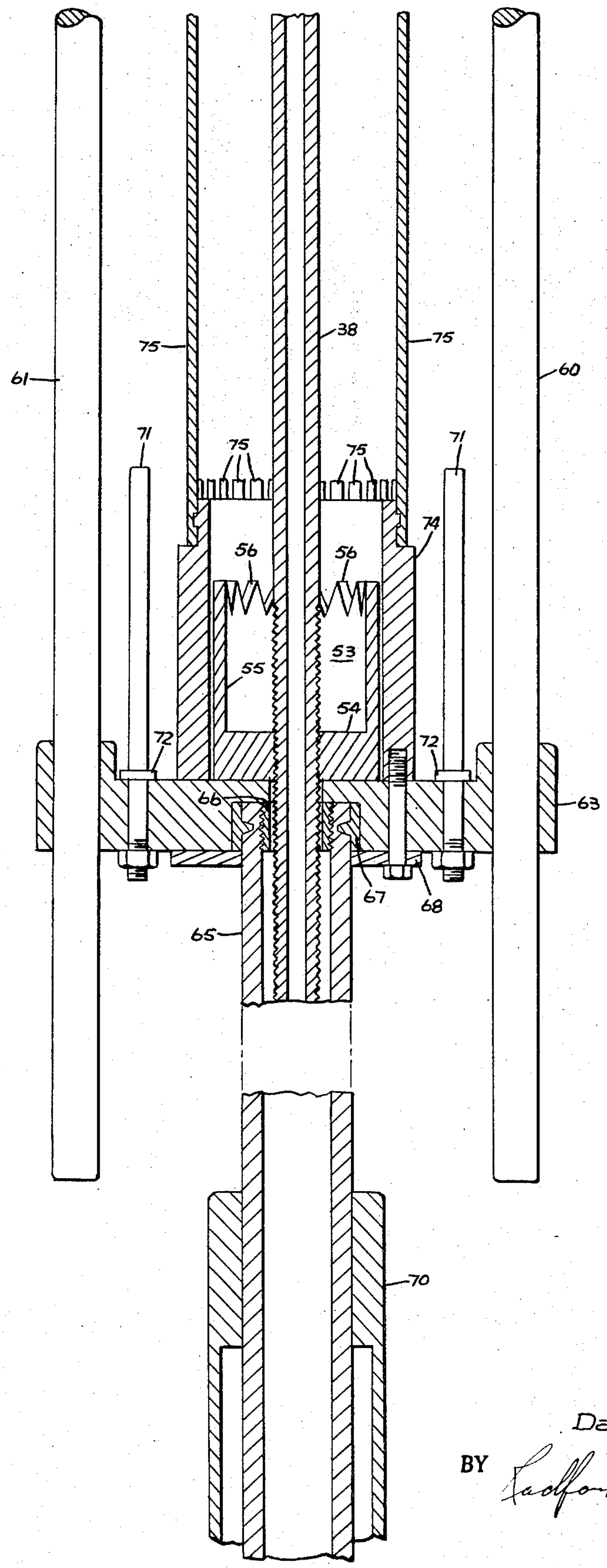

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FIG.6

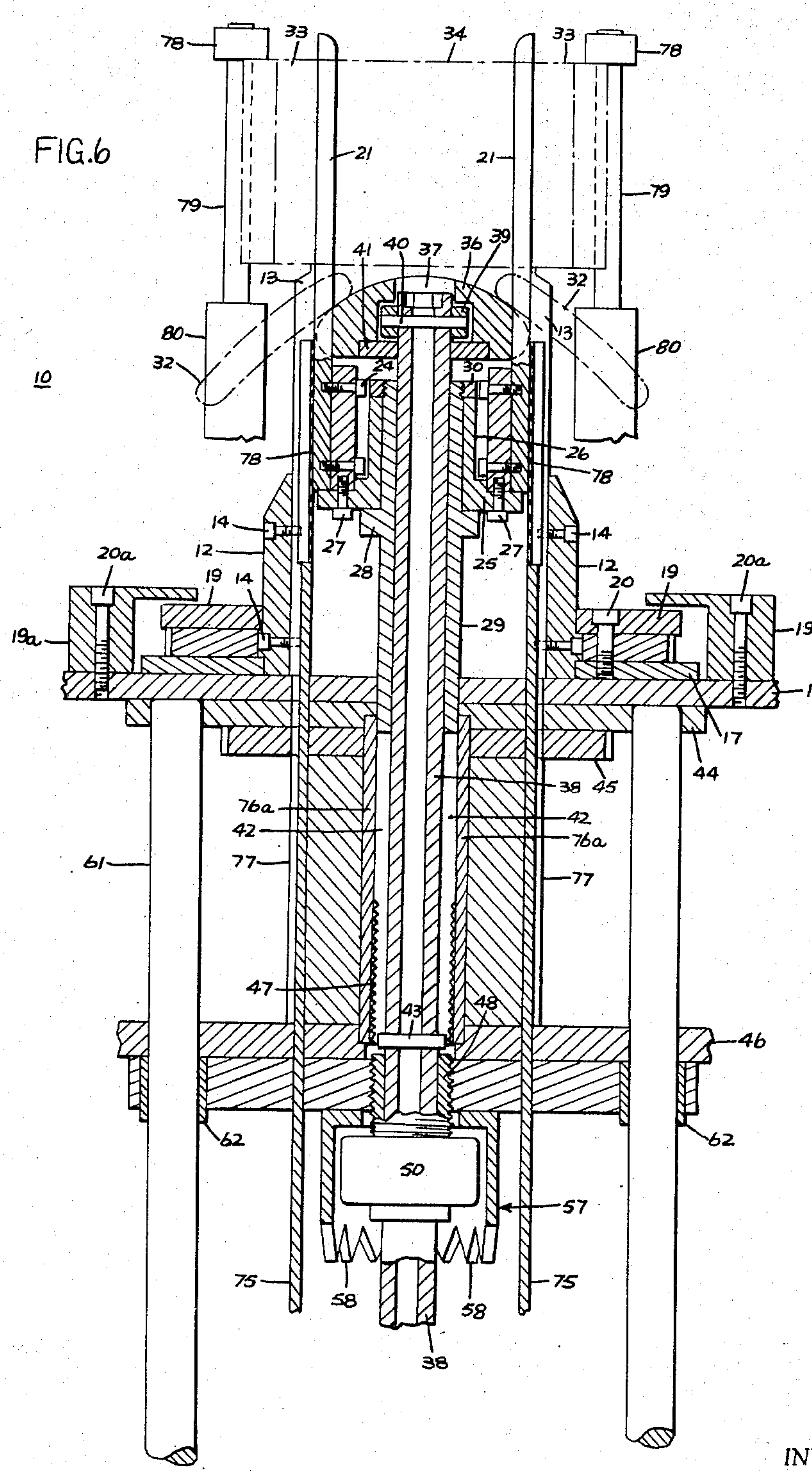

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FIG.7

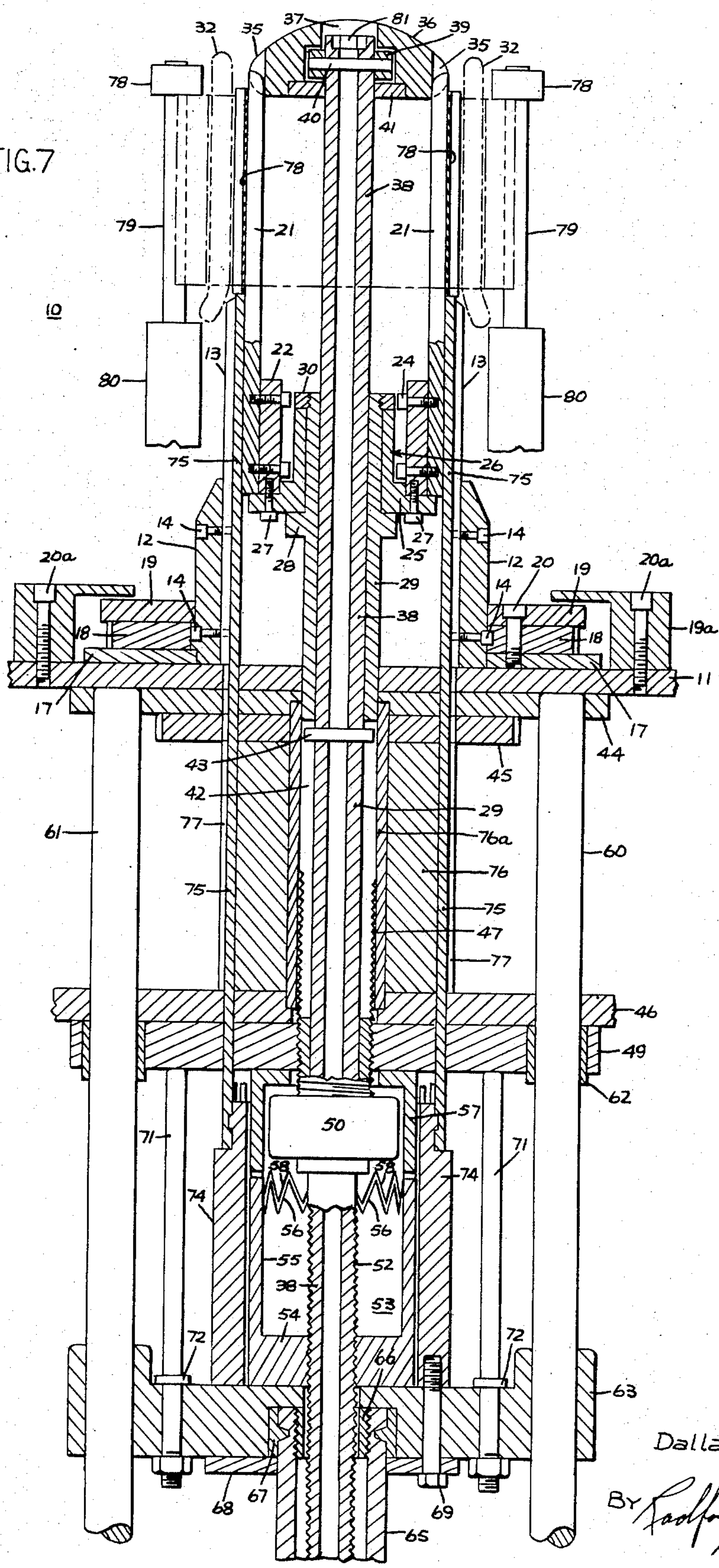

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FIG.8

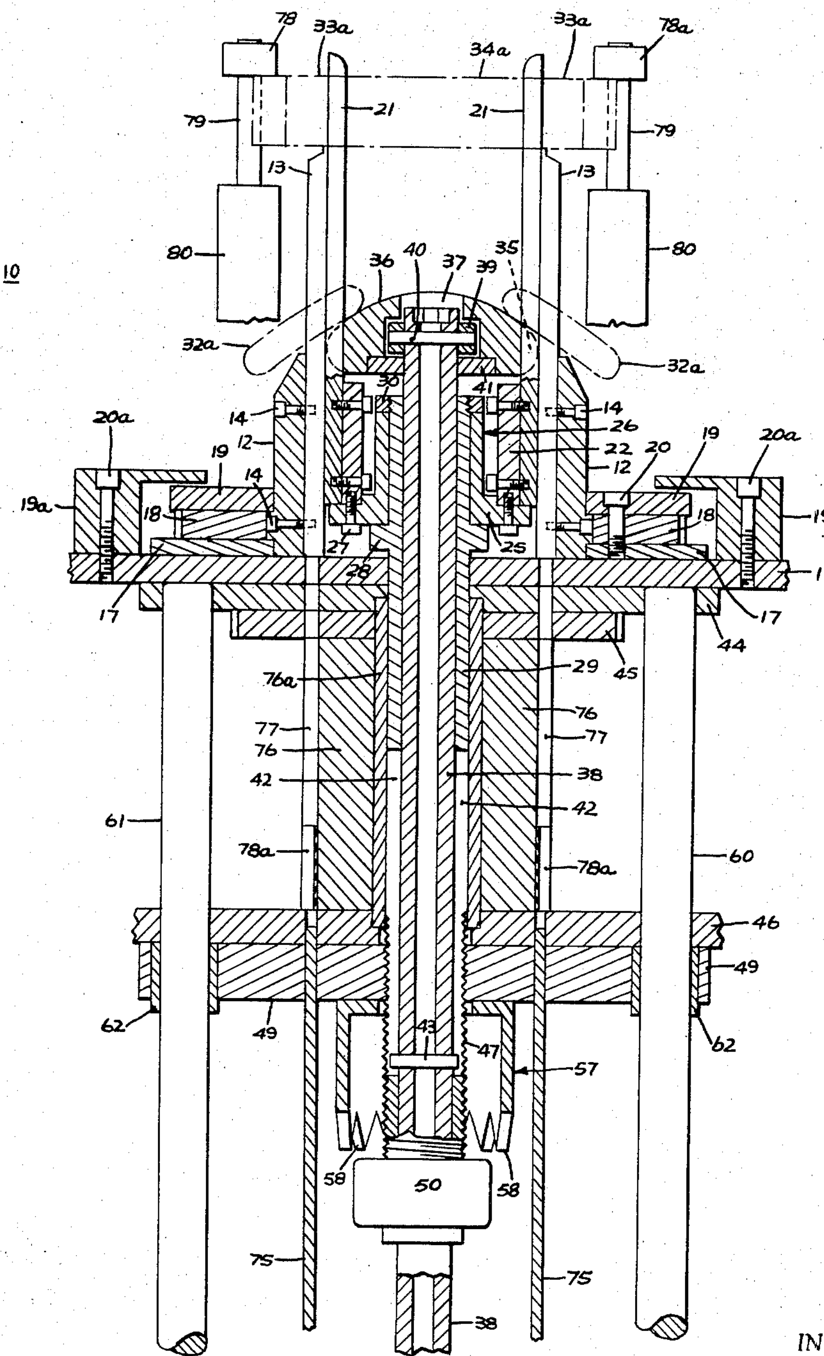

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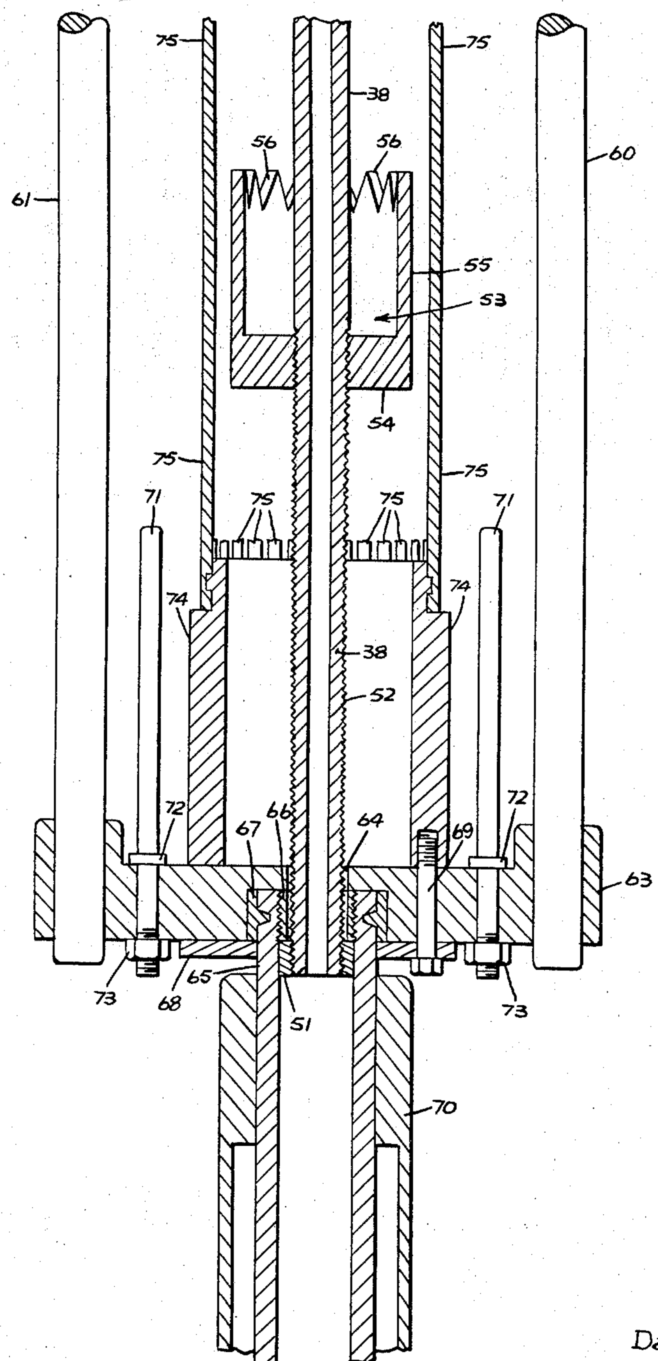
FIG.9



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APPARATUS FOR INSERTING COIL SIDE TURN PORTIONS AND INSULATORS INTO THE SLOTS OF A MAGNETIC CORE

CROSS REFERENCE TO RELATED APPLICATION

The present application discloses improvements, in certain respects, in the apparatus disclosed in U.S. Pat. Application Ser. No. 101,638, filed on Dec. 28, 1970 for Richard B. Arnold and assigned to General Electric Company, assignee of the present application.

BACKGROUND OF THE INVENTION

The present invention relates to an improved apparatus for inserting coil side turn portions, and insulators if desired, into predetermined slots of a magnetic core such as, for instance, into axially extending slots of a core for use in a dynamoelectric machine.

There have been developed a number of apparatus for inserting coil side turn portions of a group of coils, up to an entire stator winding, and associated insulators if desired, into the slots of a magnetic core. One disadvantage of such machines is that they are constructed basically for use with cores of only one stack height, i.e., cores of essentially one axial length. In order to use such apparatus with cores of various stack heights, tedious and time consuming adjustments are required and, in some cases, certain parts must be completely removed and replaced with other components. In production type operations this results in costly "down time" of the apparatus.

The aforementioned application Ser. No. 101,638 in part discloses coil turn and insulator insertion apparatus which is adjustable to accommodate cores having various stack heights.

It is an object of the present invention to provide an improved coil turn insertion apparatus which is adjustable to accommodate cores of various stack heights.

It is another object of this invention to provide such an improved apparatus in which desired adjustments may be made quickly and easily from the exterior of the apparatus.

It is yet another object of this invention to provide such an adjustable apparatus which can use many already proven components.

It is a further object of this invention to provide such an improved apparatus in which the mechanism for adjusting the apparatus to accommodate cores of various stack heights is rugged and simple in design and yet flexible and sure in operation.

SUMMARY OF THE INVENTION

In carrying out the invention, in one form thereof, there is provided apparatus for inserting coil side turn portions of a group of electrical coils formed of conductor wire into predetermined axially extending slots of a core of a given stack height within a preselected range of stack heights and having axially extending slots in communication with a periphery of the core. The apparatus comprises turn inserting means including a plurality of coil turn feeder blades and turn-receiving gaps for inserting coil side turn portions into the predetermined slots of the core. There is supporting means for mounting the turn feeder blades and core for relative axial movement. There is drive means for effecting a selected increment of movement of the turn feeder blades and core relative to one another for inserting the coil side turn portions into the predetermined slots. The apparatus also includes elective means, accessible through the turn inserting means at a location remote from the drive means, for selectively setting the selected increment of movement to conform to the given core stack height.

The subject matter which I regard as my invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. The invention itself, however, taken with further objects and advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a somewhat simplified partial plan view of an apparatus for inserting coil side turn portions and insulators into slots of a magnetic core having a given stack height within a predetermined range of stack heights, according to one form of the present invention;

FIG. 2 is a somewhat simplified elevational view of a portion of the apparatus generally as seen along line 2—2 of FIG. 1, with the apparatus set for use with cores of a first given stack height and showing the positions of certain of the components at the beginning of the insertion operation;

FIG. 3 is a somewhat simplified elevational view of another portion of the apparatus generally as seen along line 2—2 of FIG. 1, with the apparatus set for use with cores of the first given stack height and showing the positions of other of the components at the beginning of the insertion operation;

FIG. 4 is a view similar to FIG. 2 but showing the positions of certain components at another point in the insertion operation;

FIG. 5 is a view similar to FIG. 3, but showing the positions of certain other of the components at the point in the insertion operation corresponding to FIG. 4;

FIG. 6 is a view similar to FIG. 2 but showing the positions of certain of the components at yet another point in the insertion operation;

FIG. 7 is a view similar to FIG. 2 but showing the positions of certain of the components at the end of the insertion operation;

FIG. 8 is a somewhat simplified elevational view of a portion of the apparatus generally as seen along line 2—2 of FIG. 1, with the apparatus set for use with cores of a second given stack height; and

FIG. 9 is a somewhat simplified elevational view of another portion of the apparatus generally as seen along line 2—2 of FIG. 1, with the apparatus set for use with cores of the second given stack height.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings and particularly to FIGS. 1–3, there is illustrated therein, in a somewhat simplified and schematic form, various operating components of an apparatus for inserting coil side turn portions, and insulators when desired, into the axially extending slots of a magnetic core of any given core stack height within a predetermined range of core stack heights. It will be understood that, for purposes of illustration, FIG. 1 shows the apparatus without a core in place while FIG. 2 shows a core, of a first given stack height, in place to receive coils and insulators.

The apparatus 10 includes a stationary plate 11 which may in fact be a table like member. The plate 11 is illustrated as being generally horizontally disposed, as viewed in the FIGS., however, practice equipment of this type quite often is constructed such that the plate 11 is tilted with respect to the horizontal, including a vertical orientation, so that the injection tooling extends toward the operator for ease of mounting and dismounting cores. A hollow generally cylindrical housing 12 is mounted on the plate 11. A number of insulator guides 13 are secured in spaced apart relationship around the inner periphery of the housing 12 by suitable means such as bolts 14. Each of the insulator guides 13 is provided with a reduced thickness portion 15 so that there is formed, between each adjacent reduced thickness portion, apertures 16 to receive insulators for insertion into the magnetic core. These insulators may be between phase insulation or slot closers. In the exemplification there are 24 such guides 13 and associated apertures 16. It will be understood that the number of such guides and apertures may vary, depending upon the number of slots in the cores with which the apparatus is to be used.

An index plate 17 fits snugly around the outer periphery of the base portion of the housing 12, and indexing gear 18 is received around the housing 12 over the indexing plate 17 and is secured to the indexing plate by a ring like cover plate 19 which is firmly held against the top of the gear 18 by means of bolts 20, extending through the gear 18 and threadedly received in the plate 17. The cover plate 19 protects the teeth of gear 18 and prevents strands of wire from being caught in the gear teeth. The housing 12 is offset to provide a flange 21 between the plate 17 and the tabs 19 so that as the tabs are drawn down to secure together the indexing gear and indexing plate, they will also secure these members to the housing 12. This secures the assembly, including the housing 12, together for rotational movement by any suitable drive gear engaging the teeth of indexing gear 18. For the sake of simplicity such an indexing drive, which may be of any well-known type, has been omitted. A pair of spaced tabs or lugs 19*a* closely overlie the cover plate 19 and are firmly mounted to plate 11 by screws or bolts 20*a*. These tabs 19*a* allow the assembly, including the housing 12, to rotate while preventing axial movement relative to plate 11.

There are provided a number of spaced apart elongated divider blades 21 with each of the divider blades being in alignment with or mated with one of the guides 13. Thus, in the exemplification where there are 24 guides 13 there also are 24 divider blades 21. Each of the divider blades is secured to a sleeve 22 by bolts 24, and the sleeve 22 in turn is secured to the base 25 of a generally cylindrical member 26 by means of bolts 27. The base 25 is seated upon a flange 28 formed on an elongated, hollow actuator or tube 29. A lock or retainer washer 30 is threadedly mounted on the distal end of the actuator 29 and overlies the member 26 so that the member 26 and actuator 29 will move relative to one another in a rotational direction but are locked together for longitudinal movement, that is movement in a direction generally axially of the actuator. The divider blades 21, sleeve 22, member 26 and actuator 29 together form a divider blade section. As best seen in FIG. 1, the divider blades 21 are spaced apart to form therebetween turn-receiving gaps 31 in which are positioned turns of insulated conductor wire forming coils 32 the side turn portions of which are to be received in the axially extending slots 33 of a core such as that shown at 34.

There are also provided a number of turn feeder blades 35 with each of the turn feeder blades being positioned in the turn-receiving gap 31 between an adjacent pair of divider blades 21. In the exemplification the turn feeder blades 35 are formed as integral extensions of a head 36. The head 36 is provided with a central bore 37 which receives the distal end of a hollow actuator or tube 38. A lock washer or nut 39 is firmly attached to the actuator 38 by means of pin 40 and is received in an enlarged lower portion of the bore 37. The lower end of the bore 37 is closed by means of a washer or plate 41. With this arrangement the head 36, and thus the turn feeder blades, are moved with the actuator 38 as the actuator moves axially and, at the same time, the actuator and the head, including the turn feeder blades, are movable relative to one another in a rotational direction. It will be understood that, if desired, actuator 38 may be constructed from a solid, elongated rod like member.

Rotation of the indexing gear 18 will cause the wedge guides 13, the divider blades 21 and the turn feeder blades 35 all to rotate together about the actuators 29 and 38 without the actuators rotating. By the same token, the actuators 38 and 29 may be rotated without rotation of the divider blades 21 and turn feeder blades 35.

The actuators 29 and 38 are coaxial with the actuator 38 being inside the actuator 29 and are sized so as to be relatively axially movable. The actuator 29 includes a pair of slots 42 which receive a pin 43 that is firmly mounted in the actuator 38. Thus, while the actuators are relatively movable in an axial direction, with the pin 43 moving through the slots 42, the pin and slot arrangement ties the actuators together for concurrent rotational movement. The actuator 29 is slidably mounted in the plate 11 and a backup plate 44, which is firmly attached to the plate 11. The actuator 29 then extends through a ratchet plate 45 and a second station plate 46, which is spaced from the first plate 11 and backup plate 44. The lower portion of actuator 29 (as seen in FIG. 2) is provided with threads 47 which are received in mating threads 48 in a control plate 49 so that the stop plate is axially adjustably mounted to actuator 29.

A conventional slip clutch mechanism 50 is mounted to the lower end of the actuator 29 and engages the actuator 38. The slip clutch 50 ties the actuators 29 and 38 together for concurrent longitudinal or axial movement so long as both are free to move. However, if one of the actuators, such as actuator 29 for instance, is restrained from movement, the mechanism 50 will slip so that the other actuator, such as actuator 38, may move axially relative to the first one.

The inner actuator 38 extends beyond the slip clutch mechanism 50, and its lower end is provided with a lock nut 51. As best seen in FIG. 3, a relatively long portion of actuator 38 adjacent its lower end is provided with threads 52. A control member in the form of a connector device 53 is threadedly mounted to the threaded portion 52 of the actuator 38 so as to be axially adjustably mounted to the actuator. Control member 53 includes a base 54 and an upstanding side wall 55 which is generally parallel to the actuator 38. The distal end of the wall 55 is formed with a number of spaced apart teeth 56. A similar cup like member 57 is firmly attached to the control plate 49 and has a number of teeth 58 which are complimentary to the teeth 56 of control member 53. The cup like members 53 and 57 are sized so that when they are brought together the teeth will intermesh, that is the teeth 56 and 58 will have an interfitting relationship.

A pair of stationary guide rods 60 and 61 are firmly mounted in the backup plate 44 and extend downwardly therefrom (as seen in the FIGS.). Control plate 49 is slidably mounted on the control rods 60–61 by means of a pair of bushings 62 so that the control plate is free to move longitudinally of the guide rods but is restrained from any rotational movement.

A drive plate or platen 63 is slidably mounted on the guide rods 60, 61 below the control plate 49. The actuator 38 extends through an opening 64, and the lock nut 51 is mounted to the actuator 38 below the drive plate 63. The lower portion of the drive plate opening 64 is enlarged to receive the upper end of a hollow piston rod 65. A lock washer 66 is threadedly received in the upper end of the pistons 65 so as to be slidable about actuator 38 but to be in overlapping or interfering relationship with lock nut 51. A lock washer 67 is firmly connected to the outside of the upper end of piston 65. A lock plate 68 is mounted to the underside of drive plate 63 by means of bolts 69 so as to closely surround piston 65 and overlie lock washer 67. The piston 65 is received in a drive cylinder 70 which, in the exemplification, is a double acting cylinder capable of moving the piston 65 in either direction axially of the actuators 29 and 38. The upper end of piston 65 is firmly mounted between the drive plate 63 and lock plate 68 so that the drive plate 63 is moved with the piston in both of its directions. Also the overlapping or interfering relationship between lock nuts 51 and 66 assures that as the piston is moved downwardly to the position shown in FIG. 3 that the actuator 38 will be moved to its position shown in FIGS. 2 and 3.

A pair of stop members in the form of elongated rods 71 are provided adjacent each of the guide rods 60, 61 and are firmly attached to the guide plate 63 by some suitable means such as integral flanges 72 and nuts 73. If desired, stop members 71 can be threaded into guide plate 63 and locked in position by nuts 73. Such a construction will allow initial adjustment of the stop members 71 to compensate for tolerances of various other of the components to provide the proper insertion stroke.

The bolts 69 further serve to attach a cylindrical insulator drive member 74 to the upper side of drive plate 63. A number of insulator pushers 75 are firmly attached to the upper portion of the drive member 74 and are spaced circumferentially about the drive member. There is one insulator pusher 75 for each of the insulator guide apertures 16 and each of the insulator pushers 75 is aligned with a corresponding one of the insulator guide apertures. In order for the insulator pushers 75 to effect insertion of insulators into cores mounted about the upper end of the mechanism, each of the plates 11 44, 46 and 49 is provided with a series of openings in alignment with the insulator pushers so that the pushers may pass through these plates.

Referring now particularly to FIG. 2, there also is included an insulator receiving magazine 76 which has a number of insulator guide apertures 77 spaced circumferentially around its outer surface so as to be brought into alignment with the slots in plates 44 and 46 for the insulator pushers. The magazine 76 is firmly attached to the ratchet plate 45, which is toothed at its outer periphery so that by an appropriate drive arrangement the magazine may be rotated to serially present each of the insulator guide apertures 77 to an insulator making mechanism. A sleeve bearing 76a is positioned between magazine 76 and actuator 29 and is anchored in plates 44 and 46. This allows easy relative movement, both axial and rotational between magazine 76 and actuator 29. With such an arrangement insulators such as those shown at 78 may be formed of appropriate length and inserted into predetermined ones of the insulator guide apertures 77 for subsequent insertion into a magnetic core. The insulator forming mechanism may be of any conventional construction, many of which are known in the art and thus, for the sake of simplicity and ease of understanding, the details of such a mechanism have not been shown herein. It will be understood that at least in the final position of the magazine 76 and preferably in each of its positions for receiving insulators the guide apertures 77 are aligned with the guide apertures 16 for transfer of the insulators from the magazine through the apertures 16 into a suitable magnetic core.

There is also a core securement means, which in the exemplification takes the form of a pair of latches or dogs 78 which are mounted to elongated actuating rods 79. The rods 79 in turn are received in double action actuating cylinders 80 which move the rods up and down (as seen in FIG. 2) between a position engaging the upper edge of a core such as 34 and a position spaced above the core. When spaced above the core, the latches 78 may be swung out of interfering relationship with the core to the position shown in FIG. 1 so that a finished core may be removed from the apparatus and a new core placed over the divider blades 21 until it comes to rest on the top surface of the insulator guides 13. Then the latches are swung back into an interfering relationship with the core and the cylinders 80 actuated to retract the rods 79 until the latches 78 engage the outer periphery of the core.

Referring now particularly to FIGS. 2–7, there will be described a sequence of operation of the apparatus for inserting the coil side turn portions of coils 32 and insulators 78 into the axial extending slots 33 of core 34. FIGS. 2 and 3 together illustrate the positions and interrelationships of various components of the apparatus just prior to the insertion operation. At this time the insulators 78 have been formed in the predetermined insulator guide apertures 77 of the magazine 76, core 34 has been placed over the distal end of divider blades 21 so that the teeth forming the axial extending slots 33 rest on the upper ends of the insulator guides 13 and the latches 78 have been pulled down against the upper side of the core to hold the core against axial movement.

The insertion operation is provided by actuating drive cylinder **70** to move piston **65** in an upward direction (as seen in FIGS. 2–7). During a first portion of the movement of piston **65**, the apparatus moves from the position shown in FIGS. **2** and **3** to the position shown in FIGS. **4** and **5**. During this portion of the movement of the piston **65**, the piston **65** moves around actuator **38** and carries with it drive plate **63**. The drive plate moves insulator drive member **74** and thus insulator pushers **75** to move the insulators **78** out of magazine **76** and up to a position just under the coils **32**. The first portion of the movement of piston **65** ends when drive plate **63** engages the base **54** of control member **53** (as seen in FIG. 5).

Continued axial movement of piston **65** causes the drive plate **63** to continue upward movement of the insulator pushers **75** and simultaneously to move control member or connector device **53** by engagement of the upper surface of the drive plate **63** with the base **54** of control member **53**. Since control member **53** is threaded to actuator **38**, actuator **38** is moved axially upward so as to move head **36** and thus feeder blades **35**. The slip clutch **50** effectively interconnects the actuator **38** with the actuator **29** so that actuator **29** is also moved. Actuator **29** carries the divider blades **21** upwardly through the core **34** and, since control plate **49** is threaded to actuator **29**, it also carries control plate **49** and the cup like member **57** upwardly toward the core. During the second portion of the movement of the drive piston, the apparatus is moved from the position shown in FIGS. **4** and **5** to the position shown in FIG. **6**. During this portion of the movement of the actuator, there is a first portion of the increment of movement of the turn feeder blades with concurrent movement of the divider blades and the insulator pushers. Thus, during this portion of the increment of movement of the turn feeder blades, the relationship between the turn feeder blades, the divider blades and the insulator pushers remains the same and they all move in an axial direction toward the core, with the divider blades passing through the core. The second portion of the movement of piston **65** ends when the control plate **49** engages the underside of a second stationary plate **46**.

Thereafter the control plate **49** and thus the actuator **29** and divider blades **21** are restrained from any further axial movement relative to the core. Continued movement of piston **65** causes the drive plate **63**, acting through the insulator drive member **74**, to drive the insulator pushers **75** and concurrently therewith, acting through control member **53**, actuator **38** and head **36**, to continue movement of the feeder blades. During this portion of movement of the actuator, which provides a second portion of the increment of movement of the divider blades with a concurrent movement of the insulator pushers, the slip clutch **50** allows relative movement between the actuators **38** and **29** so that the actuator **38** may move axially while actuator **29** is maintained stationary. This movement continues until the upper ends of stop members **71** engage the underside of control plate **49** which then halts movement of drive plate **63** and thus piston **65** to terminate the insertion operation. The relationship of the components at the termination of the insertion operation is illustrated in FIG. **7** wherein it will be noted that the distal ends of the turn feeder blades have moved through the divider blades to insert the coil side turn portions into the axially extending slots **33** of the core **34**, and the insulator pushers **75** have moved the insulators **78** out of the insulator guides **13** and into the axially extending slots **33**. It will be noted that in this position the teeth **56** of control member **53** and teeth **58** of the cup like member **57** are intermeshed but do not quite touch. This interfitting relationship interlocks the control member, i.e., connector device **53** and the stop device formed by plate **49** and member **57**, for adjusting the apparatus for cores of different stack heights without causing any binding of the parts during the insertion operation.

Upon the completion of the insertion of the coil side turn portions, the core **34** may be removed from the apparatus by actuating cylinders **80** to raise latches **78** which are then rotated out of interfering relationship with the core. Then the core may be manually removed from the apparatus. It will be understood that, while the insertion operation has been described by reference to portions of the movement of the piston, in normal operation piston **65** travels from its position in FIG. **3** to its position in FIG. **7** in one continuous movement.

At this time the apparatus may be returned to its original position for subsequent insertion of coil side turn portions, and insulators if desired, by actuating cylinder **70** to move the piston **65** in the other axial direction (that is down as seen in FIGS. 2–7). During its return movement the drive piston **65** will retract drive plate **63**. After a first portion of the travel of the piston **65**, the lock nut **66**, attached to the end of piston **65**, engages the lock nut **51** attached to the lower end of actuator **38**. Further movement of the piston **65** causes retraction of the head **36** and thus turn feeder blades **35**. The slip clutch mechanism **50** functions during the retraction stroke to carry actuator **29**, and thus divider blades **21**, with actuator **38** until flange **28** engages plate **11** to halt actuator **29**. Thereafter clutch mechanism **50** allows actuator **38** to move relative to actuator **29** as drive plate **63** is retracted by piston **65**. The retraction operation ends when piston **70** completes its return or retraction stroke.

As an important aspect of the present invention, there is provided elective means to adjust the apparatus for use with cores of various given stack heights within a predetermined range of stack heights. Viewing particularly FIG. **7** it will be seen that the end of actuator **38** which is exposed through bore **37** in head **36** is provided with a drive socket **81**. The drive socket **81** may be of any suitable shape such as the hexagonal recess illustrated. A suitable tool such as a wrench having a driving end shaped complimentary to the socket **81** may be engaged with the socket through the bore **37**. Rotation of the tool will cause the actuator **38** to rotate, with the nut **39** moving within the enlarged portion of the bore **37**. The interconnection between the actuator **38** and the actuator **29** provided by slots **42** and pin **43** causes the actuator **29** to also rotate. Since the control plate **49** is slidably mounted on guide rods **60** and **61**, it cannot rotate. Therefore, the control plate **49** and cup like member **57** will move relative to the actuator **29** in an axial direction, either up or down in the FIGS., being driven by the threaded connection between the plate

49 and the actuator 38. The intermeshing of teeth 56 and 58 prevents control member 53 from rotating with actuator 38 and control member 53 similarly will move axially relative to actuator 38, either up or down depending on the direction of rotation of actuator 38, being driven by the threaded connection between the base 54 of control member 53 and the threads 52 of the actuator 38. Thus, there is provided an elective means by which the positions of the controls, including control member 53 and control plate 48, may be simultaneously moved relative to the actuators 29 and 38 to set the apparatus for use with cores of any given stack within a predetermined range of stack heights.

Referring particularly to FIGS. 2 and 3, it will be seen that the apparatus as shown therein is adjusted for inserting coil side turn portions, and insulators if desired, into a core 34 of a first or maximum stack height. With this setting the space between the top of control plate 49 and the bottom of stationary plate 46 is sufficient to allow the divider blades 21 to move through the bore of core 34 during the first portion of the increment of movement of the feeder blades. The control member 53 is set so that, between the position at which drive plate 63 engages the control member, base 54 and the position at which the tops of stop member 71 engage the underside of control plate 49 to halt the movement of the piston 65, the actuator 38 will be moved a sufficient distance to move the turn feeder blades through the divider blades, in their extended position, to insert the coil turn side portions. Also, the setting of control member 53 determines the distance the insulator pushers 75 are moved before the turn feeder blades begin to move so that the insulator pushers will move the insulators from the magazine to a position just behind the coils. Thus, the coils and insulators are inserted into the axially extending slots of the core in the proper sequence as the divider blades and insulator pushers thereafter move simultaneously.

FIGS. 8 and 9 illustrate the apparatus adjusted to insert the side turn portions of coils 32a into a core 34*a* having a minimum stack height within the predetermined range of stack heights. It will be seen that with this setting the control plate 49 is bottomed against stationary plate 46 so that the divider blades, which already project through the core 34*a*, will not move. Thus, the first portion of the increment of movement of the turn feeder blades 35, when the divider blades 21 move with the turn feeder blades, will be equal to zero. It also will be seen that control member 53 has been moved upwardly along actuator 38. This will provide more movement of piston 65 before drive plate 63 engages the control member 53 and less movement of the piston thereafter, until the stop members 71 engages control plate 49. Therefore, the total increment of movement of the turn feeder blades is shorter as total movement necessary to raise them through the core 34*a* and divider blades 21 is shorter. Also, the insulation pushers 75 move axially relative to the actuators 38 and 29 a greater distance before actuator 38 begins to move in order to place the shorter insulators 78*a* in proper relationship to the coils 32*a* for subsequent concurrent movement to insert them into the axially extending slots 33*a* of the core 34*a*. The apparatus has been illustrated as set for maximum and minimum core stack heights within a predetermined range of core stack heights for purposes of illustration only. It will be understood that, by proper rotation of actuator 38, the apparatus may quickly and easily be set for use with cores of any given stack height within a range of core stack heights determined by the maximum possible adjustment of the apparatus.

While I have shown and described various embodiments of the invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention. It is therefore intended in the appended claims to cover all such changes and modifications that fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Apparatus for inserting coil side turn portions of a group of electrical coils formed of conductor wire into predetermined axially extending slots of a core of a given stack height within a preselected range of stack heights and having axially extending slots in communication with a periphery of the core, the apparatus comprising: turn inserting means including a plurality of coil turn feeder blades and turn-receiving gaps for inserting coil side turn portions into the predetermined slots of the core; supporting means for mounting said turn feeder blades and core for relative axial movement; drive means for effecting a selected increment of movement of said turn feeder blades and core relative to one another for inserting the coil side turn portions into the predetermined slots; elective means, accessible through said turn inserting means at a location remote from said drive means, for selectively setting the selected increment of travel to conform to the given core stack height.

2. Apparatus as set forth in claim 1 wherein: said turn inserting means, including said turn feeder blades, includes a distal portion which is moved axially along the slots of the core for inserting the coil side turn portions; said elective means being accessible through said distal portion of said turn inserting means for selectively setting the selected increment of travel to conform to the given core stack height.

3. Apparatus as set forth in claim 1, further including: divider blades forming the turn-receiving gaps therebetween; said divider blades and core being relatively movable during a selected portion of the selected increment of movement of said turn feeder blades; said elective means selectively setting the selected portion of the selected increment of movement to conform to the given core stack height simultaneously with the setting of the selected increment of movement.

4. Apparatus as set forth in claim 1 wherein: said turn feeder blades are connected to a first elongated actuator for movement therewith; a connector is adjustably mounted to said first actuator and positioned for engagement with said drive means for providing the selected increment of movement of said turn feeder blades; said actuator being accessible through said turn inserting means for adjusting the mounting between said actuator and said connector to conform the selected increment of travel to the given core stack height.

5. Apparatus as set forth in claim 4, further including: divider blades forming the turn-receiving gaps therebetween; said divider blades being connected to a

second elongated actuator for movement therewith; said first and second actuators being coaxial; slip clutch means interconnecting said first and second actuators for concurrent axial movement; stop means adjustably mounted to said second actuator and effective, after a selected portion of the selected increment of movement, to halt movement of said second actuator and said divider blades, said slip clutch thereupon allowing continued movement of said first actuator and said turn feeder blades; said first and second actuators being connected together for concurrent adjusting movement so that the mounting of said connector and said stop means to said first and second actuators are concurrently adjusted to conform both the selected increment of movement and the selected portion of the selected increment of movement to the given core stack height.

6. Apparatus for inserting coil side turn portions of a group of electrical coils formed of conductor wire into predetermined axially extending slots of a core of a given stack height within a preselected range of stack heights and having axially extending slots in communication with a periphery of the core, the apparatus comprising: a plurality of spaced apart divider blades to receive therebetween coils to be inserted into the core; a plurality of coil turn feeder blades, each of said turn feeder blades being positioned between an adjacent pair of divider blades; an elongated actuator connected to said turn feeder blades for moving said turn feeder blades relative to the core; drive means movable axially of the actuator; a connector device axially adjustably mounted to said actuator and positioned in interfering relationship with said drive means to provide the selected increment of movement of said turn feeder blades; means associated with said actuator accessible from the turn feeder blade end of said actuator for adjusting the axial position of said connector device relative to said actuator to selectively set the selective increment of travel to conform to the given core stack height.

7. Apparatus as set forth in claim 6, further including means releasably interconnecting said divider blades and said actuator for moving said divider blades during an initial portion of the selected increment of movement of said turn feeder blades; an adjustable stop device effective to halt movement of said divider blades after the initial portion of the selected increment of movement; means selectively interconnecting said stop device and said actuator for adjusting said stop device to set the initial portion of the selected increment of travel to conform to the given core stack height concurrently with the setting of the selected increment of travel.

8. Apparatus as set forth in claim 7 wherein said connector device and said stop device have an interfitting relationship when said actuator is at a predetermined axial position for facilitating concurrent adjustment of both said connector device and said stop device.

9. Apparatus for inserting side turn portions of a group of electrical coils formed of conductor wire into predetermined axially extending slots of a core of a given stack height within a preselected range of stack heights and having axially extending slots in communication with a periphery of the core, the apparatus comprising: a plurality of spaced apart divider blades to receive therebetween coils to be inserted into the core; a first elongated actuator connected to said divider blades and extending axially therefrom; a plurality of coil turn feeder blades, each of said turn feeder blades being positioned between an adjacent pair of divider blades; a second elongated actuator connected to said turn feeder blades and extending axially therefrom; means interconnecting said first and second actuators for concurrent rotary motion; drive means; a first control device threadedly connected to said first actuator to control the positioning of said divider blades relative to the core; a second control device threadedly connected to said second actuator and positioned for engagement with said drive means to provide a selected increment of movement of said turn feeder blades for inserting coil side turn portions into preselected slots of the core; the end of at least one of said actuators adjacent one of said divider blades and said turn feeder blades being accessible for concurrent rotation of both said actuators to move said first and second control devices axially of their associated actuators for conforming the apparatus to the given core stack height.

10. Apparatus as set forth in claim 9 wherein at least one of said control devices is restrained from rotary motion and said control devices intermesh in at least one part of the selected increment of movement to facilitate moving said control devices axially of their associated actuators.

11. Apparatus as set forth in claim 9 further including means releasably securing said first and second actuators together for concurrent axial movement during an initial portion of the selected increment of movement; said first control device thereupon halting movement of said first actuator with said divider blades in a predetermined position relative to the core.

12. Apparatus as set forth in claim 9 wherein said first and second actuators are coaxial; slip clutch means interconnecting said actuators for concurrent axial movement during an initial portion of the selected increment of movement; said first control device thereupon halting movement of said first actuator while said slip clutch means permits continued axial movement of said second actuator.

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