

April 14, 1931.

L. E. POOLE

1,800,567

COMMUTATOR RIVETING MACHINE

Filed Feb. 15, 1929 4 Sheets-Sheet 1

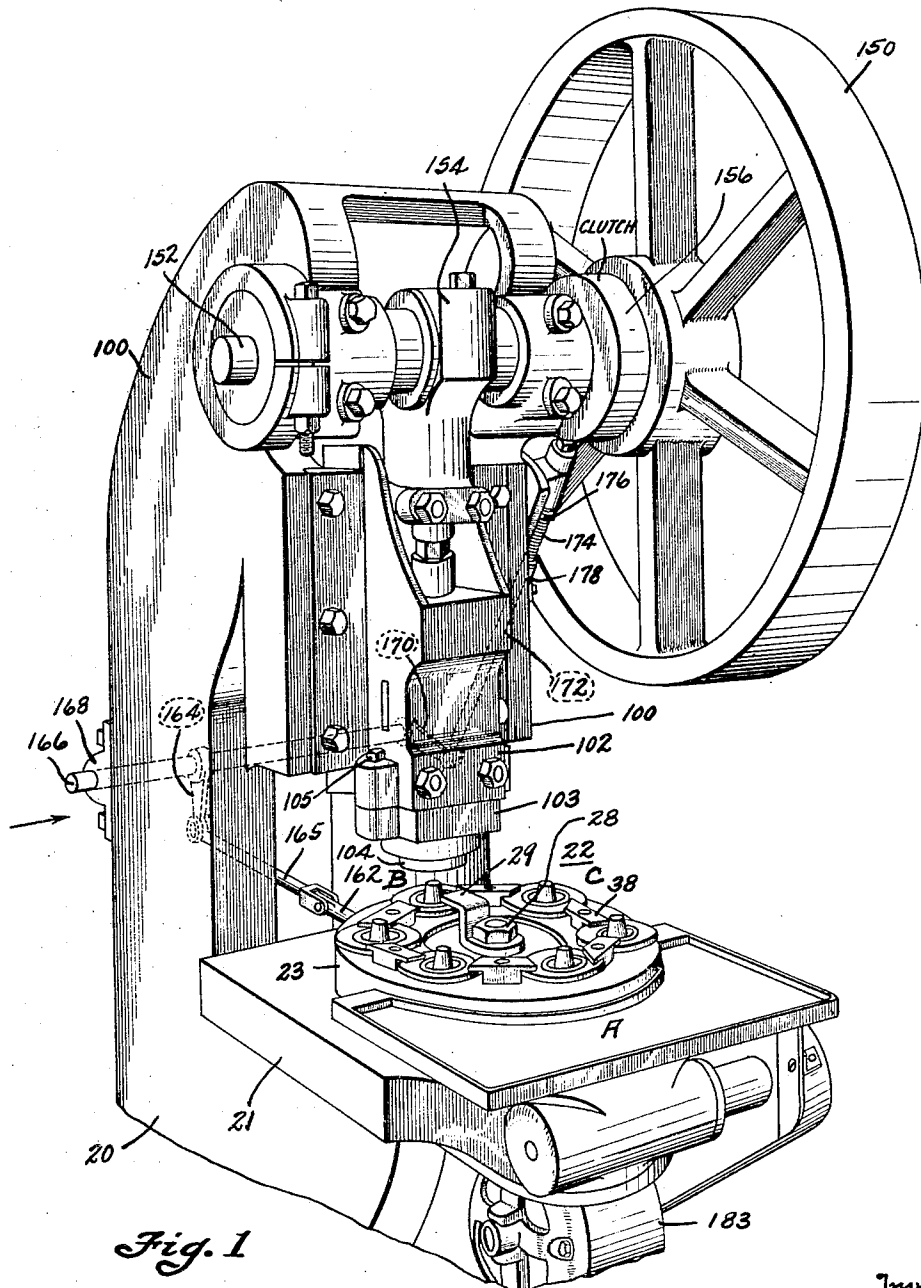


Fig. 1

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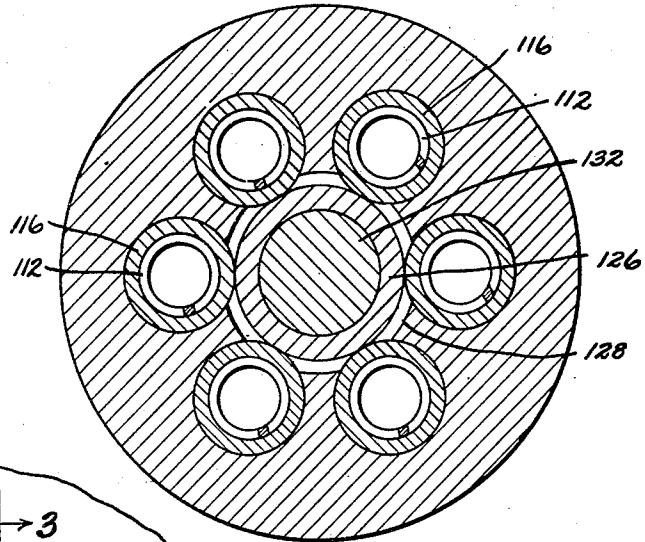


Fig. 8

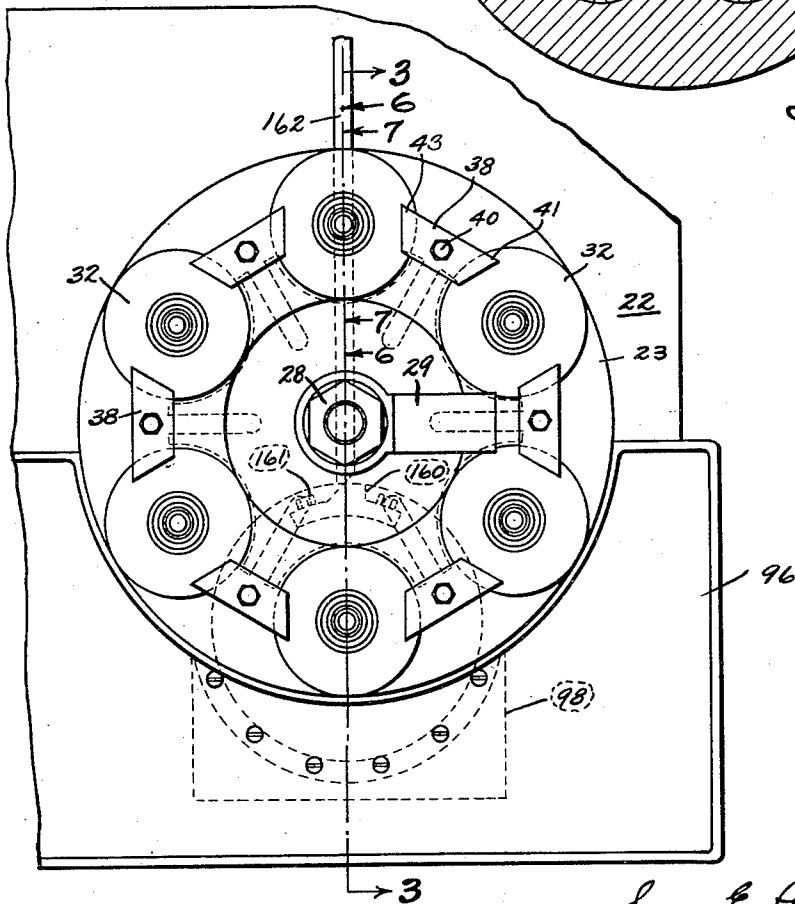


Fig. 2

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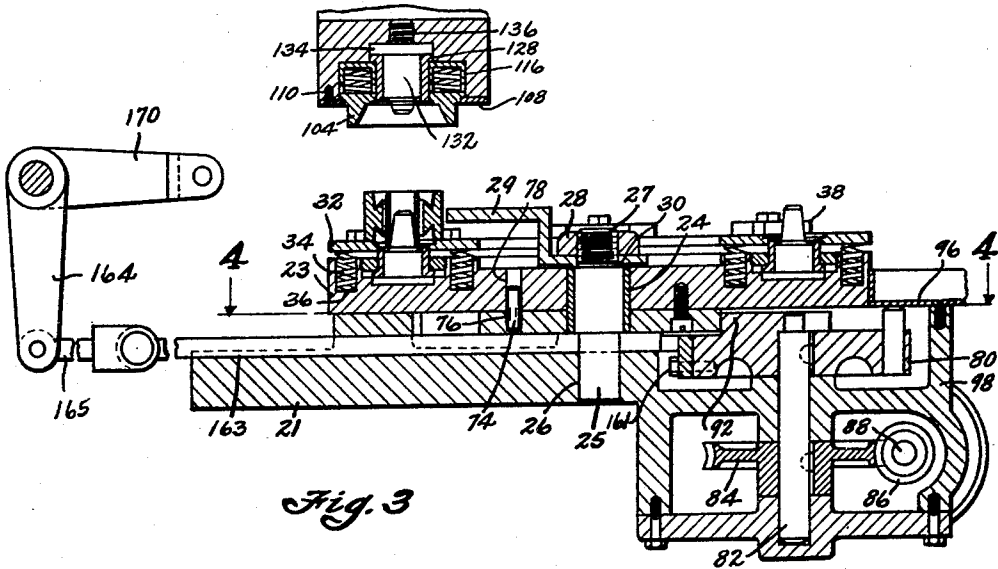


Fig. 3

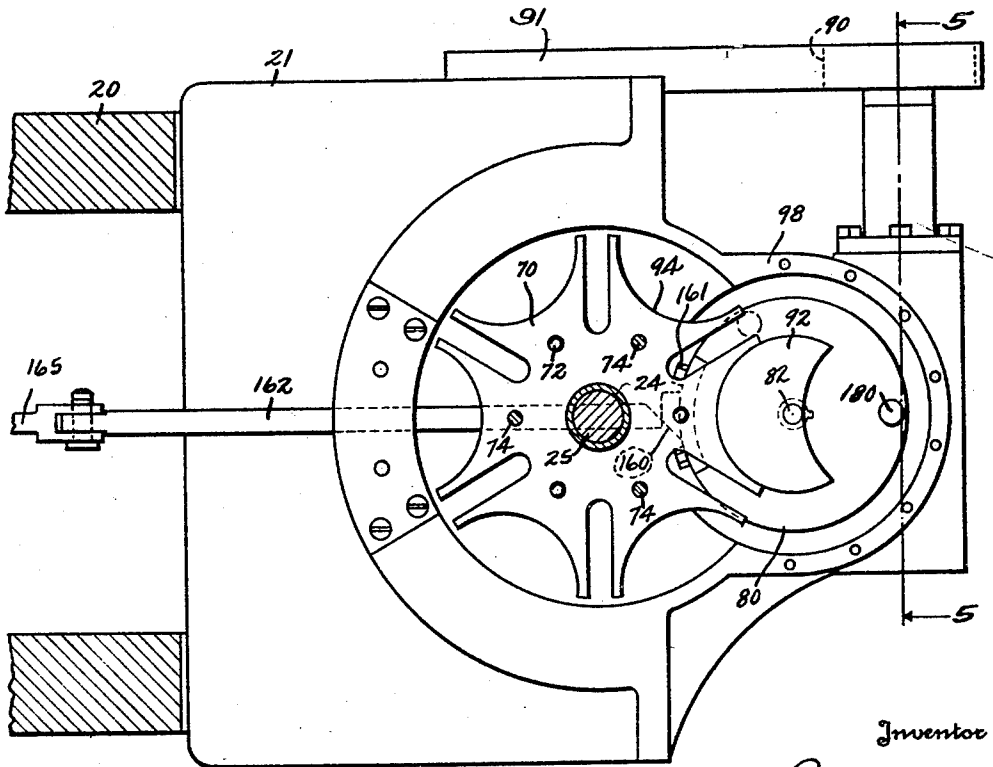


Fig. 4

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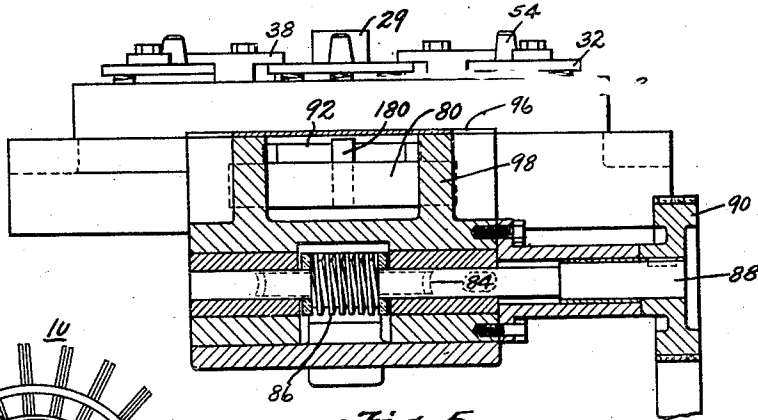


Fig. 5

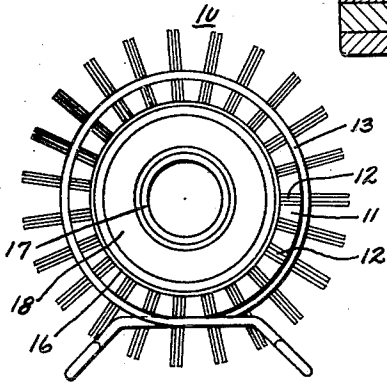


Fig. 9

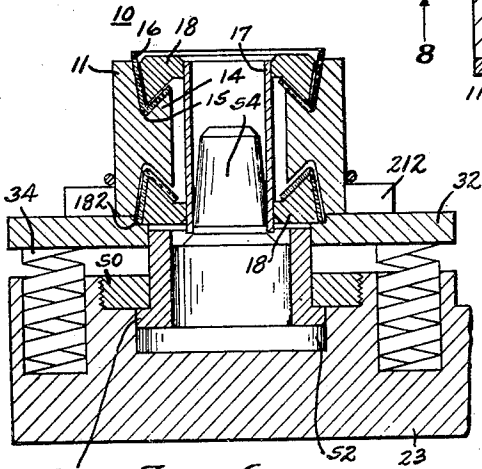


Fig. 6

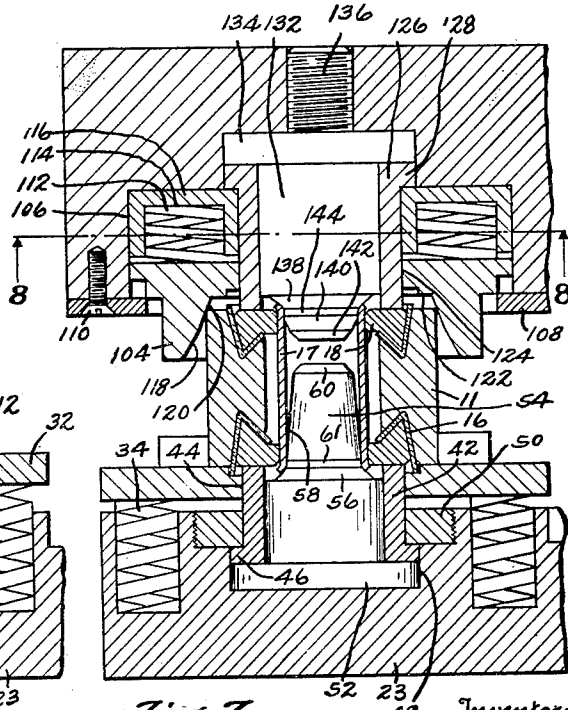


Fig. 7

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UNITED STATES PATENT OFFICE

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COMMUTATOR RIVETING MACHINE

Application filed February 15, 1929. Serial No. 340,073.

This invention relates to the manufacture of commutators for dynamo electric machines and particularly to commutators comprising an annulus of metal segments separated by
5 pieces of sheet insulation, the segments and the insulating pieces having dove-tail shanks which are permanently clamped between the metal V-rings held together by a hollow core or tubular rivet, the end edges of which are
10 deformed or swaged against the outer faces of the V-rings. This is a machine to carry out part of the method set forth in the patent to Conklin, No. 1,503,484, patented Aug. 5, 1924.

15 One of the objects of the present invention is to provide a commutator riveting machine having means for aligning the commutator, means for clamping the rings, means for deforming a tubular rivet and means for
20 stripping the commutator from the aligning means. The provision of means for aligning and of means for stripping the commutator from the aligning means results in increased production, a more uniform product, and
25 fewer defective pieces, thereby reducing the cost of production.

Another object of this invention is to provide means for automatically feeding pre-assembled commutators to and from an operating station. This is accomplished by providing a rotary turn-table having a plurality
30 of work holders, each work holder being adapted to hold a commutator and to carry the commutator to the operating station. The feeding means permits the operator to insert pre-assembled commutators on the machine when the machine is riveting a commutator thereby increasing the production which also
35 decreases the cost.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred
40 form of the embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a perspective view of the machine.

Fig. 2 is a plan view of the rotary turn-
50 table.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a sectional view of the driving mechanism for the turn-table taken on the line 4—4 of Fig. 3.

Fig. 5 is a sectional view of the driving
55 mechanism taken on the line 5—5 of Fig. 4.

Fig. 6 is a fragmentary sectional view taken on the line 6—6 of Fig. 2 showing the commutator in position prior to the riveting operation.
60

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 2 immediately after the riveting operation and prior to the retracting of the riveting members.
65

Fig. 8 is a sectional view of the cross head
65 taken on the line 8—8 of Fig. 7.

Fig. 9 is a plan view of the commutator.

Fig. 1 is drawn to a smaller scale than Figs. 3, 4, 5 and 8.
70

Figs. 6, 7 and 9 are drawn to a larger scale than Figs. 3, 4, 5 and 8.

This machine comprises a frame; a turn-table mounted on the frame, the turn-table having mounted thereon a plurality of tool
75 sets including a work support, a clamping member and a riveting member; means for intermittently rotating the turn-table; a reciprocating cross head carrying an aligning member; a clamping member; a riveting tool,
80 and a driving mechanism for the cross head operating during a rest period of the turn-table.

Referring to the drawings, 10 designates an annulus with metallic segments 11, separated by non-conducting segments 12.
85 These segments have been assembled previously either by hand or by a suitable machine for automatically assembling an annulus of commutators, as for example the machine disclosed in a copending application for a patent to Lora E. Poole, Serial No. 183,080, filed April 12, 1927, and assigned to the Delco-Remy Corporation. The assembled segments are held in position by a metallic
90 clamping ring 13, which temporarily supports the annulus of segments. The segments are each provided with a dove-tail portion 14 so that the annulus will provide two annular V-shaped grooves 15. These grooves are
95 100

lined with non-conducting V-shaped lining rings 16. These rings are made of non-conducting material which may include mica and a binding substance which will soften under the action of heat. For clamping the annulus permanently together, there are provided a central core 17 and two clamping rings 18.

Upon the frame 20 is mounted a base 21 supporting a turn-table 22 comprising a circular plate 23 having an aperture in the center into which is press-fitted a bearing 24, having journalled therein a stud shaft or pin 25. The pin 25 is fitted into an aperture 26 in the base 21 and is provided with a threaded end 27 upon which is a nut 28, abutting a stripping member 29. The stripping member 29 also serves as a washer to hold plate 23 in position, the member 29 being clamped between a shoulder 30 on the pin 25 and the nut 28. Mounted on the turn-table 22 are a plurality of work supporting members or pads 32 spaced from the plate 23 by helical springs 34 seated in apertures 36 in the plate 23. Pads 32 are held down by retaining members 38, each retaining member 38 being provided with a pair of shoulders 41 and 43 which overlap the edges of adjacent pads 32, as best seen in Fig. 2. Member 38 is attached to plate 23 by screws 40 threadedly engaging the plate. The pads 32 are prevented from moving radially by the tubular clamping member 42 which fits into an aperture 44 in the plate. The clamping member 42 is provided with a shoulder 46 which is seated in a recess 48 in plate 23 and an externally threaded annulus 50 engaging internal threads in the recess 48 holds the clamping member 42 down in the recess against a shoulder 52 provided on the riveting member 54, which also fits into the aperture 48. From this it may be readily seen that the annulus 50 rigidly holds the riveting member 54 and the tubular clamping member 42 in the recess. Member 54 is provided with tapered portions 56, 58 and 60, each of which simulates the sides of a frustro-conical member. Intermediate the tapered portions 56 and 58 is a cylindrical surface 61. The function of each of these members will appear more clearly later.

The means for intermittently rotating the turn-table comprises a driven member 70 of a Geneva gear mechanism, attached to the plate 23 by screws 72 and pins 74, the pin 74 being press-fitted into apertures 76 and 78 in the driven member 70 and the plate 23 respectively so as to prevent a relative rotary motion between the plate 23 and member 70. The mechanism for intermittently rotating the Geneva gear driven member 70 comprises a Geneva gear driving member 80. The driving member 80 is keyed to a shaft 82 which carries a worm gear 84 which is driven by a worm 86 carried by the shaft 88, upon

which is mounted a pulley 90 driven by the motor 183 through a belt 91. The part 92 which is integral with the driving member 80, is the usual Geneva gearing lock member which cooperates with a cylindrical recess 94 in the Geneva gear driven member 70. The shelf 96 serves as a cover plate for the housing 98.

On the upright portion 100 of the frame 20 is mounted the reciprocating cross head 102 having mounted thereon a tool carrying block 103 by screws 105 only one of which is shown. An aligning member 104, which is retained in a recess 106 by means of a retaining annular member 108, is secured to the block 103, by screws 110. This aligning member is urged outwardly from the tool carrying block 103 by helical springs 112 seated in cylindrical recesses 114, in the annular collars 116, as best seen in Fig. 7. The aligning member 104 is provided with concentric tapering surfaces 118 and 120 and with an annular recess 122, the function of each of these will appear more clearly later. Member 104 also has an aperture 124 into which fits a tubular clamping member 126 having integral therewith a shoulder 128 fitting the recess 106. Through the center of the tubular member 126 extends the deforming member 132 provided with a collar 134 fitting into a suitable aperture. Member 132 has a threaded end 136 threadedly engaging the block 103 and is provided with tapering surfaces 138, 140 and 142, each of which simulates the sides of a frustro-conical surface. Intermediate the tapered portions 138 and 140 is a cylindrical surface 144. The driving mechanism for intermittently reciprocating the cross head 102 comprises a continuously driven flywheel and belt pulley 150 which may be driven by a belt, not shown. The belt pulley is rotatably mounted on a shaft 152, journalled in the upright support 100. Mounted upon the shaft 152 is an eccentric which cooperates with the connecting rod 154, which is pivotally connected to the cross head 102, so as to reciprocate the cross head 102 whenever shaft 152 is rotated. Rotary motion may be imparted from the flywheel 150 to the shaft 152 by means of a one revolution clutch 156 having the driving member permanently attached to the pulley 150 and the driven member attached to the shaft 152.

A suitable mechanism for causing the one revolution clutch 156 to be engaged will now be described. Mounted on the driving member 80 is a detent 160, secured to the Geneva gear driving member 80 by screws 161, only one of which is shown. This detent actuates a rod 162 passing through a recess 163 in the base 21 and through rectangular transverse aperture in stub-shaft 25 and pivotally connected to an arm 164 by a link 165. Arm 164 is fixedly attached to a shaft 166 journalled in a pair of brackets 168 attached to the frame 100, only one of the brackets 168 being shown.

Near one end of the shaft 166 is mounted another arm 170, which is pivotally connected to a trigger, of a well known construction hence not shown, on the clutch 156, by a connecting link 172. A compression spring 174 surrounding a portion of the link 172 and positioned intermediate a nut 176, which threadedly engages the link 172, and a bracket 178 mounted on the frame 100, urges the connecting link upwardly toward the clutch 156, as viewed in Fig. 1, thereby tending to rotate the shaft 166 in a counterclockwise direction, as viewed in the direction of the arrow in Fig. 1, so as to bias rod 162 towards member 80. It can be readily seen that as the Geneva gear driving member 80 rotates and when the pin 180 in member 80 is out of engagement with Geneva gear driven member 70, the detent 160 will move rod 162 to the left, as viewed in Fig. 4, thereby rotating shaft 166 in a clockwise direction so as to release the trigger of the one revolution clutch 156, thereby causing the shaft 152 to be rotated through one revolution forcing the cross head 102 downwardly and then upwardly.

Operation

The operator, before setting the machine in motion, places a pre-assembled commutator, on a work support located in position A and a pre-assembled commutator on each work support from A in a clockwise direction as viewed in Figs. 1 and 2 to and including B. In Fig. 6 the pre-assembled commutator has been shown before the operation. The tubular member 17 is guided by the tapered portion 58 of member 54 and fits snugly over the cylindrical portion 61 resting on the tapered portion 56. The lower clamping ring 18 and the commutator segments 11 and 12 rest on the supporting pad 32, the supporting pad 32 having a recess 182 so as to permit the segments 11 and 12 to come in contact with the pad. The recess 182 also permits the lower insulating V-ring 16 to fit into this recess.

The flywheel 150 may now be set in motion and then the motor 183 started so as to supply power to the machine. The turn table 22 is intermittently rotated by the Geneva gearing 70, 83 so as to periodically rotate the turn table. The work supports are so arranged on the turn table that when the turn table is at rest, the rivet deforming member 54 on the turn table and the rivet deforming member 132 carried by the reciprocating cross head 152 are aligned.

As the detent 160 on the driven Geneva gear member 80 actuates member 162 to the right as viewed in Fig. 4, the flywheel 150 will be connected with the shaft 152 during one revolution of the flywheel, thereby bringing the crosshead 102 down to the position disclosed in Fig. 7 so as first to align the commutator segments by means of member 104 engaging the commutator segments

by its surfaces 118 and 120 so as to resiliently hold the segments between members 32 and 104, then to clamp clamping rings 18 between clamping members 42 and 124 so as to force the rings 18 into the V-shaped notches 14 in the segments 11 and 12. After the rings 18 have been partially clamped by members 42 and 124, the tubular member 17 will then be engaged by member 132, and as member 132 approaches member 54, each of the ends of 17 will be flared or swedged, as clearly seen in Fig. 7.

As the crosshead returns to the "up" position, the commutator may follow the crosshead upwardly part ways. The upward movement, however, is limited, as the stripping member 29 will engage the outwardly extending riser bars 212, thereby limiting the upward movement of the commutator and stripping it from the aligning means.

Immediately after the crosshead has cleared the commutator segments, the driving member of the Geneva gear 80 is ready to engage and rotate the driven member 70, thereby advancing another work support with a pre-assembled commutator thereon to position B, which will be acted upon next. The detent 160 again engages member 162 thereby setting the crosshead in motion so as to rivet the tubular member of this commutator.

During the rest period of the work table and during the time that the commutator segment is being acted upon by the reciprocating crosshead, the operator places a pre-assembled commutator on the work support, which has been advanced to position A, there being sufficient time during the rest period for the operator to remove a riveted commutator at station C and to place a pre-assembled commutator on the work support at station A.

It will be noted in Fig. 7 that the tubular member 17 has been partially flared, the reason for this being that it is sometimes desirable to first partially flare the rivets so as to loosely hold the commutator segments and then to apply heat so as to soften the insulating material to permit the final operation of assembling the commutator segments.

This invention is not limited to the manufacture of commutators having two rings, each separate from the tubular core. It may be used with a slight modification in the manufacture of commutators having one of the V-rings integral with the sleeve. It may also be used where the clamping rings are fixed in position in one step. It will be readily seen that this machine will expedite the step of riveting the commutators in that the commutator segments are automatically aligned with the deforming members, in that the pre-assembled commutators are automatically fed to the deforming mem-

bers, and in that the commutators are automatically stripped from the aligning means, thereby reducing the manual labor required, consequently securing a more uniform product and materially reducing cost of production.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, a plurality of movable devices each adapted to hold a preassembled commutator, means for forming the end of the rivet so as to hold the clamping rings in spaced relation, and means for automatically moving the commutator holding devices successively into rivet forming position.
2. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, a turn-table having a plurality of devices each adapted to support a commutator, means for intermittently rotating the turn-table, a device for forming the end of the rivet to hold the clamping rings in spaced relation, and a mechanism for operating said rivet forming device during a rest period of said turn-table.
3. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, a plurality of devices each adapted to hold a pre-assembled commutator; means for forming the ends of the rivets to hold the clamping rings in spaced relation; and means for moving the work holders intermittently and successively to and from the rivet end forming means and means for causing the end forming means to operate during a rest period of the work holders.
4. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, a base, a head movable relative to the base, aligned rivet-end deforming members supported by the head and base respectively, members engaging the clamping rings and supported by the head and base respectively, independent means supported by the head for aligning the commutator with said rivet deforming members and said ring clamping members, the clamping members engaging

the rings before the deforming operation begins, and mechanism for operating the movable head for advancing said head toward the base whereby the tubular rivet is deformed so as to hold the clamping rings in engagement with the segments.

5. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, a work table; a plurality of tool sets mounted on the work table, each tool set including a resiliently mounted pad for supporting the pre-assembled commutator, a clamping member for engaging one of the clamping rings and a rivet deforming member for deforming the rivet; and means cooperating with each of the tool sets in succession for clamping the parts against the tool set for holding the clamping rings in spaced relation and for causing the tubular rivet to be deformed.

6. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation; which comprises in combination, a work table; a plurality of tool sets mounted on the work table, each tool set including a work support for supporting the work piece, a clamping member for engaging one of the clamping rings, and a rivet deforming member for deforming the rivet; driving means; and movable means actuated by the driving means for cooperating with each of the tool sets in succession for clamping the work against the tool set so as to hold the clamping rings in spaced relation and to cause the tubular rivet to be deformed.

7. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, a work table; a plurality of tool sets mounted on the work table, each tool set including a work support, and a rivet support; driving means; movable means actuated by the driving member for cooperating with each of the tool sets in succession for clamping the work against the tool set, the movable means swedging the rivet when clamping the work against the tool sets so as to hold the clamping rings in engagement with the segments.

8. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, a work table; a plurality of tool sets, each tool set including a clamping member and a rivet supporting member; driving means; movable means actuated by the driv-

ing means; a clamping member carried by the
movable means cooperating with each of the
clamping members on the work table in suc-
cession to hold the clamping rings in spaced
relation; and a rivet deforming means car-
ried by said movable means for deforming the
rivet when the clamping rings are held in
spaced relation by the clamping members.

9. A machine of the class described, com-
prising in combination, a rotary turn table;
a plurality of work supports mounted on the
turn table, each support including a resilient-
ly mounted annulus and a fixed core, the an-
nulus and the core cooperating to hold a work
piece; a reciprocating crosshead; a forming
tool carried by the cross-head; means for in-
termittently rotating the turn table to align
the work supports in succession with the tool;
means carried by the cross head for aligning
a workpiece, said work piece being supported
by the work support in alignment with the
forming tool; and means for reciprocating
the cross head during the rest period of the
turn table whereby the tool is caused to de-
form the work piece.

10. A riveting machine for a commutator
comprising an annulus of insulated segments,
clamping rings for engaging the segments,
and a tubular rivet for holding the rings in
spaced relation, which comprises, in combi-
nation, means for aligning the commutator
segments; means for applying axial pressure
upon the clamping rings; other means for de-
forming the rivet to cause it to hold the rings
in clamping engagement with the segments,
said aligning means aligning the commutator
with the rivet deforming means before the
axial pressure means operates and causes
axial pressure to be maintained upon the
commutator while the rivet is being de-
formed; and mechanism for operating each
of said means.

In testimony whereof I hereto affix my sig-
nature.

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