July 27, 1954 H. H. SIMSHAUSER 2,684,523

ASSEMBLY MECHANISM

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Fig. 1

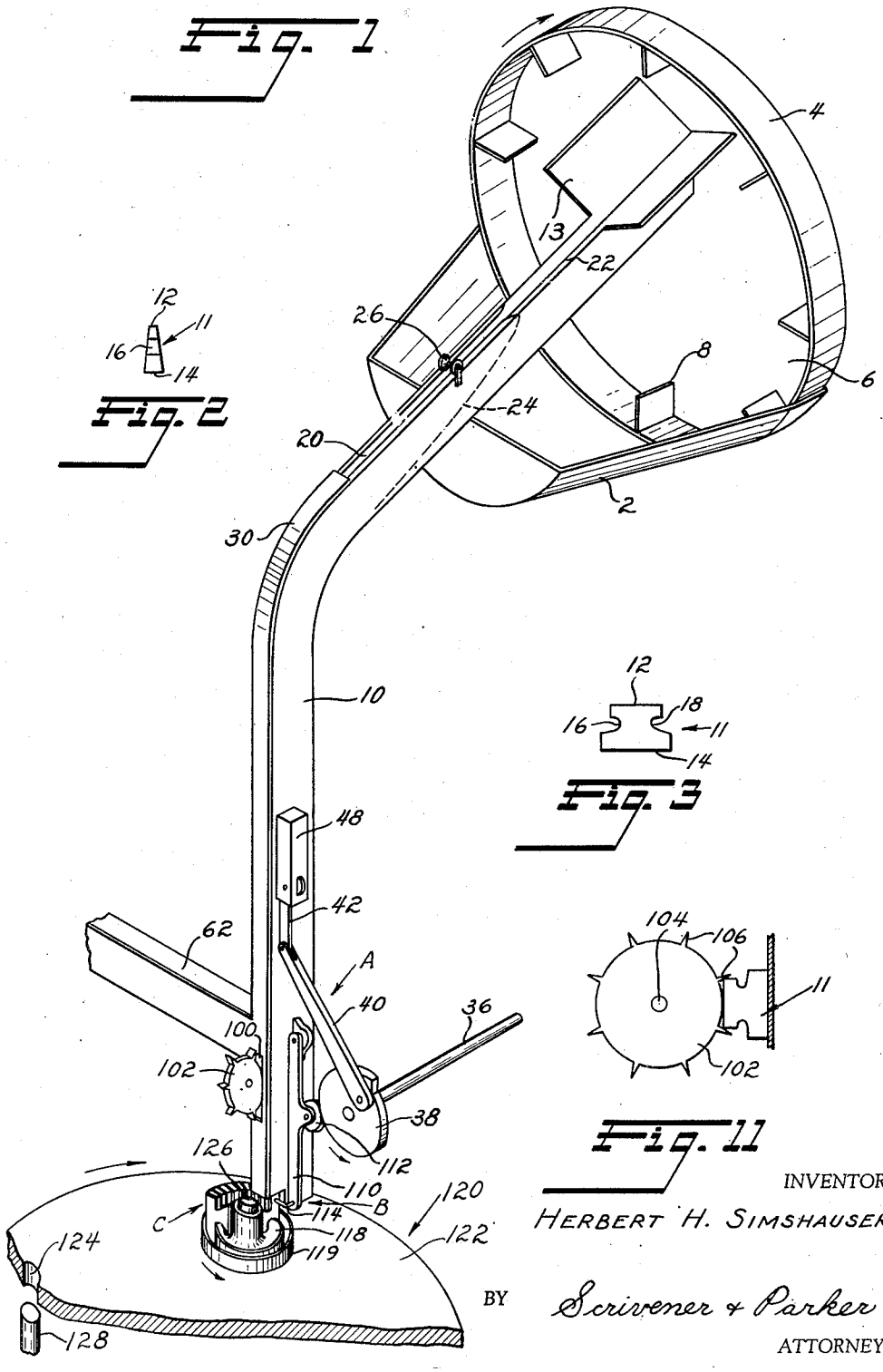



Fig. 2




Fig. 3




Fig. 11




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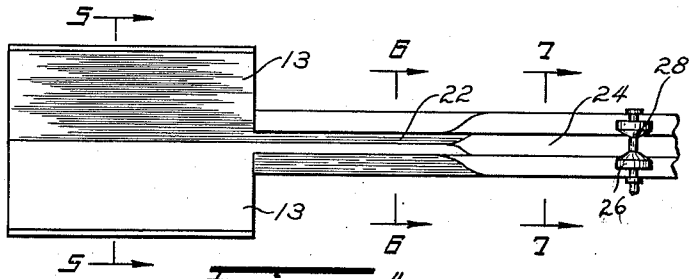



Fig. 4

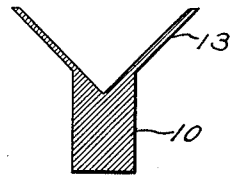



Fig. 5

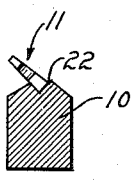



Fig. 6

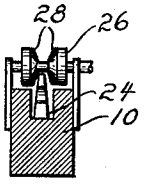



Fig. 7

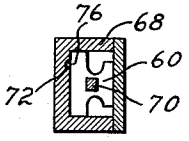



Fig. 12




Fig. 8

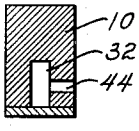



Fig. 9

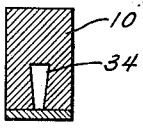



Fig. 10

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2,684,523

## ASSEMBLY MECHANISM

Herbert H. Simshauser, Ravenna, Ohio

Application June 16, 1950, Serial No. 168,400

5 Claims. (Cl. 29—205)

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The present invention relates to an assembly mechanism and, more particularly, to an apparatus for assembling the parts of a commutator or like device.

Heretofore, commutators have been assembled by hand or by the use of large and expensive mechanisms. To overcome the inherent difficulties encountered in the manufacture and use of the prior mechanisms, the present invention provides a novel construction which is so constituted as to enable the elements of the commutator to be quickly and easily assembled with the minimum amount of manual effort.

The principal object of the present invention is to provide novel means for directing the bar segments in the correct position to the assembly station and also to direct the insulator elements to the same station.

A further object of the invention is to provide a novel switching means for the motor which controls the operation of the apparatus.

A still further object of the invention is to provide a new and improved chute for conveying the bar segments in properly aligned relation to the assembly station.

A still further object of the invention is to provide new and novel conveying means for the insulator elements so that the latter may be efficiently conducted from a magazine to the assembly station.

Other objects and features of novelty of the invention will be made apparent by the following description and drawings which, it will be understood, are only illustrative of the invention and impose no limitation thereon not imposed by the appended claims.

Referring to the drawings, in which similar reference numerals refer to like parts,

Fig. 1 is a perspective view of a commutator assembly apparatus embodying the principles of the present invention;

Fig. 2 is an end view of a commutator bar segment;

Fig. 3 is a plan view of a segment;

Fig. 4 is a partial top plan view of the commutator segment assembly chute;

Fig. 5 is a transverse sectional view of the chute taken on line 5—5 of Fig. 4;

Figs. 6 and 7 are transverse sectional views taken on lines 6—6 and 7—7 of Fig. 4;

Fig. 8 is a sectional view of a portion of the apparatus and illustrates the cooperative relationship between the feeding of the segments and the feeding of the insulator elements;

Figs. 9 and 10 are sectional views of the bar

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segment chute taken on lines 9—9 and 10—10, respectively of Fig. 8;

Fig. 11 is a perspective view of the aligning wheel; and

Fig. 12 is a sectional view of the insulator element magazine taken on line 12—12 of Fig. 8.

Referring more particularly to Fig. 1, the novel commutator assembling apparatus of the present invention is illustrated therein as including a hopper 2 for receiving a plurality of commutator bar segments. These segments are delivered, in a manner which will appear more fully hereinafter, to a chute 10 and are fed downwardly through an entrance section to an assembly station A where individual commutator bar segments are matched with individual insulator elements fed from a magazine, and delivered in pairs to a final assembly station B in order to produce the commutator as shown at C.

Means are provided for elevating and conveying segments from the hopper 2 to the chute 10, and as illustrated, such means includes a rotating rim 4 provided with a cover plate 6 on the rear face thereof. Inwardly directed projectors 8 are secured to the inner surface of the rim 4 and the latter is adapted to rotate in the hopper through the pile of segments therein in order to elevate the same and convey them to the chute 10. The elevating rim 4 may be suitably driven by means of an electric motor through a V-belt drive, chain and sprocket or other suitable means, not illustrated.

As will be observed from Figs. 2 and 3, the commutator segments 11 are irregularly shaped so as to provide a pair of opposite sides 12 and 14 having different lengths, such sides being connected by curved portions 16 and 18. Such segments are also wedge-shaped or tapered as illustrated in Fig. 2. When the segments are finally assembled at C, Fig. 1, it is seen that the sides 12 are directed inwardly while the sides 14 constitute the outer periphery of the commutator. Since it is necessary that the segments be delivered to the final assembly station B in proper position to result in the arrangement shown at C, the present invention provides a novel construction for properly aligning the segments as they are conveyed along the chute 10.

In order to provide the foregoing, the chute 10 is rectangular in section and is provided at its upper inclined end within the elevating mechanism with diverging flanges 13 which receive the segment as they fall from the projections 8. A groove 20 extends throughout the length of the chute and is V-shaped in cross-section adjacent

the flanges 13, as shown at 22 in Fig. 6, and gradually changes in shape to a rectangular section 24, as shown in Fig. 7. The depth of the groove also gradually increases to a point wherein the entire bar segment is disposed within the body of the chute. The bar segments are tapered in section, as shown in Fig. 2 and, as the segments slide down the chute, the sides 14 thereof are adapted to ride in the groove. In the event one of the segments falls into the chute with its side 12 engaging the groove, the weight of the side 14 of the segment will cause it to fall out of the chute over the edges of the V-shaped portion and back into the hopper. Those segments properly positioned in the chute will pass from the V-shaped portion to the rectangularly grooved portion of the chute and thence to the assembly station.

Additional means are provided for insuring proper positioning of the bar segments in the chute 10. Such means includes a guard wheel 26 which is rotatably mounted above the chute 10 adjacent the section 24. The guard wheel is provided with flanges 28, the adjacent inner faces of which converge toward the center of the wheel. As the bar segments move down the chute 10 in the groove, these segments properly positioned will pass between the flanges 28 of the wheel 26. However, in the event a bar segment is positioned in the groove in reversed position, the side 14 thereof will engage the flanges of the wheel and the rotary movement of the wheel will either cause the segment to be turned to its proper position in the chute or cause the segment to be ejected and returned to the hopper 2. After the bar segments are properly positioned in the groove, as above stated, they move by gravity to the vertical portion of the chute and to the assembly station A. A cover plate 30 is provided on the vertical continuation of the chute 10 to confine the segments in the groove 20.

Positive means are provided for moving the bar segments through the lower, vertical portion of the chute, it being pointed out that the shape of the groove 20 adjacent the assembly station A gradually changes from a rectangular section 32 to a wedge-shaped section 34, see Figs. 9 and 10, in order to frictionally engage opposite surfaces of the segments and thus prevent the feeding thereof by gravity. As shown, such means includes a motor-driven shaft 36 having mounted on the end thereof a cam wheel 38 on one face of which is mounted an upwardly extending arm 40, the free end thereof being moved rectilinearly during rotation of the wheel 38. A crank 42 is mounted on the free end of the arm 40, the free end of the crank extending through a slot 44 formed in the side wall of the chute 10 and into the groove 20 formed therein, the end of the crank forming a dog 46 provided with an inclined end for a purpose which will appear more fully hereinafter. An enclosure 48 overlies the upper portion of the crank 42 and is mounted on the chute 10. Suitable means comprising a spring pressed roller 50 are mounted in the enclosure, the edge of the roller engaging the crank to resiliently maintain the crank in the slot 44. A spring finger 52 extends through the wall of the chute slightly above the slot and is positioned to normally engage one of sides 12.

In order to positively feed the bar segments 11 to the assembly station A, the shaft 36 is rotated in order to reciprocate the crank 42. As the segments move through the groove 20 in the chute 10 and past the spring finger 52, the dog 46 engages the reduced neck portion of the segment, defined by one of the curved portions 16, 18, and forces the segment 11 down the chute. The next succeeding segment has begun its movement down the chute and as the dog 46 moves upwardly on its return stroke, the spring finger 52 engages the surface thereof between the curved portions 16 and 18 and the side 14 and prevents the succeeding segment from being forced back up the chute by the upward movement of the dog 46. The operation is repeated and the succeeding segments positively fed down the chute. Since, as above stated, the groove 20 in the chute 10 below the slot 44 assumes the wedge-shaped section 34, see Fig. 10, the segments are held therein by friction thereby enabling the positive feeding action. The end of the dog 46 is inclined in order to permit the dog to readily pass over the succeeding segment on its upward movement.



Novel means are provided for feeding insulator elements 60 to the assembly station A in side-by-side relation to the bar segments 11, it being pointed out that the insulator elements 60 are shaped similarly to the segments 11 except that they are not tapered. As illustrated, such means includes a rectangular magazine 62 extending at right angles to the chute 10 and opening into the groove 20 in the chute below the slot 44 and on the opposite wall of the chute therefrom, the magazine being adapted to receive a series of insulator elements 60. Suitable means, such as a hinge 64 may be provided for opening the magazine and inserting the elements therein. The lower portion of the groove 20 in the chute 10 is enlarged sufficiently at 66 to receive an element 60 and a segment 11, the two being held therein by friction. A plunger 68 is slidably mounted within the magazine 62, and is provided at its end adjacent the insulator elements with an elongated projection 70. A groove 72 is provided in one of the side walls of the magazine 62, as seen in Fig. 8, the groove extending to an opening 74 formed in the side wall of the magazine near its forward end. Attached to the plunger 70 by suitable means is a cord 76 or other similar flexible material which cord is positioned in the groove 72 and which extends through the hole 74 to the outside of the container. Mounted on the free, outer end of the cord is a weight 78, the pull of the weight firmly pressing the plunger 68 and its associated projection 70 against the elements 60 to force them into the groove 20 in the chute 10.

Novel switching means are also provided for controlling the operation of the electric motor which operates the shaft 36, the motor being controlled by the number of insulator elements in the magazine 62. Mounted on the underside of the magazine is a switch 80 having a contact arm 82 mounted on a shaft within housing 84. A slot 86 is provided in the underside of the magazine 62 above the switch and a finger 88 projects through the slot 86 and into the magazine. A spring 90 is mounted in the slot, one end being attached to the finger 88, the other being attached to the lower face of the magazine. As will be seen in Fig. 8, as the insulator elements move toward the chute 10, the finger 88 will be forced by the insulator elements to the right, thereby moving the contact arm 82 to the "on" position and thereby starting the motor. As soon as the last insulator element passes the finger 88, the spring 90 will pull the arm to the left thereby

opening the circuit to the motor and stopping the same.

Means are provided for maintaining the bar segments and insulating elements in aligned side-by-side relationship as they move toward the lower end of the chute. A slot 100 is formed in the cover plate 30 adjacent the end of the magazine 62. A wheel 102 is mounted on a shaft 104 attached to the chute, the wheel being provided with spaced teeth 106, the distance between teeth being equal to the length of the upper sides of the bar segments 11 and insulating elements 60. A portion of the toothed wheel extends through the slot into the passage in the chute and, as the bar segments 11 and insulator elements 60 move adjacent to each other, one of the teeth on the wheel 102 engages the reduced sides thereof and properly positions them in side-by-side relation. The downward movenemt of the segment and element causes the wheel to revolve and causes the following tooth to engage the next pair of commutator elements. A spring finger 108 extends into the passage in the chute 10 below the magazine 62 adjacent the end of the chute, the spring finger engaging the upper surface of an insulator element as it is projected through the chute to provide additional friction.

Novel means are provided for properly positioning each pair of commutator parts in a commutator spool. As shown, such means includes an arm 110 which is pivotally mounted on the side wall of the chute 10 adjacent the cam wheel 38, the lower end of the arm extending below the end of the chute 10. A roller 112 is mounted on the arm 110 and abuts the cam surface of the wheel. The lower end of the arm 110 is provided with a plunger 114 which extends beneath the chute 10 and which is adapted to engage the pair of commutator parts as they are ejected from the chute. A spring 116 maintains the arm 110 against the cam surface of the wheel 38. As the parts emerge from the chute 10, they drop into a commutator spool 118 and associated cage 119 and the plunger 114, working in synchronism with the crank 42, engages the parts and rotates the spool a distance equal to the thickness of the parts.

As the cam wheel 38 rotates, the arm 114 is withdrawn from beneath chute 10; and another set of parts is then ejected by the action of the crank 42 and the process repeated. After the spool has been filled, the spool is removed from a turntable 120 on which it rests and another spool is positioned beneath the chute to receive the commutator parts.

The turntable 120, which is mounted beneath the chute 10, comprises a revolving plate 122 provided with two holes adjacent the periphery thereof on diametrically opposite sides, only one of the holes, 124, being shown in the drawing. Centering pins are mounted adjacent the periphery of the turntable on opposite sides of the upper surface thereof and are spaced 90 degrees from the above-mentioned holes, only one of the pins, 126, being shown. A lock pin 128 is mounted beneath the turntable and is adapted to be projected through one of the holes by a foot pedal when the apparatus is in use to properly position the spool 118 which is mounted on one of the pins. When the spool 118 is filled with the commutator parts, the lock pin is withdrawn and the turntable rotated 180 degrees to permit the filling of a second spool which has been placed on the second centering pin. The first spool is removed and an empty spool placed on the pin to replace it and the process repeated.

While one form which the invention may take has been described and illustrated, it will be apparent to those skilled in the art that other embodiments, as well as modifications thereof, may be made without departing in any way from the spirit or scope of the invention, for the limits of which reference must be had to the appended claims.

What is claimed is:

1. In apparatus for making commutators having alternate segments of the conducting and insulating types, a chute through which segments of one type are fed and respectively paired with segments of the other type, said chute including aligned sections comprising an entrance section, an assembly section and a delivery section, means for feeding segments of said one type to the entrance section one after the other and in engagement with each other, a magazine communicating with the assembly section and angularly positioned with respect to said chute, said magazine housing a plurality of segments of the other type in contact with each other, means for constantly urging the segments in said magazine toward said assembly section to effect pairing of the respective segments from the magazine with respective segments from the entrance section, and means for successively engaging and positively and intermittently moving the segments in the entrance section through the entrance section to be successively paired in the assembly section with the respective segments from said magazine and for moving said pairs through the assembly and delivery sections, said assembly section being enlarged to permit the segment emerging from the magazine to move the segment from the entrance section laterally in order to pair the same and to permit the next succeeding segment in the restricted entrance section to abut the upper ends of the paired segments and force said pair of segments to the delivery section as said segment is moved through the entrance section toward the assembly section.

2. Apparatus as set forth in claim 1 wherein the means for moving the segments through the entrance section comprises an arm mounted on the chute and having a portion thereof extending into the chute to engage each successive segment to move the same through the entrance section, and means for vertically reciprocating said arm.

3. Apparatus as set forth in claim 2 comprising, in addition, a rotatable plate mounted beneath the end of the chute, a rotatable cage mounted on said plate to receive said paired segments, a plunger engaging one side of the respective paired segments to successively move the cage after successive pairs of segments are received in the cage, and means for reciprocating said plunger in timed relation with said arm.

4. In apparatus for making commutators having alternate segments of the conducting and insulating types, a vertical chute through which segments of one type are fed and respectively paired with segments of the other type, said chute including aligned sections comprising an entrance section, an assembly section and a delivery section said assembly and delivery sections being enlarged to permit reception of the segments in side by side relation, means for feeding segments of said one type to the entrance section one after the other and in engagement with each other, the walls of the entrance section frictionally engaging opposite faces of said segments, a horizontal magazine communicating with the assembly sec-

tion and angularly positioned with respect to said chute, said magazine housing a plurality of segments of the other type in contact with each other, means for constantly urging the segments in said magazine toward said assembly section to effect pairing of the respective segments from the magazine with respective segments from the entrance section, and means for successively engaging and positively and intermittently moving the segments in the entrance section through the entrance section to be successively paired in the assembly section with the respective segments from said magazine and for moving said pairs through the assembly and delivery section, each segment as it emerges from the entrance section engaging the upper edges of a pair of said segments paired in the assembly section and forcing said pair of segments to the delivery section as said segment is moved through the entrance section toward the delivery section, the walls of the delivery section frictionally engaging opposite faces of a pair of said segments.

5. Mechanism for assembling commutators having alternate segments of the conducting and insulating types, comprising a chute including an entrance section adapted to receive segments of one type, an assembly station wherein a segment of one type is paired with a segment of the other type, and a delivery station for said pair, a magazine for segments of the other type angularly disposed to said chute and connected thereto adjacent the assembly station, said assembly station and delivery station being in vertical alignment with said entrance section and enlarged to receive the paired segments, means for moving said segments of one type to the assembly station, and means for moving said segments of the other type to said assembly station to pair the segments of the two types, the paired segments being moved to the delivery station by the next succeeding segment delivered from the entrance section.



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