Jan. 3, 1961 T. W. KALBOW 2,966,739

APPARATUS FOR INSERTING BUSHINGS

Filed Dec. 18, 1957 3 Sheets-Sheet 1

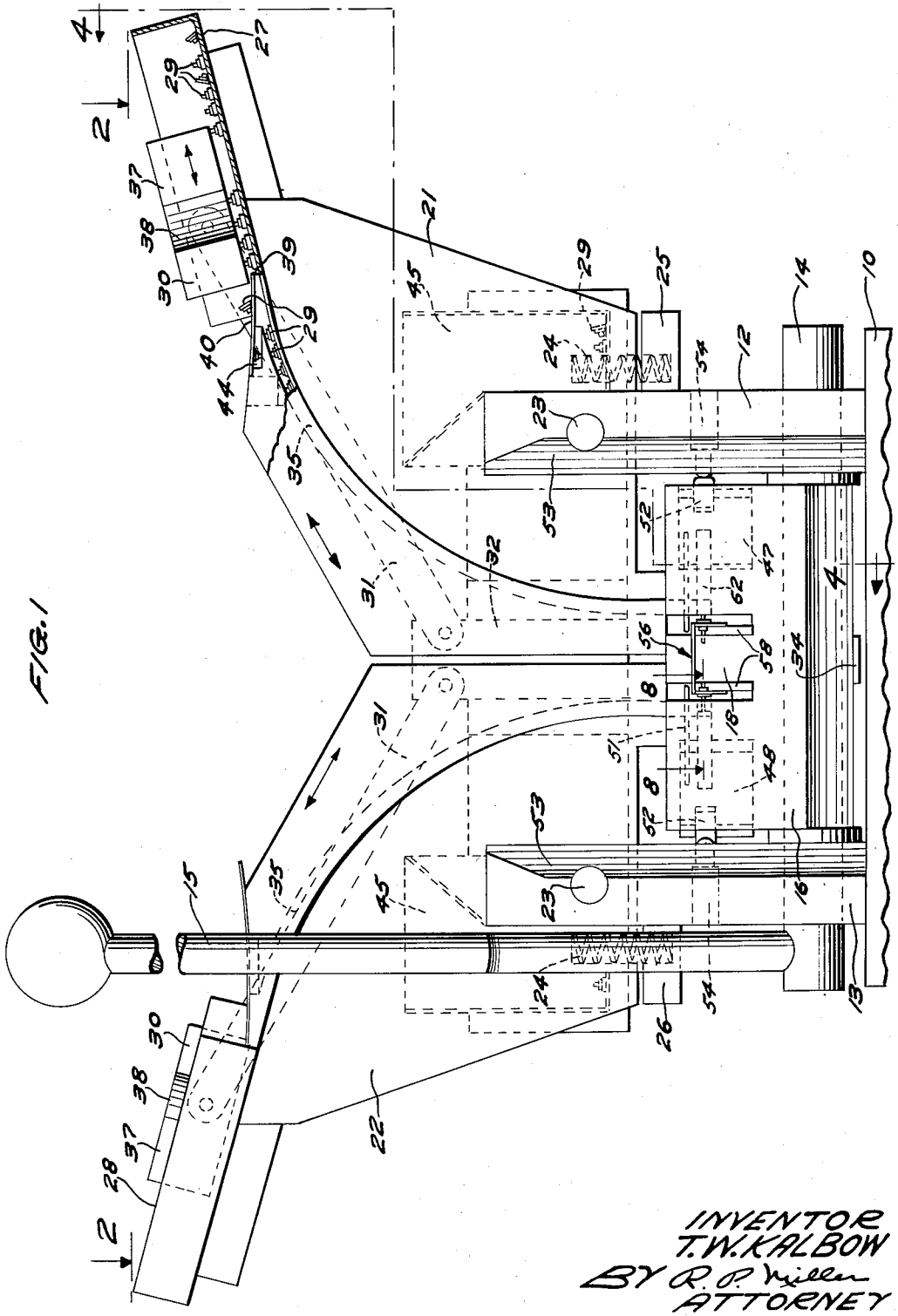


FIG. 1

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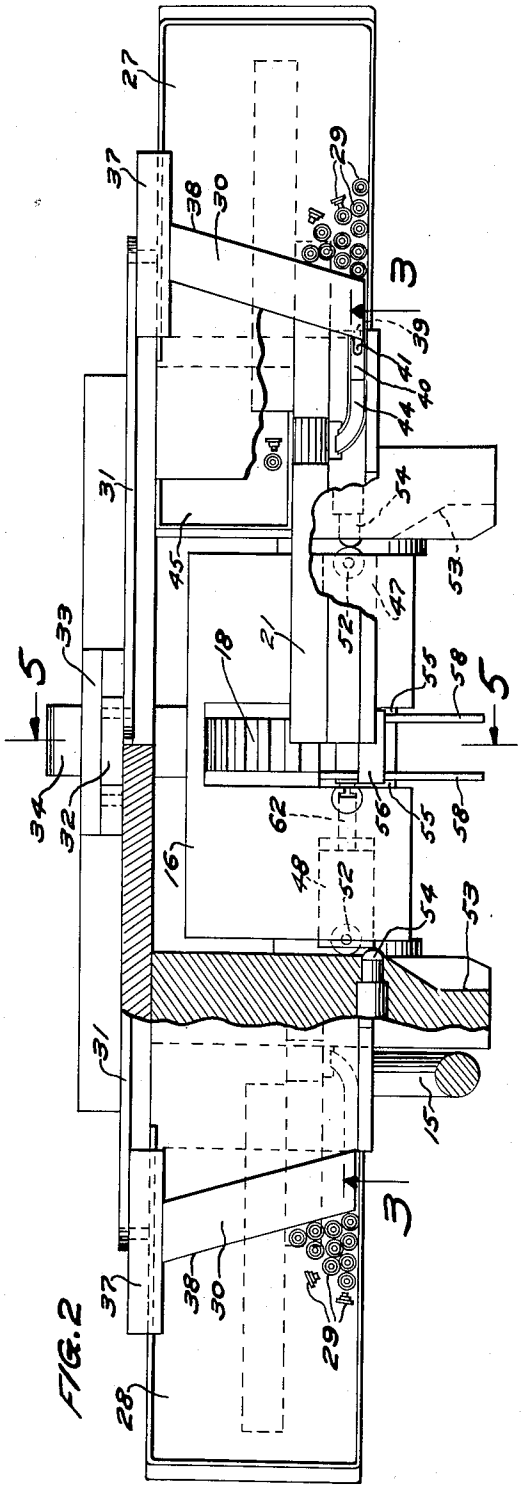


FIG. 2

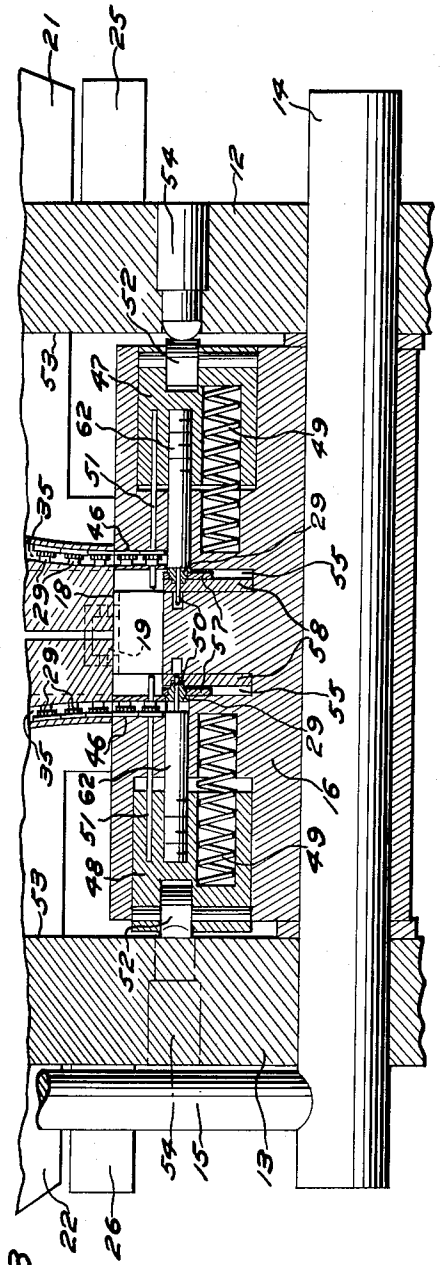


FIG. 3

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APPARATUS FOR INSERTING BUSHINGS

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FIG. 4

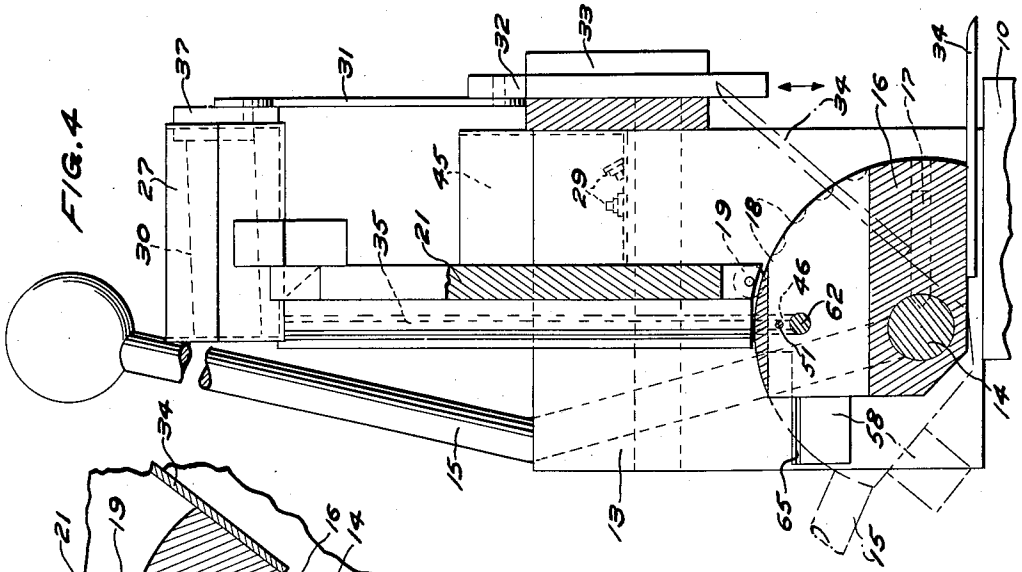


FIG. 5

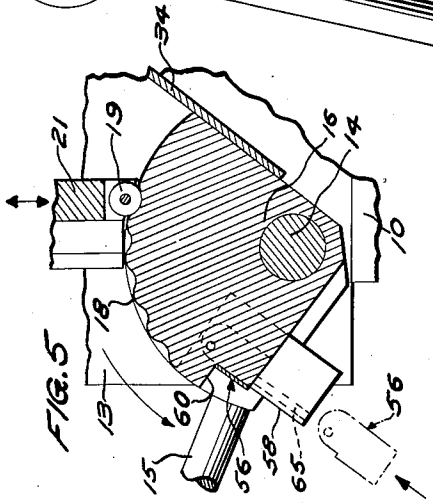


FIG. 7

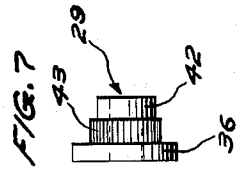


FIG. 6

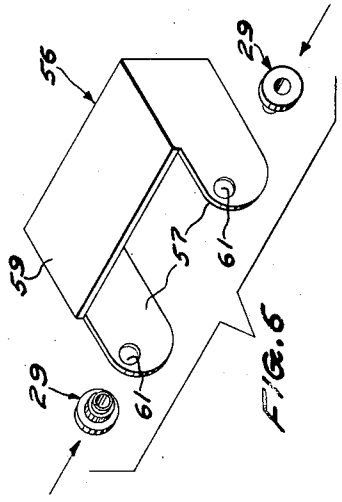
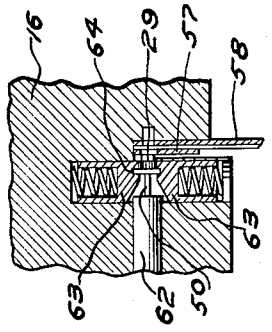


FIG. 8



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APPARATUS FOR INSERTING BUSHINGS

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Filed Dec. 18, 1957, Ser. No. 703,701

17 Claims. (Cl. 29—211)

This invention relates to an apparatus for inserting parts into apertures in a work piece or more particularly to the insertion of miniature bushings into armatures for message registers or the like.

Many difficulties have been encountered in the handling and manipulation of miniature bushings and in the placement thereof into apertures formed in small armatures of a type frequently found in message register counters of telephone switching equipment or teletypewriter apparatus. Often the insertion of bushings of this size is performed by hand operations and has been found to be both expensive and time-consuming. When attempts have been made to insert the bushings by machine, difficulties are encountered in positioning the bushings adjacent to the apertures in the armatures and in inserting them into the apertures automatically while maintaining the bushings in the exact alignment and position necessary to prevent jamming of the machine.

It is, therefore, the object of this invention to overcome these difficulties by providing an apparatus for automatically feeding the parts into exact alignment with apertures in a work piece and for inserting the parts into the apertures at a high rate of speed.

Another object of the invention is to provide a hopper for holding bushings and allowing only those bushings aligned in a predetermined direction to be fed to a work station.

Another object of the invention is to provide a hopper capable of being vibrated and a slide within the hopper capable of being reciprocated to correctly align the bushings to be fed to a work station.

Another object of the invention is to provide a means for inserting one bushing into an aperture of a work piece while preventing the other bushings from interfering with the inserting operation.

A still further object of the invention is to provide a means of sequentially inserting bushings into apertures in one side and then the other of a work piece without defamation thereto.

With these and other objects in view, the present invention contemplates an apparatus for inserting miniature bushings into apertures formed in an armature. The bushings are retained in a pair of hoppers mounted on movable supports and having a bar within each hopper capable of being reciprocated. Extending from each hopper is a downwardly projecting gravity chute which guides the bushings into slots in a rotatable feeding member forming continuations of the chutes. The armature is placed into a centrally disposed recess within the feeding member and between the two slots when the feeding member is in the rearward or retracted position. Upon rotation of the feeding member to the forward position, slidable members within the feeding member seat the two lower-most bushings into the apertures in the armature. The hopper supports and the bars within the hoppers are so connected to the feeding member that, as the feeding member is rotated back and forth, the hoppers are caused to vibrate and the bars to reciprocate to facilitate the feeding of the bushings into the gravity chutes.

Other objects and advantages of the invention will become apparent upon consideration of the following description in conjunction with the accompanying drawings wherein:

Fig. 1 is a front elevation view illustrating a bushings inserting apparatus embodying the features of the present invention;

Fig. 2 is a partial section top elevation view of the apparatus shown in Fig. 1;

Fig. 3 is an enlarged full section view taken along lines 3—3 of Fig. 2 disclosing in detail the manner in which bushings are inserted into the apertures in a work piece;

Fig. 4 is an end elevation, in partial section, of the apparatus shown in Fig. 1;

Fig. 5 is a full section view taken along lines 5—5 of Fig. 2 disclosing the detailed structure used in inducing motion to hoppers;

Fig. 6 is an enlarged exploded perspective view of an armature and the bushings to be inserted therein by the apparatus shown in the other views;

Fig. 7 is an enlarged side elevation view disclosing the detailed structure of a bushing; and

Fig. 8 is an enlarged full section view taken along lines 8—8 of Fig. 1 showing the facilities for holding a bushing before being inserted into an aperture.

Attention is now directed to Figs. 1, 2 and 4 wherein a frame is shown having a base 10 and two upright supports 12 and 13. A shaft 14 extends through the upright supports and is rotatable by means of a handle 15. Mounted on the shaft 14 and rotated thereby is a feeding member 16 which is keyed to the shaft by means of a screw 17 (Fig. 4). The feeding member 16 possesses a sinuated surface 18 centrally located on its upper surface and in engagement with a roller 19 which is rotatably mounted to a pair of hopper supports 21 and 22. The supports 21 and 22 are pivotally mounted to the upright supports 12 and 13 by means of pins 23 and biased toward the sinuated surface 18 by springs 24 positioned within suitable bores formed in the supports 21 and 22 and in extensions 25 and 26 of the upright supports 12 and 13.

A pair of hoppers 27 and 28 are mounted on the supports 21 and 22 and hold a supply of bushings 29 of the type shown in Fig. 7. Two bars 30 are slidably mounted within the hoppers 27 and 28 by means of slides 37 riding on the sides of the hoppers and are adapted to be reciprocated in the hoppers by a system of levers comprising a pair of links 31 and a link 32. The lower link 32 is slidably mounted within a portion of the frame 33 (Fig. 4) and is actuated by a lever 34 mounted on the feeding member 16. As the handle 15 is moved back and forth between the forward or vertical position and the rearward or horizontal position, the lever 34 is rotated with the feeding member 16 between the solid line position and the dotted lined position shown in Fig. 4. This movement of the lever 34 causes the link 32 to move up and down and the links 31 pinned thereto to reciprocate in essentially a horizontal direction thereby giving the bars 30 a reciprocating motion. Also upon the rotation of the feeding member 16 by means of the handle 15, the roller 19 rides along the sinuated surface 18 producing an oscillatory motion in the hopper supports 21 and 22 and to the hoppers 27 and 28 mounted thereon.

The oscillatory movement of the hoppers 27 and 28 facilitate the movement of the bushings 29 down the slightly inclined bottom surface of the hoppers toward downwardly extending gravity chutes 35. The lower surface of the slidable bars 30 are spaced from the bot-

tom of the hoppers 27 and 28 to allow the bushings 29 to fit thereunder, providing the bushings are properly oriented, that is, resting either on their heads 36, or their tubular extensions 42. This spacing between the bars 30 and the bottom surface of the hoppers preclude all bushings that are not so positioned from entering beneath the bars 30. The reciprocation of the bars 30 rearrange those bushings not properly oriented in order to place them in the correct position for entrance under the bars 30. An inclined surface 38 on each bar 30 guides the bushings toward an opening 39 in each hopper which has a width slightly larger than the heads 36 of the bushings 29 for allowing only one bushing at a time to enter the chutes 35. A plate 40 is placed over each opening 39 providing a clearance that will permit only the heads 36 of the bushings to enter beneath the plate 40. Slots 41 (Fig. 2) are formed in the plates 40 to allow tubular extensions 42 of the bushings 29 and raised serrated portions 43 thereof to pass beneath the plates 40 thereby preventing the bushings resting on the tubular extensions 42 from entering the chutes 35. At this point, those bushings not resting on their heads 36 ride along the plates 40 and fall into rejection chutes 44 which guide the rejected bushings into a pair of hoppers 45.

The correctly aligned bushings are guided down the chutes 35 and fall into a pair of slots 46 in the feeding member 16 forming a continuation of the chutes. As shown in Fig. 3, the slots 46 are of a depth to hold three aligned bushings, although they may be constucted to hold more. A pair of blocks 47 and 48 are slidably mounted within a pair of guideways formed in the feeding member 16 and are urged away from the center of the feeding member by means of springs 49. Each slidable block 47 and 48 carries a rod 62 having a pusher pin 50 extending therefrom and a retaining pin 51 which are engageable with the lower-most and next successive bushings respectively in the slots 46. The blocks 47 and 48 also carry rollers 52 on the outside of the blocks which ride along camming surfaces 53 (Fig. 2) of the upright supports 12 and 13. The rounded heads of pins 54 protrude from the camming surfaces 53 along the path travelled by the rollers 52 to impart an inward movement to the blocks 47 and 48 and the pins 50 and 51.

Centrally disposed slots 55 are cut into the feeding member 16 on either side of the sinuated surface 18 to allow the insertion of an armature 56 of the type shown in Fig. 6. As seen in Fig. 5, a pair of forward arms 57 of the armature 56 are placed into the slots 55 along two guiding tracks 58 secured to the feeding member 16 and extending within the slots 55. The tracks 58 are spaced apart a distance less than the distance between the forward arms 57 of the armature 56 to provide a tolerance for variations in the spacings of the forward arms 57. If, however, the armatures 56 are precision made, this tolerance may not be necessary. The armature 56 is inserted along the tracks 58 until the forward edge of the top plate 59 of the armature strikes a surface 60 of the feeding member 16. At this point, apertures 61 formed in the armatures 56 are aligned with the lower-most bushings positioned in the slots 46 of the feeding member. The pusher pins 50 are aligned with both the apertures in the lower-most bushings and the apertures 61 in the armature 56 while the retaining pins 51 are aligned with the apertures of the next successive bushings in the slots 46.

The lower-most bushings are held in the slots 46 by a pair of spring biased members 63, shown in Fig. 8. The members 63 are provided with a notched surface 64 for holding the heads 36 of the bushings 29 and at their most extended position, provide an opening between the notches slightly greater than the width of the heads 36. As the blocks 47 and 48 move forward, the pusher pins 50 enter the apertures in the bushings 29 and the rods 62 cam the spring biased members 63 apart to release the bushings. This procedure allows the lower-most bushings to be supported at all times and prevents the bushings from overturning within the bottom of the slots 46.

Operation

Assuming the handle 15 to be in the rearward position, as shown in Fig. 5, an armature 56 is placed upon the guiding tracks 58 and pushed up into the feeding member 16 until the forward edge of the top plate 59 of the armature strikes the surface 60 of the feeding member. On the forward movement of the handle 15 and the feeding member 16, the blocks 47 and 48 are cammed inwardly by the action of the rollers 52 riding on the camming surfaces 53 of the upright supports 12 and 13. The camming surfaces 53 move the blocks 47 and 48 until the pusher pins 50 enter the aperture in the lower-most bushings and the retaining pins 51 enter the apertures in the next successive bushings. At this point, the rods 62 cam and thus separate the spring biased members 63; however, the bushings have not yet been inserted in the apertures 61 of the armature 56.

As the feeding member proceeds to the forward-most position, the roller 52 of the block 48 engages the projecting rounded end of the pin 54 thereby forcing the face of the rod 62 against the lower-most bushing whereupon the bushing is moved within the aperture 61 and the raised serrated portion 43 of the tubular extension 42 upsets the metal forming the periphery of the aperture to retain the bushing in the aperture 61. Following seating of a bushing by action of the slidable block 48, the same operation is performed by the pusher pin 50 and the rod 62 held by the block 47 as the feeding member reaches the forward-most position. The pins 54 have been offset with respect to each other to provide for the sequential seating of the bushings. If the bushings were simultaneously seated, the opposing seating forces would tend to bend the arms of the armature.

When the feeding member 16 is in the forward-most position an additional bushing is lowered into each slot 46 from the chutes 35 so that there will be at least two bushings in the slots at all times. As the handle 15 is then pulled to its rearward position, the pusher pins 50 and the retaining pins 51 move out of the slots 46 to allow the two bushings now in the slots to drop to the lower-most position. At this point, the armature 56 is allowed to slide from the member 16 along the tracks 58. The unserrated tubular extensions 42 of the bushings 29 which protrude through the forward arms 57 of the armature ride along grooves 65 in the tracks 58 which allows the armature to be released. As the feeding member 16 is continually rotated back and forth to seat successive pairs of bushings into the armatures 56, the sinuated surface 18 and the lever 34 continue to move the hoppers 27 and 28 and the slidable bars 30 therein to feed more bushings into the chutes 35.

It is to be understood that the above-described operation, arrangements of apparatus and construction of elemental parts are simply illustrative of the application of the principles of this invention and many other modifications may be made thereto without departing from the scope and spirit of the invention.

What is claimed is:

1. Apparatus for inserting bushings into apertures in a work piece comprising a base, a pair of supports movably mounted to said base, a hopper attached to each support for holding bushings and having an agitating member therein, a rotatable feeding member for positioning the work piece in a work station, said feeding member having a pair of slots formed therein for receiving a pair of bushings, a downwardly extending gravity chute associated with each hopper for guiding the bushings into said slots, said slots positioned adjacent to the apertures in the work piece, means within said feeding member for forcing the bushings into the apertures upon rotation of the feeding member, a sinuated surface on the feeding member and in engagement with said supports for oscillating said supports and hoppers attached thereto upon

rotation of the feeding member, and means actuated by the rotation of the feeding member for reciprocating the agitating members.

2. Apparatus for inserting bushings into apertures in armatures for message registers comprising a frame having a base and a pair of upright supports, a feeding member rotatably mounted between the upright supports for positioning an armature in a work station and having a centrally disposed recess for receiving the armature, said feeding member having a pair of slots formed therein, a pair of plates pivotally mounted to said upright supports for holding bushing retaining hoppers, a downwardly extending gravity chute associated with each hopper for guiding the bushings into said slots, said slots holding a plurality of stacked bushings and positioned such that the lower-most bushings are adjacent to the apertures in the armature, a pair of members slidably mounted in the feeding member and having pins aligned with the lower-most bushings, means for moving first one of the slidable members and the pin carried thereby and then the other upon rotation of the feeding member into the work station causing the pins to force the lower-most bushings into the apertures, and a sinuated surface on the feeding member in engagement with the plates for inducing an oscillatory motion to the plates and hoppers mounted thereon upon rotation of the feeding member.

3. Apparatus for inserting bushings into apertures in armatures for message registers comprising a frame having a base and a pair of upright supports, a feeding member rotatably mounted between the upright supports for positioning an armature in a work station and having a centrally disposed recess for receiving the armature, said feeding member having a pair of slots formed therein, a pair of plates pivotally mounted to said upright supports for holding bushing retaining hoppers, a bar slidably mounted in the hoppers for orienting the bushings, a downwardly extending gravity chute associated with each hopper for guiding the bushings into slots formed in the feeding member, said slots holding a plurality of stacked bushings and positioned such that the lower-most bushings are adjacent to the apertures in the armature, pusher pins carried by a pair of members slidably mounted in the feeding member and engageable with the lower-most bushings for forcing the bushings into the apertures, retaining pins carried by the slidable members and engageable with the next successive bushing in the slots for preventing the lowering of the bushings into the path of the pusher pins, camming surfaces on said upright supports for moving the slidable members and the pins carried thereby into engagement with the bushings upon rotation of the feeding members, a sinuated surface on the feeding member and in engagement with said plates for inducing an oscillatory motion to the plates and hoppers mounted thereon upon rotation of the feeding members, and means actuated by the rotation of the feeding member for reciprocating the bar within the hopper.

4. In an article feeding apparatus, a movable feed member having a plurality of slots formed therein to receive articles, a hopper associated with each slot mounted on movable supports for storing a supply of articles, a gravity chute for guiding the articles from each hopper to the slot associated therewith, means for moving the feed member, and a sinuated surface on said feed member and in engagement with the supports for inducing motion to the supports and hoppers carried thereby upon the movement of the feed member to facilitate the feed of articles to the chutes.

5. In an article feeding apparatus, a movable feed member having a plurality of slots formed therein to receive articles, a hopper associated with each slot and mounted on movable supports for storing a supply of articles, a bar slidable within each hopper for agitating and orienting the articles, a gravity chute for guiding articles from each hopper to the slot associated with the hopper, means for moving the feed member, said feed member having a sinuated surface in engagement with the supports for inducing motion to the supports and hoppers carried thereby upon movement of the feed member to facilitate the feed of articles to the chutes, and a system of levers actuated by the movement of the feed member for reciprocating the bars within the hoppers to orient the articles.

6. Apparatus for inserting a pair of bushings into a pair of apertures formed in an armature, which comprises, a pair of hoppers for holding supplies of bushings, a rotatable feed member having a recess formed therein to receive an armature, said feed member having a pair of slots extending from the recess to receive bushings, a pair of gravity chutes extending from the hoppers to the feed member, means for moving the feed member to position the slots in the feed member in alignment with the gravity chutes to receive a pair of bushings, a pair of inserting members mounted in said feed member for movement toward said slots, each of said inserting members having a pusher pin and a retaining pin projecting therefrom, and means rendered effective by the movement of the feeding member for moving the inserting members toward said slots to advance the pusher pins to insert a pair of bushings within the apertures in the armature and to advance the retaining pins into engagement with a pair of bushings in said slots.

7. A device for assembling a plurality of parts which comprises, a base, a pair of upright supports mounted on said base and having camming surfaces thereon, a member rotatably mounted between said supports for movement from a loading position to an assembling position, a plurality of communicating recesses formed in said member for holding the parts in spaced relationship, and means slidably mounted in and extending from the sides of said member and engageable with the camming surfaces on the supports upon movement of the member to the assembling position for forcing the parts together.

8. An assembling apparatus which comprises, a base, a pair of upright supports mounted on said base and having camming surfaces thereon, a member rotatably mounted between said supports for movement from a loading position to an assembling position, said member having a centrally disposed recess for supporting an article having apertures therein, said member having a slot on either side of the recess the lower portion of which is in alignment with the apertures in the article, means for feeding parts into said slots, means for rotating the member from the loading position to the assembling position, and a means slidably mounted and extending from each side of the member and cooperating with the camming surfaces on the supports upon movement of the member to the assembling position for moving the lowermost part in each slot into the apertures in the article.

9. In an apparatus for inserting parts into apertures in a workpiece, a base, a pair of upright supports mounted on said base and having camming surfaces thereon, a member rotatably mounted between said supports for movement between a loading position and an assembling position, said member having a centrally disposed recess for supporting a workpiece with apertures formed therein, said member having a pair of slots extending from the recess for retaining parts such that the lowermost part positioned in each slot is in alignment with an aperture in the workpiece, a pair of blocks slidably mounted in and extending from the sides of the member and engageable with the camming surfaces on the support for moving inwardly towards the slots and recess, a pin mounted in each block in alignment with the lowermost part in the slots, and means for moving the member from the loading position to the assembling position for engaging the blocks with the camming surfaces to move the pins inwardly with the blocks whereby the parts are forced into the apertures in the workpiece.

10. In an apparatus for inserting parts into apertures in a workpiece, a base, a pair of upright supports mounted on said base and having camming surfaces thereon, a feed member rotatably mounted between said sup-

ports for movement between a loading position and an assembling position, said feed member having a centrally disposed recess for supporting a workpiece with apertures formed therein, said member having a pair of slots extending from the recess for receiving a plurality of parts such that the lowermost part in each slot is in alignment with an aperture in the workpiece, two pairs of spring-biased oppositely disposed members movably mounted in said feed member and forming the lower walls of the slots, a pair of blocks slidably mounted in and extending from the sides of the feed member, spring means mounted in the feed member for urging the blocks against the camming surfaces, a pin mounted in each block in alignment with the lowermost parts in the slots, and means for moving the feed member from the loading position to the assembling position for moving the blocks along the camming surfaces to move the pins inwardly whereby the pins separate the spring-biased members forming the lower walls of the slots and the parts are forced into the apertures in the workpiece.

11. Apparatus for inserting bushings into apertures formed in a pair of projecting arms of an armature, comprising support means, a feed member movably mounted on said support means for movement into and out of a work station, said feed member having a pair of spaced slots for receiving the bushings and having means formed therein for receiving the projecting arms of the armature with the apertures in the arms positioned adjacent the feed member slots, storage means mounted on said support means for holding a supply of the bushings, means for guiding the bushings from the storage means to each of the feed member slots, members movably mounted in said feed member in alignment with the feed member slots, means on said support means engageable with said movable members when said feed member is moved into the work station to move said movable members and force the bushings into the apertures in the arms of the armature, and means connected to said feed member for moving said feed member into and out of the work station.

12. In an article feeding apparatus, support means, storage means mounted on said support means for holding a supply of the articles, a feed member movably mounted on said support means, said feed member having a slot formed therein to receive an article, a bar slidably mounted on said storage means for agitating and orienting the articles, said bar being spaced from the bottom of said storage means a distance such that the articles will pass thereunder only when properly oriented, said bar extending obliquely across said storage means to guide the articles transversely of said storage means to a predetermined point therein, article guiding means extending between the predetermined point in said storage means and the feed member slot to guide the articles to the slot, pivoted lever means pivotally connected at one end to said bar and slidably mounted at the other end in a slot in said support means, and means on said feed member for engaging and actuating said pivoted lever means when the feed member is moved, to move said bar to orient the articles in said storage means and assist in the feeding thereof into said article guiding means.

13. Apparatus for attaching a plurality of articles to a work piece in a single operation, comprising support means, a feed member movably mounted on said support means, said feed member having a plurality of spaced slots for receiving the articles and having means for receiving portions of the work piece with the portions of the work piece positioned adjacent the feed member slots, a plurality of hoppers mounted on said support means for holding the articles and each associated with one of the feed member slots, separate means for guiding the articles from each of said hoppers to the feed member slot associated therewith, a movable guide bar positioned in each of said hoppers for agitating and orienting the articles therein, members movably mounted in said feed member, means engageable with said movable members for moving the same and forcing the articles onto the work piece, separate means connected to each of said guide bars, and means on said feed member engageable with each of said last mentioned means for inducing movement to the guide bar connected thereto.

14. In an article feeding apparatus, support means, a feed member movably mounted on said support means, said feed member having a plurality of slots formed therein for receiving the articles, a plurality of hoppers for holding a supply of the articles and each associated with one of the feed member slots, means for movably mounting each of said hoppers on said support means, a movable guide bar positioned in each of said hoppers, said bars being spaced from the bottom of their respective hoppers a distance such that the articles are passed thereunder only when properly oriented, each of said bars extending obliquely across its respective hopper to guide the articles transversely of said hopper to a predetermined point therein, separate article guiding means extending between the predetermined point in each hopper and the feed member slot associated therewith, means connected to said guide bars, means on said feed member engageable with said last mentioned means for inducing movement to the guide bars when said feed member is moved, and means on said feed member engageable with said hopper mounting means for inducing movement to said hoppers when said feed member is moved, the movement of said guide bars and said hoppers agitating and orienting the articles in said hoppers and assisting in the feeding of the articles into said article guiding means.

15. Apparatus for attaching a plurality of articles to a work piece in a single operation, comprising support means, a feed member movably mounted on said support means, said feed member having a plurality of spaced slots for receiving the articles and having means for receiving portions of the work piece with the portions of the work piece positioned adjacent the feed member slots, a plurality of hoppers movably mounted on said support means for holding the articles and each associated with one of the feed member slots, separate means for guiding the articles from each of said hoppers to the feed member slot associated therewith, members movably mounted in said feed member, means engageable with said movable members for moving the same and forcing the articles onto a work piece, and means on said feed member engageable with each of said hoppers for inducing movement thereto when the feed member is moved, to agitate and orient the articles therein and assist in the feeding of the articles into said article guiding means.

16. Apparatus for attaching a plurality of articles to a work piece in a single operation, comprising support means, a feed member movably mounted on said support means, said feed member having a plurality of spaced slots for receiving the articles and having means for receiving portions of the work piece with the portions of the work piece positioned adjacent the feed member slots, a plurality of hoppers for holding the articles and each associated with one of the feed member slots, means for movably mounting each of said hoppers on said support means, separate means for guiding the articles from each of said hoppers to the feed member slot associated therewith, members movably mounted in said feed member, means engageable with said movable members for moving the same and forcing the articles onto the work piece, a movable guide bar positioned in each of said hoppers, means connected to each of said guide bars, means on said feed member engageable with said last mentioned means for inducing movement to the guide bars when said feed member is moved, and means on said feed member engageable with said hopper mounting means for inducing movement to said hoppers when said feed member is moved, the movement of said guide bars and said hoppers agitating and orienting the articles in said hoppers and assisting in the feeding of the articles into said article guiding means.

17. Apparatus for inserting bushings into apertures in

a pair of spaced projecting arms of an armature, comprising support means, a feed member movably mounted on said support means for movement into and out of a work station, said feed member having a plurality of spaced slots for receiving the bushings and means for receiving the projecting arms of the armature with the apertures in the projecting arms positioned adjacent to the feed member slots, members movably mounted in said feed member in alignment with the feed member slots, storage means mounted on said support means for holding a supply of the bushings, means for guiding the bushings from said storage means to each of the feed member slots, means on said support means for engaging and moving said movable members in sequence when

said feed member is moved into the work station to force the bushings into the apertures in the projecting arms of the armature, and means connected to said feed member for moving said feed member into and out of the work station.

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