Dec. 17, 1963 KAMEO YOSHIKAWA 3,114,159

PARTS FEEDER FOR AUTOMATICALLY FEEDING BOLTS ONTO WASHERS

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Fig. 1

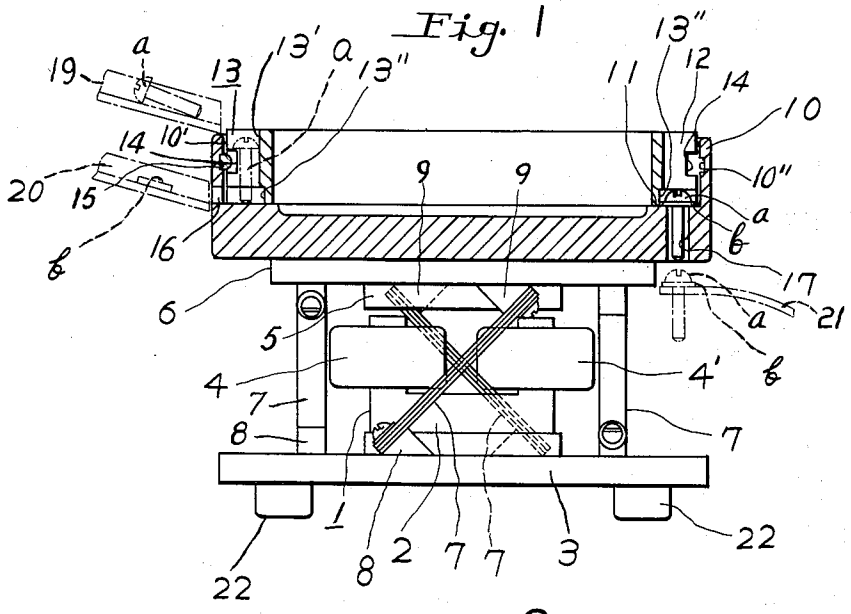

Fig. 2

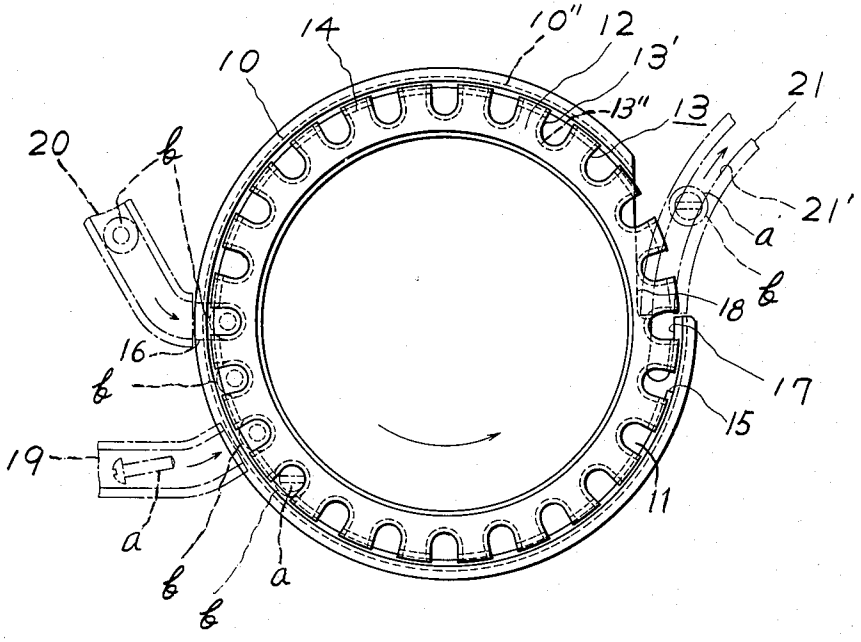

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Fig. 3

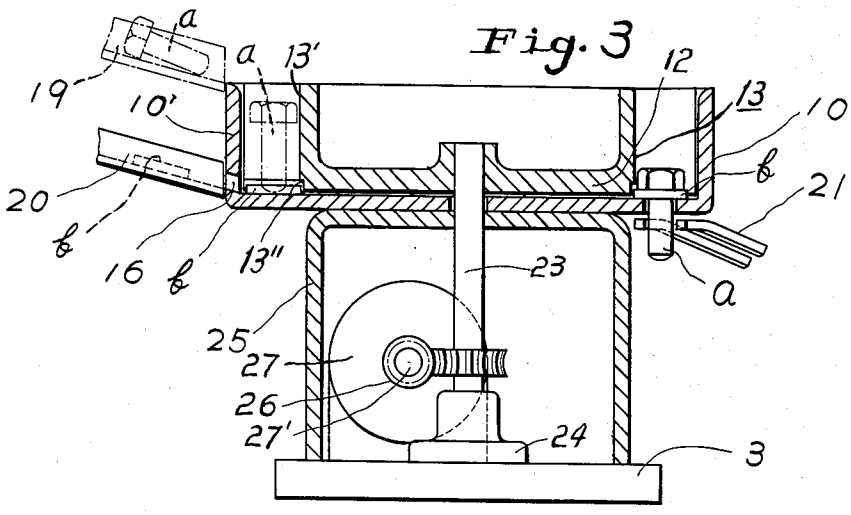
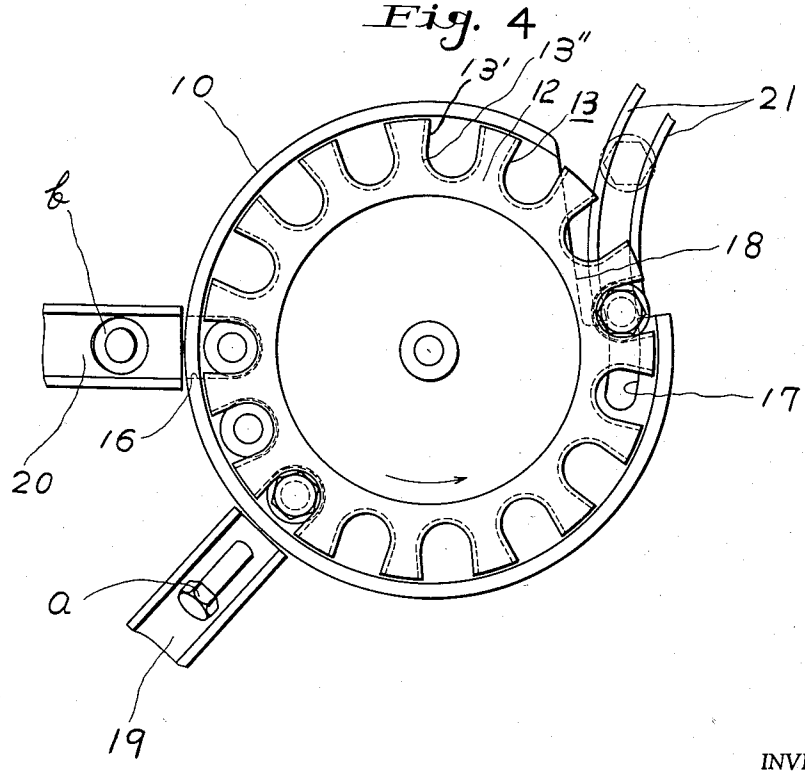


Fig. 4



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3,114,159

PARTS FEEDER FOR AUTOMATICALLY FEEDING BOLTS ONTO WASHERS

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1 Claim. (Cl. 10—135)

This invention relates to parts feeders and in particular to parts feeders in which bolts fed are put in washers in the course of feeding operations.

The object of the present invention is to provide parts feeders which perform automatically an extremely troublesome operation of putting bolts in washers, said operation having hitherto been performed, one by one, manually.

In order to accomplish the above object, a parts feeder in accordance with the present invention provides a cylindrical body placed on the bowl of the feeder to rotate around the inner wall of said bowl by vibratory oscillation, said cylindrical body having on its circumference a plurality of open slots for receiving bolts from their top and receiving washers at their bottom where the slots are enlarged. One slot receives a supply of bolts with their heads upwards and another slot receives washers, and assembles such bolts and washers one by one automatically which thereafter progressively fall on the trough provided outside of the feeder.

Other objects and advantages appear hereinafter in the following description and claims.

The accompanying drawings show for the purpose of exemplification without limiting this invention or the claims thereto certain practical embodiments illustrating the principles of this invention wherein:

FIG. 1 shows a view in side elevation partially in section of an embodiment of the present invention.

FIG. 2 shows a top plan view of FIG. 1.

FIG. 3 shows a view in side elevation partially in section of another embodiment of the present invention.

FIG. 4 shows a top plan view of FIG. 3.

In the drawings, 1 is an electromagnet, 2 an iron core mounted on a base 3, 4 and 4' exciting coils wound on the iron core 2, 5 a movable iron piece facing the iron core 2 and fixed to the under side of a plate 6 on which an upwardly opened bowl 10 is fixed. A plurality of springs are shown by 7, the lower ends of which being fixed to seats 8 and the upper ends of which being fixed to seats 9 in such a way that said springs are arranged symmetrically sloped to a vertical line of symmetry. The bowl 10 has a bottom and an annular wall and a ring formed annular track 11 at the bottom adjoining lower parts of its inner side wall. The bottom of the bowl 10 is cut away as shown at 18 in FIG. 2. 12 is a cylindrical body placed on the track 11 and is rotated in the bowl 10 in a certain direction by vibratory oscillation caused by the electromagnet 1. 13 are laterally open slots provided equidistantly and vertically on the outer circumference from top to bottom of the cylindrical body 12. These slots are of U formed section and are formed by upper portion 13' and lower recesses 13'', each of part 13' and 13'' constituting one slot. The width of the upper part 13' is a little larger than the diameter of bolthead -a- and the width of the lower recess 13'' is a little larger than the diameter of washer -b- which is to be put on a bolt. 14 is a ring formed groove provided horizontally on the outer circumference of the cylindrical body 12, and 15 is a C formed ring forming a shoulder which extends into the groove 14 of the cylindrical body 12 and is inserted in a groove 10'' which is provided on the inner side of wall 10' of the bowl 10. 16 is a hole or slot for feeding washers and is provided horizontally through the wall 10', facing the lower slots 13''. 17 is a portion cut away of the circular track 11 neighbouring the cut away portion 18, the width of the portion 17 being slightly larger than the diameter of bolt stem and slightly smaller than the diameter of the washer and is placed so that its center line substantially coincides with the locus of centers of curvature of slots 13. Each of the bolts -a- carried onto the cut away portion 17 and falls thereinto and engages a washer completely, by engaging the said washer at the neck of the bolt. A trough is shown at 19 which is for feeding bolts -a- to the bowl 10 and the outlet of the trough 19 is placed above the slot 13. Another trough is shown at 20, which is for feeding washers -b- to the bowl 10, and the outlet of the trough 20 is placed facing the hole 16. 21 is a track for feeding out the parts, which is provided on the outside of the bowl 10, below the open end of the cut away portion 17. 21 is a track formed by two parallel beams, longitudinally equidistantly placed, and the gap therebetween, namely 21', has the same width as that of the portion 17. 22 are legs of the feeder. In the drawings the arrows show the direction of rotation of the cylindrical body 12 and the direction of feeding of parts.

When the electromagnet 1 is excited, the bowl 10 makes a helical reciprocating movement, as in the conventional parts feeders, and makes the cylindrical body 12 in the bowl 10 rotate at a certain speed in a certain direction. The cylindrical body 12 is guided by the C formed ring 15 at the groove 14. In the course of the above movement of the bowl 10, washers are fed one by one from the trough 20 to the slot 13'' through the hole 16, and, on the other hand, bolts are fed one by one with their heads upward from the trough 19 to the slot 13'. In each lower part of the slots 13, a washer -b-, and in each upper part, a bolt -a-, are fed, each washer being put on each bolt-end, and are carried continuously to the end of the track 11 of the bowl 10 as the cylindrical body 12 rotates. When bolts and washers are carried one above the other, as above mentioned, onto the portion 17, the stem of bolts -a- fall into the portion 17, and these bolts and washers continue to be carried on the track 11 at the position where washers are completely held by bolts at the neck of the latter. Such bolts and washers maintain this relative position until they arrive at the cut out portion 18 and fall on the track 21, the washers and the bolt-heads being held by track 21.

From the above description it will be made clear that bolts and washers are separately fed to the parts feeders and assembled with the washers completely engaged by the heads of the bolts.

The second embodiment shown in FIGS. 3 and 4 is similar to the first embodiment shown in FIGS. 1 and 2. The numbers appearing in FIGS. 3 and 4, which are the same as those appearing in FIGS. 1 and 2, represent the same parts. The only point on which the second embodiment differs from the first embodiment is that the cylindrical body 12 rotates by means of rotating motor 27, instead of by the vibratory oscillation of the bowl 10. In FIG. 3, 26 is a worm gear mechanism which transmits the rotation of the motor 27 to a shaft 23. 23 is fixed to the bottom of the cylindrical body 12. The motor 27 is mounted on the base 3. The bowl 10 is supported by a frame 25 on the base 3. 24 is a thrust bearing mounted on the base 3, supporting the lower end of the shaft 23. 27' is the rotating axis of said motor 27.

I claim:

A parts feeder consisting of an upwardly open bowl with a bottom and an upstanding annular wall and having a vertical central axis, an annular track in said bowl adjacent said wall, a cylindrical body rotatable in said bowl in cooperation with said track, a plurality of vertically disposed and vertically and laterally open slots in the outer perimetral surface of said cylindrical body and

closed laterally by said upstanding annular bowl wall, an enlarged coaxial concentric recess open downwardly to said track and outwardly to said bowl wall at the bottom of each slot in said cylindrical body, a first feeding station including a horizontal feeding slot in said bowl wall opposite to said enlarged recesses for supplying a part member of the washer type to each enlarged recess to ride on said track as said cylindrical body rotates, a second feeding station at the top of said upstanding annular bowl wall circumferentially spaced in the direction of rotation of said cylindrical body from said first feeding station to deliver headed stem parts to said slots with the stem extending through the washer type part member to ride on said track as said cylindrical body rotates, a cutout in said track bottom to drop the stem and land the head on the washer type part member, a discharge cut-

out in said bowl bottom and wall connected to said track cutout to deliver the headed stems assembled in the washer type part members from said bowl as said cylindrical body rotates, said discharge cutout being spaced circumferentially from said second feeding station to allow said headed stem and washer type member to cooperate while in said laterally open slots to feed these parts in assembled engagement with each other before reaching said discharge cutout.

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