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RIVETING MACHINE

Filed May 13, 1936

2 Sheets-Sheet 1

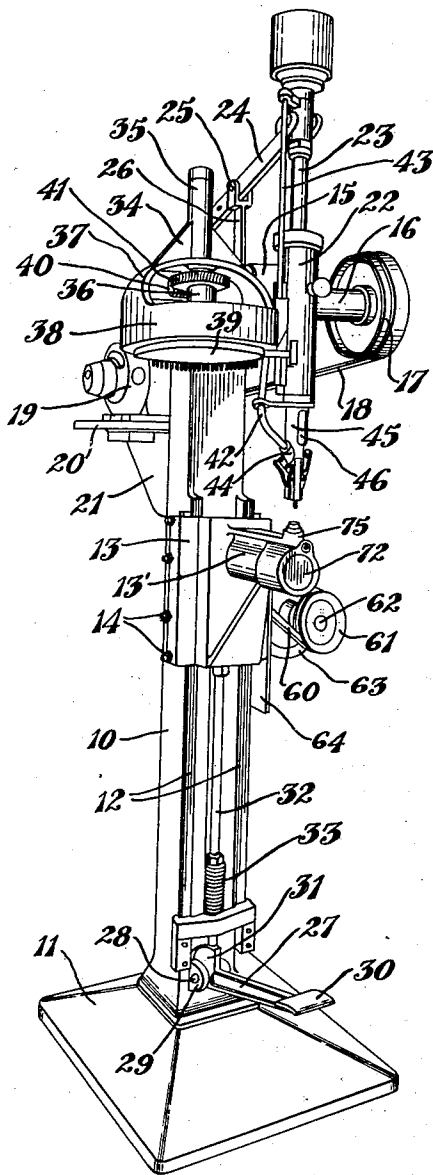


Fig. 1

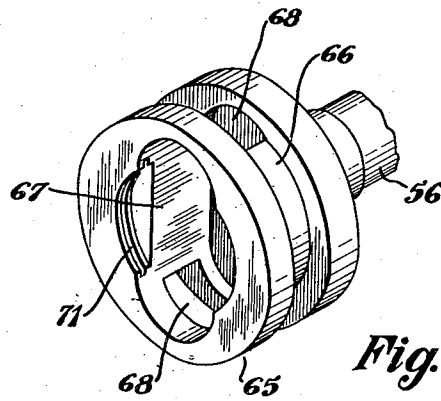


Fig. 5

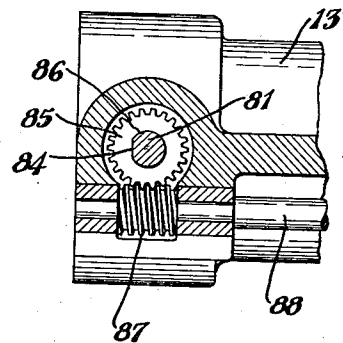


Fig. 4



Fig. 8

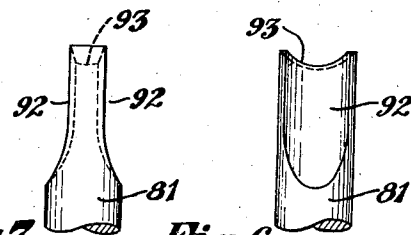


Fig. 7

Fig. 6

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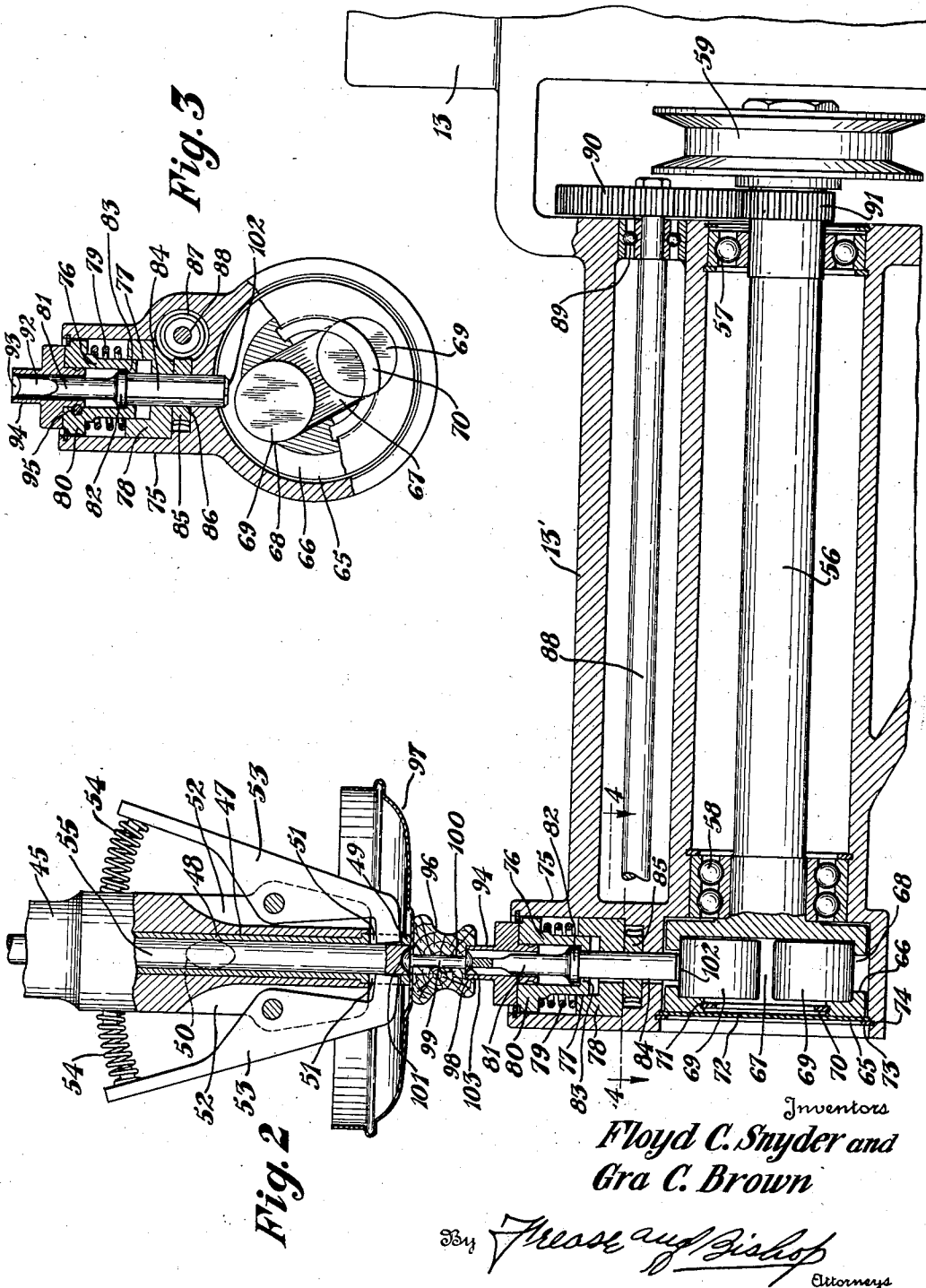
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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RIVETING MACHINE

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13 Claims. (Cl. 78—46)

The invention relates to riveting machines and more particularly to a machine of this character in which the riveting hammer includes a high speed rotary cage containing pressure members adapted to cooperate with a plunger upon which the riveting tool is formed or fixed.

An object of the improvement is to provide a riveting machine including a hammer comprising a high speed rotary cage containing two diametrically opposed pressure rollers adapted to alternately engage an offset plunger upon which is formed or fixed a riveting tool.

Another object is to provide a riveting machine of this character in which the riveting tool is rotated in order to form a uniformly upset head upon the rivet.

A further object is to provide a new and novel form of riveting tool.

Another object of the improvement is to provide an automatic riveting machine which automatically feeds the rivets to the work.

A still further object is to provide a machine of this character which not only automatically feeds the rivets to the work but punches the rivets through the work and in the same operation holds the rivets solidly in position during the riveting operation.

The above objects, together with others which will be apparent from the drawings and following description, or which may be later pointed out, may be attained by constructing the improved riveting machine in the manner illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view of an automatic riveting machine embodying the invention;

Fig. 2 is an enlarged detail sectional view through the riveting hammer and associated parts showing the operation of riveting a knob upon a cooking utensil cover;

Fig. 3, a transverse sectional view through the riveting hammer;

Fig. 4, a fragmentary detail section taken as on the line 4—4, Fig. 2;

Fig. 5, a detail perspective view of the rotary cage;

Fig. 6, a side elevation of the improved riveting tool;

Fig. 7, an edge elevation of the same; and

Fig. 8, an end elevation of the riveting tool.

Similar numerals refer to similar parts throughout the drawings.

The invention is illustrated in the accompanying drawings as applied to an automatic self-feeding riveting machine, although it should be understood that this is merely for the purpose of

illustration and that there are many other uses to which the riveting mechanism per se is applicable.

In the form of the machine illustrated, the mechanism may be carried by a vertical standard 10 mounted upon a base 11. The standard may have guides 12 formed thereon upon which is slidably mounted the carriage 13, which carries the riveting mechanism, and which is arranged to be held upon the standard as by the screws 14.

The feed mechanism is supported above the riveting mechanism, at the upper end of the upright 10 and may be of the same construction as illustrated and described in detail in Wilson P. Hunt Patent No. 950,534, granted March 1, 1910.

This feed mechanism includes a bearing 15 for the drive shaft 16 upon which is mounted the drive pulley 17 operatively connected, as by the belt 18, to the motor 19 or other suitable driving means which may be mounted upon the table 20 supported on the rear side of the standard 10 as by the bracket 21.

A vertical bearing 22 is provided for the vertically reciprocating plunger 23. This plunger is arranged to be reciprocated through a lever 24 fulcrumed intermediate its ends as at 25 upon a bracket 26, the rear end of the lever being connected by a link (not shown) to the rear end of the pedal lever 27 which is fulcrumed intermediate its ends as at 28 upon ears 29 formed upon the standard 10, the pedal lever extending entirely through a suitable central opening in the standard.

A foot pedal 30 is formed at the forward end of the lever 27 and a cam 31 is formed upon the upper side of said lever cooperating with the push rod 32 connected at its upper end to the carriage 13, a pull spring 33 being provided for normally pulling said push rod down into contact with the peripheral surface of the cam 31.

As the treadle lever 27 is depressed by placing the foot upon the treadle 30 thereof, the carriage 13 will be slidably moved upward on the guideways 12 of the standard and at the same time the plunger 23 will be reciprocated downward.

Secured to and projecting laterally from the vertical bearing 22 is a bracket 34 provided with a vertical bearing 35 for a vertical spindle 36. The bracket 34 has its ends bent or curved downward forming an arch 37 for the magazine 38 within the lower open end of which is rotatably mounted the circular turntable 39 fixed upon the lower end of the spindle 36.

A worm 40 is formed upon the inner end of the

drive shaft 16 and meshes with the worm gear 41 fixed upon the spindle 36 whereby the turntable 39 is rotated by the drive shaft.

The interior construction and details of the magazine and associated parts are not illustrated or described in detail as they in themselves form no part of the present invention excepting that suitable feeding mechanism is necessary and since this mechanism may be identical with that disclosed in the Hunt patent above referred to, it is thought that no further description of the same is required herein.

As disclosed in said Hunt patent, the turntable 39 is of such diameter that its peripheral edge 15 is separated from the flanged lower open end of the magazine 38, so that a circular space or runway is left between them, into which the shanks of the rivets supplied to the magazine fall, and are suspended by reason of the heads thereof resting on the flanged lower end of the magazine and the table.

As the table slowly revolves, the rivets are moved around to a point nearest the vertical bearing 22, where they are dropped, one by one, through a suitable recess in the flange of the magazine into a tubular chute 42, which extends down from the rim of the magazine to the chuck, as will be hereinafter described.

It should be understood that the circular brush 30 illustrated at *h* in said Hunt patent may be provided in the magazine for the purpose of brushing back any surplus rivets that may be carried forward by the revolving turntable, allowing only those to pass which are suspended by their heads 35 in the annular runway above described.

As the rivets move toward the position where they will be discharged from the magazine, they may be retarded in the manner described in said Hunt patent and come into position under a vertically reciprocating plunger 43, one after another in close order. The lower end of this plunger moves through a suitable guide opening and extends straight downward through the annular runway, forming a stop for the rivets in 45 the same, at a point immediately over the discharge opening.

In this position the rivet is suspended between the revolving turntable and a trip such as disclosed in the Hunt patent, and when the plunger 50 moves downward, it engages the rivet and forces it downward and thereby makes the trip yield outward to permit the rivet to pass down into the chute 42.

The chute 42 extends downward in a laterally inclined direction toward, and has its lower end secured in an aligning stub 44, projecting from the adjacent side of a tubular extension 45, whose upper end is secured to and depends from the vertical bearing 22.

The portion of the tubular extension 45 above the stub 44 may have elongated openings 46 on its side, if desired; the part below said stub has its bore reduced as at 47 and occupied by a filler tube 48 that has its lower end extended below the 65 lower extremity of the chuck, and, preferably, provided with a circumferential flange 49 to strengthen it.

This filler tube is cut away as at 50 to permit the rivet from the chute 42 to enter its bore, and its portion between its lower flanged edge and the lower end of the chuck is provided with diametrically opposite openings 51.

The lower portion of the chuck may be grooved longitudinally as at 52 to provide seats for the 75 corresponding jaws 53-53. These jaws consist

of elongated strips of metal that are fulcrumed about their centers of length, and each has a coil spring 54 placed between its upper end and the side of the chuck to keep their lower ends normally pressing in toward each other.

The lower ends of these jaws are bent toward each other, and are adapted to enter the openings 51 of the tube, and their extremities approach near each other. Corresponding semi-funnel-shaped grooves may be formed in the opposing faces of these extremities, as in said Hunt patent, and when a rivet is fed to the tube 48, the shank thereof enters this funnel-shaped opening between the extremities of the jaws, and said jaws will be forced apart as the rivet is forced down 15 between them by the bit 55 connected to the lower end of the plunger 23.

The riveting mechanism *per se* is mounted upon the carriage 13 and supported by the horizontally disposed housing 13' which may be formed 20 integrally with or rigidly attached to the carriage. The driving shaft 56 for the riveting mechanism is located within the housing and may be journaled in suitable bearings such as the antifriction bearings 57 and 58 located within 25 opposite ends of the housing.

A pulley 59 is fixed upon the inner end of the shaft 56 and connected as by a belt 60 with a pulley 61 upon the shaft 62 of the motor 63 which is mounted upon the supporting plate or bracket 64 fixed to the carriage 13. The cage, indicated generally at 65, is formed upon or fixed to the outer end of the shaft 56.

This cage is of generally cylindrical form and has the central peripheral groove 66 therein and the diametric slot 67 open at opposite ends into the groove 66 as shown at 68.

The pressure members, preferably two in number, may be in the form of rollers 69 located within the diametric groove 67 and retained against displacement as by the split spring ring 70 seated in the groove 71. The open end of the housing 13' is closed by means of a plate 72 fitting over the end of the cage 65 and retained in place as by a split spring ring 73 seated in the groove 74. 45

An upright hollow boss 75 is formed upon the outer end of the housing 13' and has slidably mounted therein a bushing 76, the lower end of which slides into the opening 77 in the cup-shaped member 78 which is mounted within the hollow boss. A coil spring 79 is located around the bushing 76, being interposed between said cup member 78 and the outturned flange 80 formed at the upper end of the bushing 76.

The riveting tool 81 is provided midway of its ends with a shoulder 82 adapted to rest upon the lower flanged end 83 of the bushing 76, the portion of the tool below said shoulder having a squared face 84 and being slidably located through the worm gear 85 which has a central opening 86 shaped to receive said portion of the riveting tool. It should be understood that any other suitable and well known means may be provided for slidably mounting the worm gear upon the tool shank and holding the gear against 65 rotation thereon.

The worm gear 85 meshes with the worm 87 fixed upon the shaft 88 journaled in the housing 13' as at 89 and having a gear 90 fixed upon its inner end meshing with a pinion 91 upon the shaft 56 whereby the tool will be continuously rotated at a relatively slow speed during the rotation of the riveting cage.

The riveting tool has its upper portion laterally cut away on either side as at 92, the cutaway 75

sides being preferably concaved as best shown in Fig. 8 so that the end portion of the tool is thinnest at its center. The end of the tool is also concaved as at 93 to conform to the shape of the head to be formed upon the rivet. The bushing 76 is provided with a tubular extension 94 which may be formed upon the upper end of the bushing or fixed thereto as by the pin 95, this tubular projection surrounding the working portion of the tool and extending substantially to the upper end of the tool. As best shown in Fig. 2 of the drawings, the tool 81 is axially aligned with the plunger 55.

The machine as illustrated in the drawings is especially adapted for putting knobs as indicated at 96 upon sheet metal utensil lids or the like as indicated at 97. Ordinarily, it is necessary to place a washer beneath the head of the rivet and against the inner side of the cooking utensil lid but it has been found in actual practice with the present machine that the rivets are placed so tightly through the knob and utensil lid that no washer is required.

Furthermore, it has been found that with this machine it is not necessary to provide the usual aperture in the utensil lid to receive the rivet as with the present machine the rivet may be driven through the sheet metal utensil lid, punching its own aperture therein, after which the rivet is upset as will be further described.

In the operation of the apparatus to rivet a knob upon a utensil lid, the knob as shown at 96 is placed upon the upper end of the tubular extension 94 which is received within the socket 98 of the knob. The utensil lid 97 is then positioned above the knob and the operator steps upon the treadle 30. The cam 31 through the plunger 32 raises the carriage 13 so that the lid and knob are held tightly between the tubular extension 94 and the chuck 47.

At the same time a rivet is fed from the hopper 38 through the chute 42 and into the tubular bushing of the chuck and the plunger 55 descends, driving the rivet downward between the jaws 53, punching the rivet through the sheet metal utensil cover and forcing the shank 99 of the rivet down through the aperture 100 in the knob 96, the head 101 of the rivet being pressed tightly against the inner side of the sheet metal cover 97 by means of the plunger 55, the lower end of the rivet projecting into the tubular extension 94.

At the same time, the cage 65 is rotated at high speed, the pressure rollers 69 alternately engaging the lower flat end 102 of the tool shank which is continuously rotated by the worm 87 and worm gear 85 upsetting the lower end of the rivet forming a head 103 thereon.

It will be seen that as each pressure roller 69 contacts with the lower flat end of the tool shank, this lower end of the shank is tangential to the periphery of the roller and remains tangential thereto as the roller passes under and beyond the tool. It is thus found in practice that the tool is operated by pressure rather than impact, the pressure being almost continuous due to the rapid rotation of the cage and the alternate engagement of the pressure rollers with the end of the riveting tool.

It has also been found by practice that the improved riveting apparatus may be used for riveting knobs of wood, glass or other material and it is not only adapted for the riveting of knobs upon utensil covers but may be used for riveting any kind of work and that steel or iron

rivets may be upset as well as rivets of softer non-ferrous metals.

We claim:

1. An apparatus including a rotating cage having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, removable means associated with the open side of the radial groove for retaining the rollers in the cage, and a tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof.

2. An apparatus including a rotating cage having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, removable means associated with the open side of the radial groove for retaining the rollers in the cage, and an offset tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof.

3. An apparatus including a rotating cage having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, a ring associated with the open side of the radial groove for retaining the rollers in the cage, and a tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof.

4. An apparatus including a rotating cage having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, removable means associated with the open side of the radial groove for retaining the rollers in the cage, a tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof, and means for rotating said tool.

5. An apparatus including a rotating cage having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, removable means associated with the open side of the radial groove for retaining the rollers in the cage, a tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof, means for rapidly rotating the cage, and means for slowly rotating the tool.

6. An apparatus including a housing, a rotating cage within the housing having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove and out of contact with the housing, a ring in

the open side of the radial groove for retaining the rollers in the cage and a tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof.

7. An apparatus including a housing, a rotating cage within the housing having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, the ends of the radial groove being closed on opposite sides of the peripheral groove to permit the rollers to extend through said openings but holding the rollers out of contact with the housing, removable means associated with the open side of the radial groove for retaining the rollers in the cage and a tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof.

8. An apparatus including a rotating cage having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, removable means associated with the open side of the radial groove for retaining the rollers in the cage, a tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof, a chuck alined with and spaced from said tool shank to permit the work to be placed therebetween, means for feeding rivets to said chuck and a plunger for forcing the rivets from the chuck and into the work.

9. An apparatus including a rotating cage having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, removable means associated with the open side of the radial groove for retaining the rollers in the cage, a tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof, a tubular bushing surrounding said tool shank and adapted to contact with the work, a chuck alined with and spaced from said tubular member to permit the work to be placed therebetween, means for feeding rivets to said chuck, and a plunger for forcing the rivets from the chuck and into the work.

10. An apparatus including a rotating cage having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, removable means associated with the open side of the radial groove for retaining the rollers in the cage, a tool shank slidably mounted

adjacent to the cage and projecting into the peripheral groove thereof, means for rotating said tool, a chuck alined with and spaced from said tool shank to permit the work to be placed therebetween, means for feeding rivets to said chuck, and a plunger for forcing the rivets from the chuck and into the work.

11. An apparatus including a rotating cage having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, removable means associated with the open side of the radial groove for retaining the rollers in the cage, a tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof, means for rapidly rotating the cage, means for slowly rotating the tool, a chuck alined with and spaced from said tool shank to permit the work to be placed therebetween, means for feeding rivets to said chuck, and a plunger for forcing the rivets from the chuck and into the work.

12. An apparatus including a rotating cage having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, removable means associated with the open side of the radial groove for retaining the rollers in the cage, a tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof, means for rotating said tool, a tubular bushing surrounding said tool shank and adapted to contact with the work, a chuck alined with and spaced from said tubular member to permit the work to be placed therebetween, means for feeding rivets to said chuck, and a plunger for forcing the rivets from the chuck and into the work.

13. An apparatus including a rotating cage having a peripheral groove and a radial groove, said radial groove extending entirely through the cage on one diameter and being open at opposite ends through the peripheral groove and open throughout its length through one side of the cage, pressure rollers freely mounted in the radial groove, a split ring associated with the open side of the radial groove for retaining the rollers in the cage, a tool shank slidably mounted adjacent to the cage and projecting into the peripheral groove thereof, means for rapidly rotating the cage, means for slowly rotating the tool, a tubular bushing surrounding said tool shank and adapted to contact with the work, a chuck alined with and spaced from said tubular member to permit the work to be placed therebetween, means for feeding rivets to said chuck, and a plunger for forcing the rivets from the chuck and into the work.

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