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APPARATUS FOR FORMING LOCKING HEADS ON RIVETS

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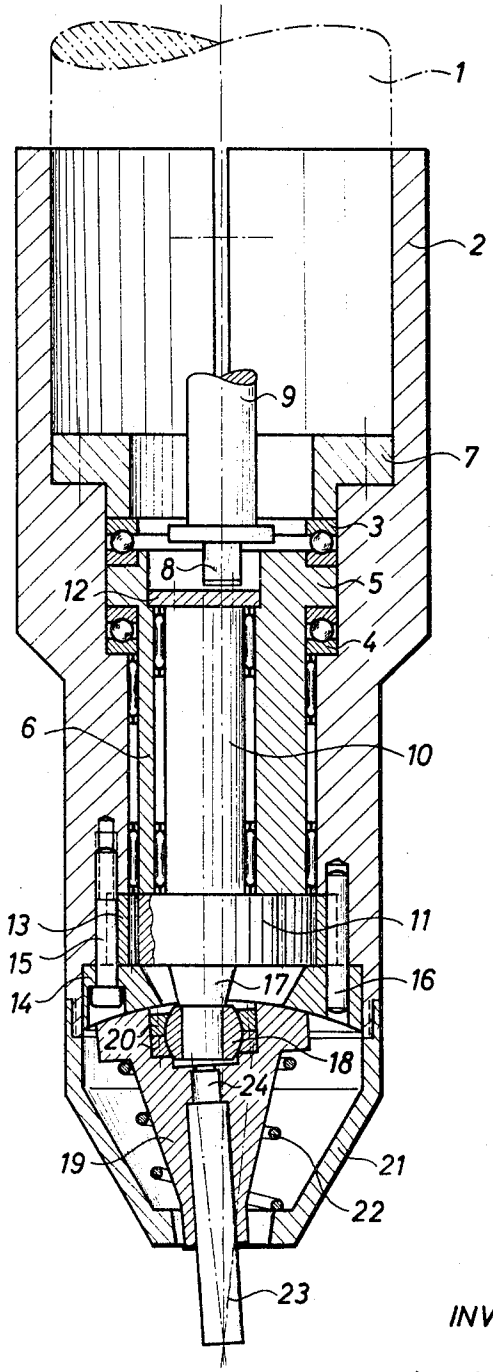

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APPARATUS FOR FORMING LOCKING HEADS ON RIVETS

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ABSTRACT OF THE DISCLOSURE

An apparatus for forming locking heads on rivets comprises a hollow body for detachable securement to the head of a riveting machine, a constantly-driven member journalled in this body for coaxial rotation, and a shaft journalled in this rotary member for rotation about a parallel eccentric axis. A pinion at the outer end of this shaft meshes with an internally-toothed gear located in the body, an annular end-cap which contains a holder for a rivet-set spring-pressed against a retaining ring for the internally-toothed gear. The tool-holder and ring have complementary part-spherical faces to permit universal oscillatory movement of said tool-holder during its rotation by a ball-ended eccentric peg on the driving pinion, the diameter of the latter being so related to that of the internally-toothed gear that the hypocycloids described by a point on said pinion intersect the axis of said rotary member.

The invention concerns an apparatus for the formation of locking heads on rivets by the pressure of a rivet-set which is mounted in a tool-holder for movement upon an inner spherical surface.

In a known apparatus, the substantially conical tool holder is eccentrically mounted at its tip, so that during operation of the longitudinal axis of such holder it describes a conical surface. When rotation of the tool-holder is resisted, due to its spherical outer surface bearing upon a stationary part of the machine, its rolling movement has a sliding movement superimposed thereon except when there is line contact between the riveting-set and the head of the rivet. In practice, however, a conical rivet head is not desired, and accordingly the point of contact between the rivet-set and the head of the rivet follows a curvilinear path. Whatever its design, the rivet-set whilst rotating around the head of the rivet, engages the latter along a line, so that during the production of the rivet head, material is displaced transversely of such line of contact.

The object of the invention is to provide an apparatus in which the end of the rivet-set remote from the workpiece carries out a diametral, as well as a rotary, movement, so that irrespective of the design of the rivet-set, point contact between the latter and the workpiece is always obtained. This is achieved, according to the invention, by driving the tool holder by means of a gear, a point on which traces hypocycloids, such hypocycloids causing the tool holder, during the working process, to pass through a position aligned with the rivet axis and arranging themselves in a circumferential row, on the area to be stroked. In this way an even working of the head of the rivet is obtained with a constantly changing inclination of the rivet-set. Due to the varying direction of movement of the set, only a theoretical point contact can arise between the latter and the head of the rivet. It has been ascertained that less power is needed for the production of a rivet head in this manner than for the production of the same rivet head by means of the known apparatus, so that larger rivets can be produced with the same power or rivets of the same size with lesser power. A more even

and cleaner rivet-head results and the production of a round headed rivet is possible. The riveting process takes place relatively quietly.

Further advantageous features of the invention will become apparent from the following description and the drawing, in which an apparatus for the formation of locking heads on rivets by the pressure of a rivet-set is shown schematically in longitudinal section as an embodiment of the subject matter of the invention and by way of example only.

A body **2** provided with a longitudinal slot is clamped by means of screws (not shown) upon the head **1**, shown in chain-dotted line, of a driving machine. A rotary member **6** is journalled in this body **2** by means of two thrust bearings **3**, **4** engaging a flange **5** thereon and needle bearings arranged in axially-spaced sets. The thrust bearings **3** and **4** are located by means of a retaining ring **7** secured in the body **2**. The rectangular nose **8** of a driving shaft **9** mounted in the head **1** engages with a diametral slot in the rotary member **6**. This shaft and the rotary member **6** may also be coupled to one another by means of at least one peg.

The rotary member **6** has an eccentrically-disposed longitudinal bore through which passes a driving shaft **10**, itself mounted in axially-spaced sets of needle bearings and having a pinion **11** at the end remote from the driving shaft **9**. This pinion abuts the rotary member **6** and is located against axial movement relative thereto by means of a retaining plate **12** fixed to the other end of the driving shaft **10** by screws.

An internally-toothed wheel **13**, axially located by means of a pressure ring **14** whose securing screws **15** engage with the outer circumference of the wheel **13**, is disposed at the end of the body **2** remote from the driving head **1**, to mesh with the pinion **11**. A peg **16** passes through the pressure ring **14** and likewise engages with the outer periphery of the gear wheel **13**. The transmission ratio between the pinion **11** and the internally-toothed wheel **13** is, for example, 41:50.

A peg **17** eccentrically arranged on the outer face of the pinion **11** passes through the pressure ring **14** and carries at its free end a driving ball **18**, which engages with a part-spherical shell **20** secured in a conical tool-holder **19**. The driving ball **18** and pressure ring **14** have complementary part-spherical surfaces in mutual contact so that the tool holder **19** is capable of universal movement with reference to the ring **14**. A spring **22** interposed between the screw-cap **21** on the body **2** and a shoulder of the tool holder **19** constantly urges the latter towards the pressure ring **14**. A rivet-set **23** is inserted in the tool holder **19** and held in its working position by means of a magnet **24** secured within such holder.

On rotation of the pinion **11** by means of the driving shaft **9**, such pinion rolls on the internally-toothed wheel **13** and the axis of the peg **17** describes a hypocycloids or cycloids whose tracks intersect the axis of the driving shaft **9** and, due to the transmission ratio selected, run adjacent to one another or form into a row in a circumferential direction in the surface to be stroked, so that the axis of the rivet-set **23** is inclined to that of the rivet under treatment at an angle which varies continuously between zero and an extreme value predetermined by the eccentricity of the peg **17**, and which is contained within a conical surface of revolution having an apex angle of about 12°. Due to the constantly-changing inclination of the rivet-set during the riveting process a theoretical point contact is always present between the rivet-set and the head of the rivet.

If the working surface of the rivet-set is designed as a curve around the axis of the latter, so that a point at its centre lies substantially at the same height as the outer

edge of the work surface, then a round rivet head with a central depression can be produced. A higher rivet head has the advantage of a greater resistance to shearing.

The embodiment described by way of example may also be applied with advantage to hollow rivets which can be outwardly flanged due to the diametral movement of the end of the rivet-set with reference to the rivet.

What I claim is:

1. Apparatus for forming locking heads on rivets, comprising a body for attachment to a pressing head, a rotary member journalled in said body, means for driving said rotary member during operation of said pressing head, a shaft journalled in said rotary member for rotation about an axis eccentric thereto, a pinion fixed to said shaft, an internally-toothed gear fixed to said body and meshing with said pinion, the transmission ratio being such that points on said pinion describes a geometric figure selected from the group consisting of hypocycloids and cycloids intersecting the axis of said rotary member, and eccentrically-disposed peg on said pinion, a tool-holder mounted for universal movement upon said body and oscillatable relatively to the axis thereof by means of said peg, and a rivet-set detachably mounted in said holder.

2. Apparatus according to claim 1, wherein the axes of said rotary member and said shaft are mutually parallel and longitudinal to said body.

3. Apparatus according to claim 1, wherein the driving means for said rotary member comprises a driving shaft rotatable in said pressing head and having a rectangular nose engaging a diametral slot in the adjacent end of said rotary member.

4. Apparatus according to claim 1, wherein said pinion is arranged at the end of said shaft remote from said driving means and has said peg on its outer face in alignment with the axis of said shaft.

5. Apparatus as claimed in claim 1, including a ring for axially locating said internally-toothed gear, and screws securing said ring to said body as well as locating said gear against circumferential movement.

6. Apparatus as claimed in claim 1, including a ring fixed to said internally-toothed gear, an annular cap attached to said body and enclosing said tool-holder, and spring means acting between said cap and said tool-holder to urge the latter into engagement with said ring, the coacting surfaces of said ring and tool-holder being part-spherical and mutually complementary.

7. Apparatus according to claim 1, wherein said peg carries a loose ball and engages with a part-spherical shell mounted in the adjacent end of said tool-holder.

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