In the head, taper rollers are freely mounted on axles secured in a casing for their independent rotation as strikers roll over them in the course of rotation of the arbor which has a kinematic drive linkage with the casing to impart thereto reciprocatory movements in the axial direction.
WORKING HEAD OF A ROTARY SWAGING MACHINE

The present invention relates to equipment for effecting the plastic deformation of metals, and more specifically, to the working heads of rotary swaging machines.

The conventional working heads of rotary swaging machines comprise an arbor with radially disposed slide strikers, and a casing mounted coaxially therewith which carries taper rollers interacting with the strikers during the course of the arbor rotation so as to swage the blank fed into the arbor and between the strikers.

In these conventional heads, the taper rollers which are retained in a cage, are freely mounted in a movable casing, i.e., such as a taper ring.

It has been proven in practice that the movability of the contacting surfaces, and the relatively free location of the taper rollers generate impact loads, which have an adverse effect on the operative life of the taper ring or casing, the cage, the rollers, and the slide strikers.

In these conventional heads there are further present significant clearances between the various mating parts, which generates additional noise during the operation of the machines.

With the above design of the conventional head, the accuracy of operation depends upon the accuracy of the tapered surfaces of the contacting parts, the size of which exceeds by many times the size of the job, as well as on the quality or accuracy of the assembly of the numerous required components forming the rigid, generally designated, “casings (taper ring) — blank.”

The prior art conventional heads are complex to produce, with their design also involving difficulties in replacing various parts, and which fail to provide the accuracy inherently required in the method of swaging.

An object of the present invention is to eliminate the above mentioned disadvantages.

Another important object of the present invention is to provide a working head for a rotary swaging machine having an arrangement of the taper rollers in the casing, and a kinematic linkage of the casing with the arbor, as to strike in design and in production as compared to conventional heads in machines of similar type, while affording a high degree of accuracy of working, and generating only little noise during operation.

With the above and other objects in view, in the working head of a rotary swaging machine, the taper rollers, according to the invention, are freely mounted on axles secured in the casing and permitting for their independent rotation as the strikers roll over them during the course of rotation of the arbor, the latter of which has a kinematic drive linkage with the casing so as to impart to the casing axial reciprocatory movements. The above mentioned objects are most advantageously achieved in the case when the kinematic linkage of the arbor with the casing is formed by cooperative driving and driven spur gears forming a continuous kinematic chain wherein the driving gear is connected to the arbor, and the driven gear is rotatably mounted on the casing with a provision for axial movements together with the latter, and through a cam drive formed by interacting profiled cams fixed on the opposite faces of the driving and the driven gears, in which the gears have different speeds of rotation.

Due to such an arrangement of the taper rollers in the casing and the kinematic linkage of the arbor with the latter to impart thereto axial displacements, the proposed head performs radial swaging of components over a wide size range and at a high degree of accuracy. Additionally, this head generates little noise during operation, and is convenient in work, as being simple in its assembly and disassembly.

The invention is further exemplified through an illustrative embodiment thereof, having reference to the appended drawings, wherein:

FIG. 1 is a kinematic diagram of the working head of a rotary swaging machine according to the invention;

FIG. 2 is a section along line II—II in FIG. 1.

Shown in the drawing is a working head of a rotary swaging machine, comprising an arbor 1 (FIG. 1) with strikers 2 which are radially disposed in its rotor portion 1a, and a casing 3 mounted coaxially therewith which carries taper rollers 4. Casing 3 is mounted in a housing 5 by means of a key 6 (FIG. 2) so as to be capable of reciprocatory movements in the axial direction thereof.

The taper rollers 4, according to the invention, are rotatably mounted on axles 7 (FIG. 1) secured in casing 3, for their independent rotation as strikers 2 roll over them during the course of swaging the blank fed into the arbor and between the strikers 2.

According to the invention, arbor 1 has a kinematic drive linkage with casing 3 so as to impart to the latter reciprocatory movement in the axial direction thereof.

The kinematic drive linkage of arbor 1 with casing 3 is, according to the invention, effected through cooperative driving and driven spur gears 8, 9, 10 and 11 which form a continuous kinematic chain, in which the driving gear 8 is rigidly connected to the arbor, and the driven gear 11 is rotatably placed on casing 3 with a provision for axial displacements together with the latter, and also through a cam drive A.

The cam drive A is formed by interacting profiled cams 12 and 13 which are fixed on the opposite faces of the driving gear 8 and the driven gear 11, respectively.

The profiled cams 12 and 13 are in constant elastic contact due to the action of a spring 14 which biases casing 3 away from the rotor portion 1a of arbor 1.

Gears 8 and 11 are dimensioned so as to have unequal speeds of rotation. Gears 9 and 10 are rigidly fixed on a single rotatable shaft 15.

In order further reduce noise during the process of operation, dampers 16 are positioned between the heads of the strikers 2 and the rotor portion 1a of arbor 1 (FIG. 2).

So as to ensure uniform operation of the inventive head, at the end of arbor 1 opposite to the location of its rotor portion 1a there is mounted a flywheel pulley 17 together with a suitable drive.

The head operates as follows.

The blank (not shown in the drawing) is fed into the space B of the rotor portion 1a of arbor 1, and between the strikers 2. An electric motor by means of a belting (not shown) then drives the flywheel pulley 17 so as to effect rotation of the arbor 1 together with its rotor portion 1a. During arbor rotation the strikers 2 roll
over the taper rollers 4, the latter of which are freely revolving about their axles 7.

As the arbor 1 rotates, it rotates the gear 8 which is engaged with the gear 9, and which in its turn rotatably drives the shaft 15 together with the gear 10. The gear 10 then transmits rotation to the gear 11, the latter being rotatably mounted on the casing 3 and having a rotational speed differing from that of the driving gear 8. Due to the unequal speeds of rotation of the gears 8 and 11, the profiled cams 12 and 13, which are in constant mutual elastic contact start to act on each other. As a result, casing 3, under the effect of spring 14, will perform reciprocatory movements in its axial direction, i.e., in the direction of the geometrical axis of the arbor 1. The taper rollers 4 mounted on the axes 7 in the casing move together with the latter, their tapered surfaces acting on the strikers 2 which roll over these rollers freely revolving on their axes.

Thus, with rotation of the arbor 1, the strikers 2 in the rotor portion of the former are moved radially (pulled together and apart) with respect to the center. Within each single revolution of the arbor 1, the strikers 2 are pulled together and apart as many times, as there are taper rollers 4.

During the course of the arbor rotation, the casing 3 with the rollers 4 moving in the axial direction (rightwards, as shown in FIG. 1), changes from maximum to minimum the diameter of space B for the blank, which is formed between strikers 2. This diameter determines the final diameter of the component.

The blank feed has no kinematic linkage with the operative movements of the head parts. Thus, the blank feed into space B between the strikers may be effected manually or automatically without having to stop the rotation of the head arbor. This is quite essential with respect to the machine productivity during serial and mass production, and particularly in erection operation.

Due to the above-described design, the inventive head provides for plastic deformation of significant size to be effected on various components, particularly those with a small length, by gradually swaging them in the radial direction within one working cycle.

Experiments have proven that, for example, in the manufacture of powerful semiconductor rectifiers by gradually swaging the sleeve about the operating lead the value of deformation is 30 percent and more for one working cycle of the head.

Additionally, it is noted that the inventive head effects gradual swaging of a tube or a band at the end of electric conductors, wherein the diameter can be changed, for example, from 13 to 8 mm, providing thereby a secure and quality joint without the need for any solder.

The inventive head can also be employed to effect the forming of bodies of rotation, such as pipes and rods, across any length thereof.

What we claim is:

1. A working head of a rotary swaging machine, comprising: an arbor with radial strikers; a casing mounted coaxially with said arbor; axes secured in said casing; taper rollers freely mounted on said axes for their independent rotation as said strikers roll over them in the course of swaging the blank fed into said arbor between said strikers, said arbor having a kinematic drive linkage with said casing to impart thereto reciprocatory movements in the axial direction.

2. A working head as claimed in claim 1, wherein the kinematic linkage of the arbor with the casing cooperative driving and driven spur gears forming a continuous kinematic chain, and a cam drive, the driving gear of said kinematic chain being connected to the arbor, and the driven gear of said kinematic chain being mounted on the casing so as to be reciprocable in conjunction with said casing, said cam drive being formed of interacting profiled cams mounted symmetrically relative to the arbor axis and on the opposed faces of said driving and driven gears, said driving and driven gears having unequal speeds of rotation.

* * * * *