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EUROPEAN PATENT APPLICATION

21 Application number: 86101044.5

51 Int. Cl.: **B 21 K 13/02**
E 05 D 11/04, E 05 D 5/10

22 Date of filing: 27.01.86

30 Priority: 04.02.85 IT 8251085

43 Date of publication of application:
13.08.86 Bulletin 86/33

84 Designated Contracting States:
CH DE FR LI

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54 Method of manufacturing male elements for hinge devices and male elements obtained thereby.

57 The method of manufacturing sealed hollow male elements for hinge devices comprises the steps of shearing a segment off a drawn rod, and successively causing the material to flow laterally upwards such as by cold impact extrusion by means of a punch, to form a hollow body (5) of constant cross section having an open end. Thereafter, there is performed on said hollow body (5), as by impact with a die, a reduction of one portion at the open end (14), thus defining a hollow pin (8) having an open end (14). The latter is then stopped by press fitting a shaped body (13) thereinto.

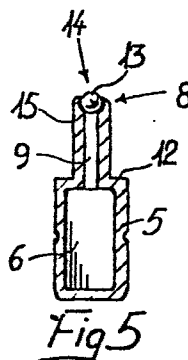


Fig 5

"METHOD OF MANUFACTURING MALE ELEMENTS FOR HINGE DEVICES
AND MALE ELEMENTS OBTAINED THEREBY"

The present invention relates to a method of manufacturing male elements for hinge devices and male elements obtained thereby.

Currently known are hinges, the male element
5 whereof is internally hollow to lighten the construction while decreasing manufacturing costs.

Such a product and the method for forming it are described in German published Patent application N. 28 08 411.9 filed on February 27, 1978, by the
10 same applicant.

That prior type has, however, a drawback due to the particular construction of the male which, being hollow, during the galvanic bathing some of the liquid penetrates the interior of the same, contaminat-
15 ing the other successive vats, in the following steps required to complete the treatment.

This results in an increase in cost, albeit only slight.

During the storage step, moreover, any liquid
20 left inside the male may flow out thereof and attack, owing to its primarily acidic nature, other hinges.

Furthermore, owing to the particular construction of the male, the female bears and rotates on the base.

This is a disadvantage in the instance where the
25 hinge is formed from ferrous materials and then used in a marine environment; there occurs, in fact, in this case the formation of oxides which create a region of high frictional resistance on the pin base which

reduces the overall functionality of the hinge.

To solve such drawbacks there may be employed such materials as steel and brass, which considerably increase however, the cost of the end product.

5 The primary aim of this invention is, therefore, to eliminate the above cited drawbacks, by providing a method of manufacturing male elements, for hinge devices which are of low cost and feature a sealed construction.

10 Another object is to provide a method of manufacturing male elements, for hinge devices which have a strong, homogeneous pivot point protected against any oxidizing agents present in the environment.

15 A not least object is to provide a method of manufacturing male elements for hinge devices, which is fully automatic and implementable with ordinary equipment.

20 These and other objects are achieved by a method of manufacturing male elements, for hinge devices characterized in that it comprises the following processing steps:

- a) shearing of a segment off a drawn rod;
- b) cold impact extruding said cylindrical segment by means of a punch effective to cause the material
25 to flow laterally upwards to produce a constant pattern hollow body having at least one open end;
- c) reducing one portion of said hollow body from the open end by striking with a die defining a pin;
- d) press fitting a shaped body at the open end
30 of the pin with consequent sealing of the same;

e) surface finishing the thus formed male element for hinge devices.

According to another aspect of the invention, there is provided a male element for hinge devices
5 which is characterized in that it comprises a hollow body having protruding therefrom a pin the end whereof is sealed by a shaped body, adapted for rotatably supporting a female element, means being provided for associating said male element with casings.

10 Further features and advantages of the invention will be more clearly apparent from the detailed description of a particular, but not exclusive, embodiment, shown by way of illustration and not of limitation in the accompanying drawing sheets where:

15 Figure 1 is a partly cut-away perspective view of a hinge device including a male element obtained by the method according to the invention and a female element for cooperation therewith;

20 Figure 2 is a perspective view of a sheared segment of drawn rod;

Figures 3, 4 and 5 are sectional views of the male element taken on a longitudinal section plane thereof during some of the successive processing steps of the method of manufacturing male elements
25 for hinge devices according to the invention.

With reference to the above-cited drawing figures, the method consists of a first step, of shearing a segment from a drawn rod (not shown), to define a blank.

The material volume forming the blank should be equal to the volume of the material of the semifinished product to be obtained in the penultimate step of the method described hereinafter.

5 The sheared blank is first upset by striking on a die to obtain a substantially regular cylinder 1 with one end 2 having a flat surface 3, and expediently formed with a rounded zone 4 at the peripheral edge of the opposite end.

10 This technology is more fully described in the copending applicant's EP patent application N. 86100126.1 filed on January 7, 1986.

15 In a following step the cylinder 1 is cold extruded in a special die by means of a cylindrical punch having a smaller cross-sectional area than the surface 3; thus, causing the material flow laterally and upwards to define a body 5 with a cavity 6 of cylindrical shape, and an opening 7 at the end 2.

20 Thereafter, means such as a die, reduces by striking, as illustrated in Figure 4, a portion of the body 5 at the end 2, to define a pin 8, of open-ended cylindrical shape having an inner cavity 9 with the same shape and an opening 10 at its terminating end 11.

25 The pin 8 has a smaller outside diameter than the body 5, between the two of them there being created a flat annular base 12.

30 The next step envisages the press fitting of a shaped body at the opening 10 of the pin 8; that body is composed, in the preselected embodiment, of a ball 13 with a slightly larger diameter than the

opening 10, though obviously, any other shaped body may be used which can be adapted for sealing the opening 10 of the pin 8 and providing a bearing of low frictional resistance for a female element.

5 The ball 13, which is press fitted, is formed preferably from hardened steel, which causes the end 11 of the pin 8 to yield, creating in that step the housing seat; the fitting of the ball 13 into the opening 10 is, moreover, carried out so as to let
10 a part of the curved surface of the ball project relatively to the terminating end 11 of the pin 8.

Expediently, the die which may be used to fit the ball into the end 11, advantageously defines a bevel which is adapted to squeeze the peripheral
15 edges of the end 11 onto the lateral curved surface of the ball 13, this forming an aesthetic surface finish whilst completely sealing the pin 8.

Thus, there is defined an end 14 of substantially hemispherical shape, merging with the outer lateral
20 wall 15 of the pin 8, and sealing the cavity 9 of the same so as to prevent the liquid from entering during the next step of immersion into galvanic baths for the necessary successive treatment steps.

Thus, the end 14 becomes the terminating end of
25 the pin 8 on which the flat, internal end of the female element 16, bears and turns with a very low coefficient of friction due to its small area of surface contact afforded by virtue of the curved terminating end of the pin.

30 The female element has a cylindrical body 17

defining at an internal portion thereof a seat 19,
shaped to substantially correspond to the shape of
the pin 8 of the male element 18, with necessary
clearance, the depth of its seat 19 being slightly
5 smaller than the length of the pin 8 itself, such that
the flat end of the seat 19 bears directly onto the
ball 13, and thus leaving a slight clearance between
the end of the female element and the annular shoulder
12 of the male element.

10 With each of the lateral surfaces 20 and 21 of
the bodies 5 and 17 there is made rigid a means 22
adapted to associate the hinge 23 with the casings,
said means being composed for example of an outside
threaded shank.

15 Thus, the hinge 23, given the shape of the pin 8
and the seat 19, has the feature of working on the
end 14 and not on the base 12.

This improves the functional aspect because
rotation is improved and the pivot point, formed by
20 the end 14, is protected, inside the female element 16,
against any outside atmospheric agents.

The male element 18, being hollow, lowers the
manufacturing costs by decreasing the amount of raw
material used.

25 The automatic insertion of the ball 13, defining
the end 14, closes the cavity 9 and, accordingly,
prevents the liquid present in successive galvanic
treatment vats from entering the interior of the
male element 18 and thus eliminating the risk of the
30 introduction of any foreign bodies thereinto.

It has thus been ascertained that the method of forming a sealed hollow male hinge element for hinge devices achieves all the objects set forth above, affording reduced manufacturing costs and improving, at the same time, the functional aspect of the product.

Of course, the invention herein is susceptible to many modifications and changes, which fall within the scope of the same inventive concept.

Thus, for example, in the step of cold extruding by impact the cylinder 1 there may be obtained, at the end 4, a tang projecting according to the same mid-longitudinal axis, that tang being adapted to be later molded into any desired aesthetic shape.

Furthermore, the shaped body fittable over the opening of the pin's open end may be a nail-like element with a larger diameter shank than that of the cavity 9 and whose head, preferably of hemispherical shape, serves as an optimum pivot point for the base of the seat 19 of the female, or that body may comprise a hardened steel cylinder of larger diameter than the cavity 9, also acting as a pivot pin for the female.

Of course, also the materials used and the dimensions may be any ones contingent on requirements.

CLAIMS

1 1. A method of manufacturing male elements for
2 hinge devices, which is characterized in that it
3 comprises the following processing steps:

4 a) shearing a segment off a drawn rod;

5 b) cold impact extruding said cylindrical seg-
6 ment by means of a punch effective to cause the
7 material to flow laterally upwards to produce a
8 constant pattern hollow body having at least one
9 open end;

10 c) reducing one portion of said hollow body from
11 the open end by striking with a die defining a pin;

12 d) press fitting a shaped body at the open end
13 of the pin with consequent sealing of the same;

14 e) surface finishing the thus formed male element
15 for hinge devices.

1 2. A method of forming male elements for hinge
2 devices according to claim 1, comprising a first step
3 of shearing a segment from a drawn rod which is charac-
4 terized in that it has a volume equal to that of the
5 semifinished product and is upset by striking to
6 obtain a cylinder having, at at least one end, a flat
7 surface.

1 3. A method according to claims 1 and 2, com-
2 prising a second step which is characterized in that
3 in said step the material is caused to flow laterally
4 upwards to define a hollow body with a cylindrical
5 cavity, said hollow body having at least one opening.

1 4. A method according to claims 1,2 and 3
2 including a third step which is characterized in that

3 it comprises by means of the reduction of a portion
4 of said hollow body in the proximity of its open
5 end, a pin having an outside diameter which is smaller
6 than the corresponding diameter of the hollow body,
7 said pin having a cylindrical cavity and an opening
8 at its terminating end.

1 5. A method according to the preceding claims
2 comprising a fourth step characterized in that it
3 permits the insertion into the cavity of the pin,
4 a body having a slightly larger diameter, said body
5 blocking the end of the pin itself, at least a portion
6 of said body projecting from the end of the pin and
7 defining a pivot point for a female element.

1 6. A method according to claims 1 and 5, charac-
2 terized in that said body is composed of a ball
3 slightly projecting from the pin end.

1 7. A male element for hinge devices, characterized
2 in that it comprises a hollow body having protruding
3 therefrom a pin the end whereof is sealed by a shaped
4 body adapted for rotatably supporting a female element
5 means being provided for associating said male element
6 with casings.

1 8. A male element for hinge devices according to
2 claim 7, characterized in that it comprises a hollow
3 pin, the terminating end whereof is composed of a
4 portion of a ball fitted partway into its cavity.

