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

⑤⑦ The present invention has for its subject a hinge and a method of forming a closed cavity hollow male hinge. The method comprises a first processing step consisting of shearing a section from a cylindrical drawn blank followed by cold impact reverse-extrusion by means of a punch and die action; that step causes the material to be upturned laterally to form a constant pattern hollow body having an open end. Thereafter, there is carried out on said hollow body, as by striking with a die, a reduction of one portion thereof at the open end, thus defining a hollow pin. The open end of the latter is then upset and stopped to make the hollow body watertight.

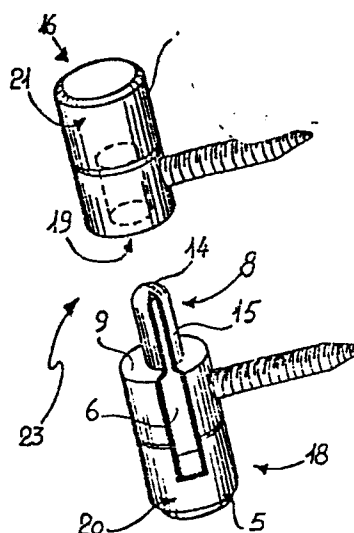


Fig.1

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

The present invention relates to a method of making hinge devices and hinge devices obtained thereby.

5 Currently known are hinges having an internally hollow male element in order to achieve a lighter construction and lower manufacturing costs.

Such a product and the method of making it are described in the published German Patent Application No. 2808411 filed by the same Applicant on February
10 27, 1978.

That prior type has, however, some small drawbacks: first, owing to the particular construction of the male element, the female element bears on the base of the same.

15 This is disadvantageous where the hinge is formed from ferrous materials and then used in a marine environment: there occur, in fact, in such conditions oxide formations which create an area of high frictional resistance on the pin base which reduces the
20 overall functionality of the hinge.

To obviate such drawbacks one may use such materials such as stainless steel or brass, which however, greatly increase the cost of the end product.

25 Further, with the particular hollow construction of the male element, another drawback is encountered: during galvanic bath treatment, some of the liquid seeps into the interior of the male element which then contaminates other tanks containing different liquids

during the successive steps required to complete the treatment.

This also results in a cost increase, albeit a minor one.

5 During storage, moreover, any liquid left inside the male element may seep out of it and attack, due to its prevailingly acidic nature, other hinges.

10 In an effort to partly solve the problem, the holder of this Application filed a European Patent Application No. 85108665.2 on July 11, 1985 wherein a hinge device is described which includes a hollow male element, at the end of which there is mounted a hardened sphere adapted to plug the open end of the hinge's hollow male element or pin and to bear on the
15 base of a seat, formed on the female element and correspondingly shaped to accommodate the pin.

20 However, that prior type also has the disadvantage that it is more expensive to manufacture owing to the added material and machining involved in mounting the sphere at the end of the male element.

25 It is the primary aim of the present invention to eliminate such drawbacks of prior types by providing a method which permits the obtainment of a hinge device of reduced overall cost and in particular reduced material requirements, as well as being of watertight construction.

30 A further important object is to provide a method which permits the obtainment of a watertight hinge device without resorting to the use of additional elements of a different material.

Another object is to provide a method which permits the obtainment of a hinge device having a strong pivot point of homogeneous construction well protected against any oxidizing agents which may be present in the environment.

A not least object is to provide a method which is automatable throughout and implementable with ordinary equipment.

These and other objects are achieved by a method of making hinge devices and hinge devices obtained thereby, characterised in that it comprises the following steps:

a) shearing a section from a cylindrical drawn blank;

b) cold impact extruding said cylindrical sections using a punch effective to form the material to provide a hollow body having at least one open end;

c) reducing a portion of said hollow body from the open end thereof by impact with a shaped punch;

d) upsetting and consequent plugging of said open end of the reduced portion;

e) surface finishing the obtained hinge. According to another aspect of the invention there is provided a hinge device obtained by the above cited method, which is characterised by that it comprises a hollow male element having a pin whose end is upset and stopped, said hinge further comprising a female element shaped to match and bearing on said end of the pin, a means being also provided for associating the same with standing finish.

Further features and advantages of the invention will be apparent from the following detailed description of a particular, but not exclusive, embodiment thereof, with reference to the accompanying
5 illustrative and not limitative drawings, where:

Figure 1 is a perspective, exploded partly sectional view of the hinge;

Figure 2 shows a perspective view of a cylindrical drawn blank;

10 Figures 3,4,5 and 6 show a view taken on the longitudinal section plane of the male element as depicted during some machining steps.

Figures 7 to 11, show processing sequences as carried out by cooperating tool means.

15 With reference to the previously cited figures, the method comprises a first step of shearing or severing a section or length from a cylindrical drawn wire rod blank to define a blank section cut from a wire rod (not shown). The volume of the material making
20 up the blank section should be equal to the volume of the material of the semifinished product obtained during the last step. That section is impact upset on a die to provide a regular cylinder 1 with one end 2 having a flat surface 3, and possibly a rounded area 4
25 at the other end as shown in Figure 2.

During a subsequent step (Figures 7 and 8), the cylinder 1 is cold reverse-extruded in a suitable die
30 by means of a first cylindrical punch 31 and subsequently a second cylindrical punch 32, if desired, having a smaller cross-section than that of the surface

3; thus, the material is upturned laterally to define a body 5 (Figure 3) or 5a (Figure 8) with a cavity 6 of cylindrical form and an opening 7 at the end 2.

5 Thereafter, a die 33 will reduce a portion of the body 5 at the end 2 by striking as shown in Figure 4 or 9, to define a pin 8 (Figure 4) or 8a (Figure 9) of cylindrical shape having an inside cavity 9 with the same shape and an opening 10 at its end extremity 11.

10 The pin 8 or 8a has a smaller outside diameter than the body 5, there being formed a flat annular base 12 therebetween or a transitional bevelled shoulder 12a (Figure 9) which is subsequently rendered flat in 12b (Figure 10).

15 The next step of the method is one of cold or hot upsetting the end extremity 11 of the pin 8, with a single strike or more strikes, the inner cavity 9 of the latter communicating with the 6.

20 In Figures 5 and 6 and 10,11 there are shown an intermediate step wherein the walls 13 of the end extremity 11 are brought together first, and the final step wherein an end of essentially hemispherical shape is defined which is radiused to the side walls 15 of the pin 8 and closes the cavity 9 thereof.

25 The end extremity 14 thus defined prevents penetration of the liquid during the successive step of immersion into galvanic baths for the necessary treatment.

30 The extremity 14 becomes, therefore, the terminating end of the pin 8 on which the female 16 is made to bear and turn friction-free.

The latter has a cylindrical body 17 shaped to match the pin 8 of the male element 18, the depth of its seat 19 being slightly smaller than the length of the pin 8 itself.

5 Secured on each of the side surfaces 20 and 21 of the bodies 5 and 17 is a means 22 adapted to associate the hinge 23 to the casings, said means consisting of an outside threaded shank.

10 The hinge 23, owing to the configuration of the pin 8 and seat 19, characteristically works on the end 14 rather than on the base 9. This improves the functional aspect in that sliding is improved and the pivot point, represented by the extremity 14, is protected, inside the female element 16, against any
15 environmental agents.

The male element 18 being of hollow construction, manufacturing cost is lowered because of the reduced raw material requirements.

20 The upsetting of the end 11 defining the extremity 14 of essentially hemispherical shape results in the cavity 9 being closed and the liquid present in the galvanic bath tanks being prevented from entering the male element 18, and this without any addition or removal of foreign bodies.

25 Thus, it has been shown how the method of forming a hollow male hinge with a closed cavity achieves all its objects by affording lower costs and improving the functional aspect.

30 Of course, the invention herein is susceptible to many modifications and changes without deviating from

the scope of the inventive concept.

Thus, as an example, during the cold impact reverse-extrusion step for extruding the cylinder 1, a tang may be formed at the end 4 which protrudes along the same longitudinal mid-axis, which tang may be then fashioned plastically into a desired aesthetic configuration. Such tang may be formed by providing a counter-punch 34, which normally closes the bottom 35 of the die 30, with a central bore (not shown) or by omitting the use of a counter-punch 34 so that the bottom 35 of the die 30 is left with a bore-like opening in which the counter-punch 34 may be arranged if desired. Of course, also the materials used and the dimensions of the hinge may be any ones according to necessity.

CLAIMS

1 1. A method of forming a closed cavity hollow male
2 hinge, characterised in that it comprises the following
3 steps:

4 a) providing a blank having a preestablished
5 volume of solid material;

6 b) reverse-extruding said blank by a punch and die
7 action effective to upturn the material laterally to
8 provide a hollow body having an axis and at least one
9 open axial end;

10 c) reducing the diameter of a portion of said
11 hollow body at said open end by a die action defining a
12 pin formation;

13 d) upsetting and consequent closing the open end
14 of said pin formation to form a bearing surface on the
15 top of said pin formation;

16 e) surface finishing at least said pin formation.

1 2. A method according to Claim 1, characterised in
2 that said blank is a solid cylinder having, at at least
3 one end, a flat surface.

1 3. A method according to Claims 1 and 2, wherein
2 said reverse-extruding is a cold reverse-extruding
3 obtained by means of a cylindrical punch having a
4 smaller diameter than the die cavity and the
5 cylindrical blank the material being upturned
6 laterallly to define a cylindrical cavity body, being
7 subjected to a reverse-extrusion action through the
8 circular interspace left between said die cavity and
9 said punch.

1 4. A method according to Claims 1,2 and 3, wherein

2 the step of reducing the diameter of a portion of said
3 hollow body near the open end thereof is carried out by
4 the action of a die having a constant cylindrical
5 cross-section equal to the diameter of the female bore
6 wherewith the male hinge is to be associated , said pin
7 formation formed thereby having a cylindrical cavity
8 and transitionally an opening at the end extremity
9 thereof.

1 5. A method according to the preceding claims,
2 wherein said upsetting and closing said end comprises
3 imparting to the same a rounded shape for the bearing
4 surface formed thereon.

1 6. A hinge device having a hollow male hinge as
2 obtained with the method of the preceding claims,
3 characterised in that it comprises said hollow male
4 element (18) having a pin (8) the end (14) whereof is
5 upset and closed, said hinge device further comprising
6 a matingly shaped female element (16) rotatably
7 supported on said pin end (14), a means (22) being
8 provided for associating the hinge with the component
9 parts to be hingedly connected.

1 7. A hinge device according to Claim 6, comprising
2 said male element per se, characterised in that it
3 comprises a cylindrical body from one end whereof a pin
4 with the same shape protrudes which lies along the same
5 longitudinal axis but has a smaller outside diameter,
6 said male element being hollow inside.

1 8. A hollow male hinge according to Claims 6 and
2 7, comprising a pin characterised in that it has the
3 end extremity upset and closed, said extremity having

4 an essentially hemispherical shape.

1 9. A hinge device according to Claims 6,7 and 8,
2 having a female element characterised in that it is
3 shaped to match the pin of the male element, the inner
4 seat for the same having a slightly smaller depth than
5 the height of said pin.

1 10. A hinge device according to the preceding
2 claims, characterised in that on the outer surface of
3 each of the male and female elements there is secured a
4 means consisting of a threaded shank adapted to
5 associate said elements with standing finish.

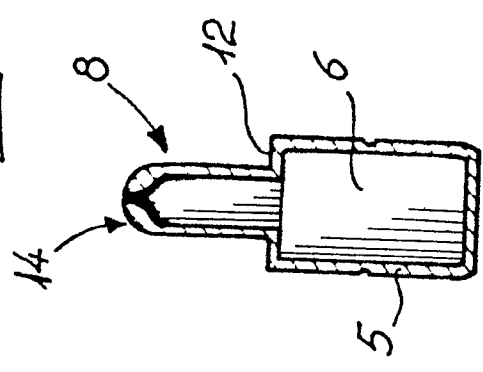
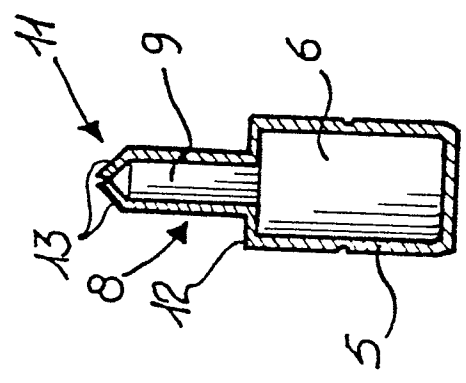
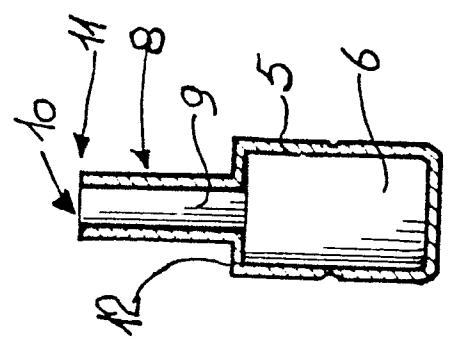
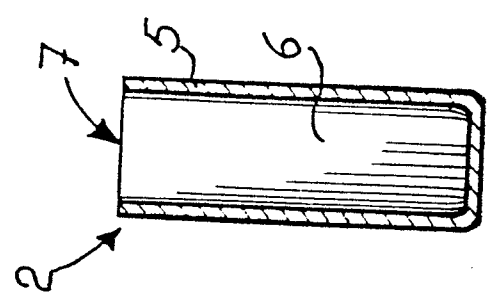
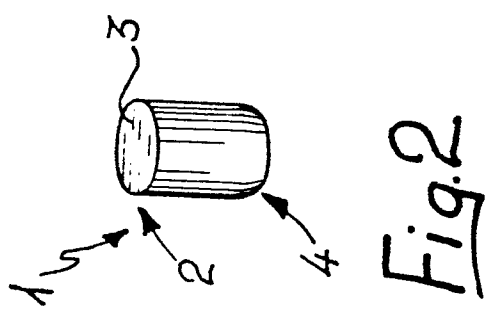
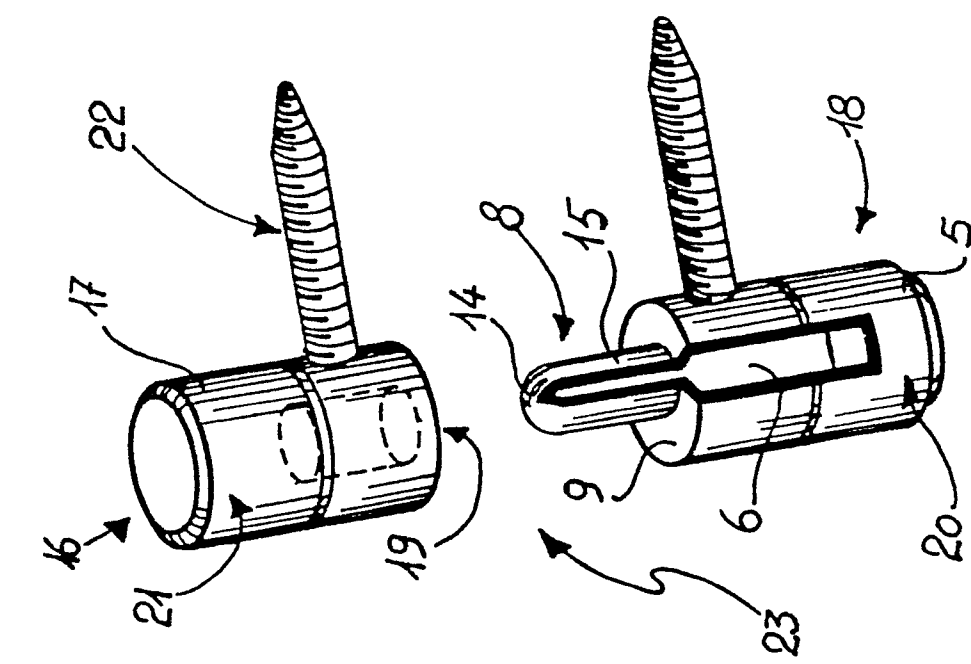


Fig. 8

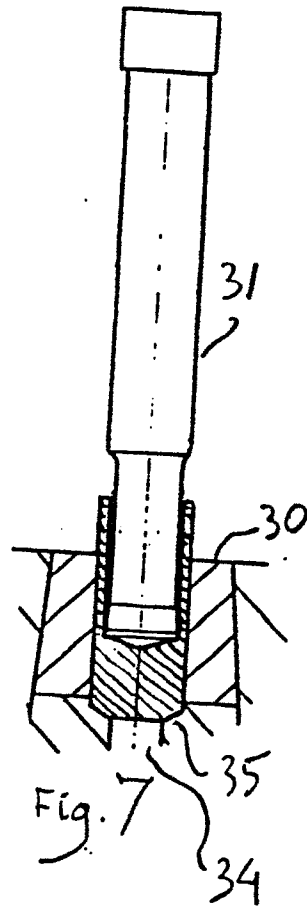
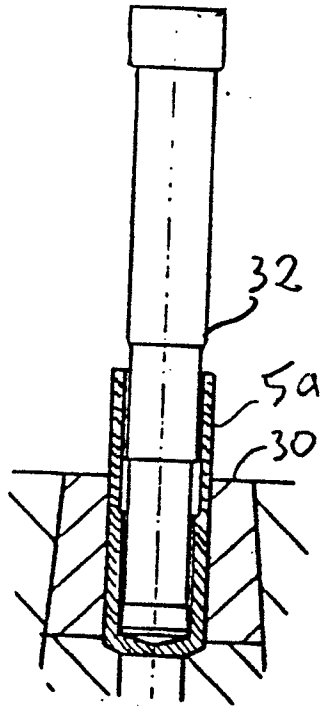


Fig. 7

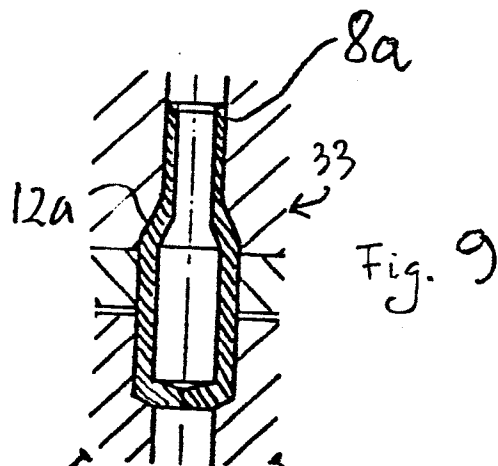


Fig. 9

Fig. 10

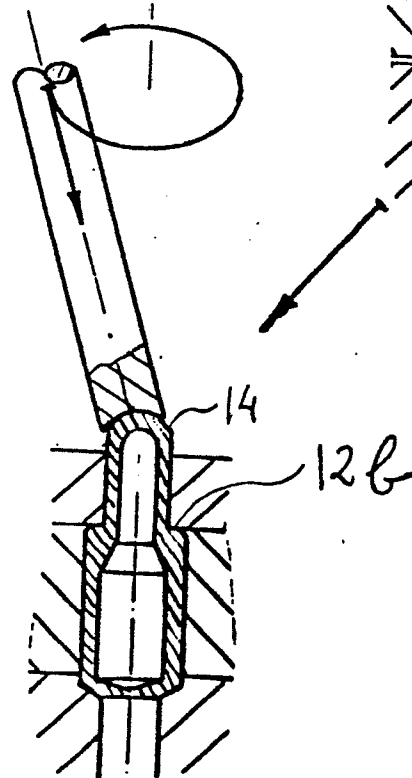


Fig. 11

