(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 037 547 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.03.2009 Bulletin 2009/12

(51) Int Cl.:
H01R 43/16 *(2006.01)* ***B21D 22/14*** *(2006.01)*
B21D 22/20 *(2006.01)*

(21) Application number: **08014031.2**

(22) Date of filing: **05.08.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(30) Priority: **11.09.2007 CN 200710071130**

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(54) Manufacturing process of cylinder plug pins for electric connection and plug pins manufactured in this process

(57) A manufacturing process of cylinder plug pins for electric connection on plugs and plug pins manufactured in this process. Said process mainly comprises the following steps: sorting, selecting a copper stripe with the width of 21~25mm and the thickness of 0.4~0.6mm and put it on a feeder; stamping, sending the copper strip with the sender to a drawing cavity die for multiple times of drawing till the cylinder plug pin blank conforming to the specification is achieved; cutting, evenly cut the end of a semi-finished cylinder plug pin conforming to the specification; extrusion forming, place a semi-finished cylinder plug pin with cut end breadthwise on a collet of the auto lathe with the rotating speed of 5000-6000 rpm for extrusion into finished products. This invention adopts the technology combining drawing progressive die and extrusion forming by auto lathe to produce the finished plug pin conforming to the specification, which can not only greatly reduce the production cost and save materials, but also ensure fine mechanical strengthen and conducting performance, after tests, multiple parameters of the plug pins made in this process, including the mechanical strength and the current capacity, have achieved or even exceeded the performances of solid copper bar plug pins by auto lathe.

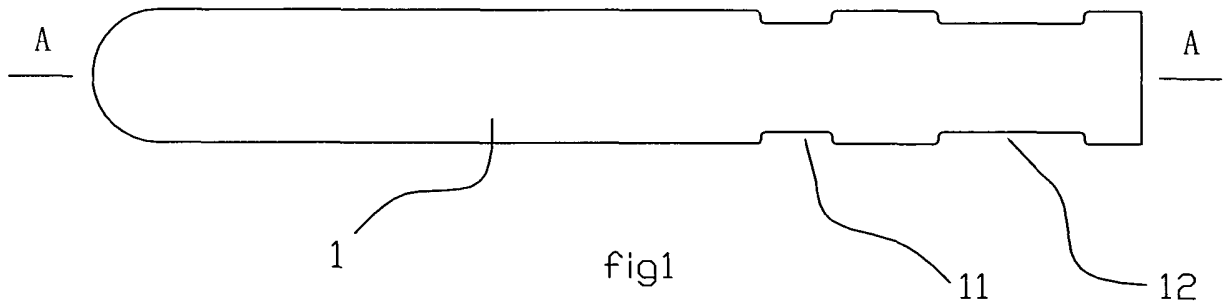


fig1

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Description

Technical Field

[0001] This invention relates to a manufacturing process of cylinder plug pins for electric connection on plugs and plug pins manufactured in this process.

Background Technology

[0002] Existing column-shaped pins for European plugs are made of copper bars by auto lathe, this process has the disadvantages of high consumption of copper, high production cost and low daily output, etc. In the current situation of insufficient resources and the promotion of energy saving, this traditional process needs to be improved.

Disclosure of the Invention

[0003] The first technical problem for this invention to solve is to, targeting at the existing situation described above, provide a manufacturing process for cylinder plug pins for electric connection that can not only ensure the performances of pins, but also greatly reduce the production cost as well as plug pins made in this process.

[0004] The technical solution of this invention to solve the technical problem mentioned above is: said process for cylinder pins for electric connection featured by the following steps:

Step 1: sorting, selecting copper stripes with the width of 21~25mm and the thickness of 0.4~0.6mm and put them on a feeder;

Step 2: stamping and drawing, send the said copper strips to a drawing progressive die with the said feeder for continuous progressive drawing till a semi-finished cylinder plug pin conforming to a specification is made;

Step 3: end cutting, evenly cut the end of the said semi-finished cylinder plug pin conforming to the specification;

Step 4: extrusion forming on a lathe, place a semi-finished cylinder plug pin with cut end breadthwise on a collet of an auto lathe with the rotating speed of 5000~6000rpm, and then extrude the part of the plug pin to be shrunk lengthwise with a extrusion tool head to form it into a finished pin.

[0005] It is recommended to carry out 6 times of drawing as mentioned above, however, the drawing varies due to plug pins of different specifications, for example, for a plug pin with the diameter of 4.8mm and height of 31.5mm, first, a cylinder blank with the diameter of 21.5mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 14.5mm and the height of 7.4mm, the work piece is then sent to the next position by a manipulator; after the 2nd drawing, the diameter of the cylinder work piece is 11.6mm and the height is 11.4mm; said cylinder work piece is then drawn into one with the diameter of 9.2mm and the height of 15.5mm after the 3rd drawing; then drawn into the diameter of 7.3mm and the height of 21.5mm after the 4th drawing; then drawn into the diameter of 5.8mm and the height of 28mm after the 5th drawing; and at last, it is made into a semi-finished cylinder plug pin with the diameter of 4.8mm and the height of 35mm after the 6th drawing.

[0006] However, for a plug pin with the diameter of 4.0mm and the height of 28.5mm, first, a cylinder blank with the diameter of 20.0mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 12.5mm and the height of 7.5mm, the work piece is then sent to the next position by a manipulator; after the 2nd drawing, the diameter of the cylinder work piece is 10.0mm and the height is 11.5mm; said cylinder work piece is then drawn into one with the diameter of 8.0mm and the height of 16.5mm after the 3rd drawing; then drawn into the diameter of 6.5mm and the height of 21.5mm after the 4th drawing; then drawn into the diameter of 5.2mm and the height of 27.5mm after the 5th drawing; and at last, it is made into a semi-finished cylinder plug pin with the diameter of 4.0mm and the height of 31.5mm after the 6th drawing.

[0007] Said extrusion tool head should adopt an alloy steel bead with the diameter of 1.0mm~6.0mm.

[0008] A plug pin made according to the said manufacturing process above is in the shape of a one-block hollow cylinder with cavity.

[0009] Another technical solution of this invention to solve the technical problem mentioned above is: said process for cylinder pins for electric connection is featured by the following steps:

Step 1: sorting, selecting copper stripes with the width of 21~25mm and the thickness of 0.4~0.8mm and put them on a feeder;

Step 2: stamping and drawing, send the copper strips to the drawing progressive die with the feeder for continuous progressive drawing till the semi-finished cylinder plug pin conforming to the specifications are made;

Step 3: end cutting, evenly cut the end of the semi-finished cylinder plug pin conforming to the specifications;

Step 4: extrusion forming on a lathe, place a semi-finished cylinder plug pin with cut end breadthwise on a collet of an auto lathe with the rotating speed of 5000~6000rpm, and extrude the end of the semi-finished plug pin with a shrinking cuff homocentric with the semi-finished plug pin and capable of sliding breadthwise to make the end of the semi-finished plug pin shrunk due to the extrusion, and then take out the shrinking cuff and make a tapered push pin homocentric with the semi-finished plug pin and ca-

pable of sliding breadthwise inserted in a hole at the end of the semi-finished plug pin to make a flange of a hole at the end of the semi-finished plug pin turn down, when the turndown flange of the hole achieves the designed specification, draw back the pull board to take it out, at the same time, the tool head equipped on the lathe that can move up and down extrudes lengthwise the semi-finished plug pin, which produces a shrunk concave ring at corresponding location at the middle of the semi-finished plug pin, and then move the semi-finished plug pin to a driller for drilling the hole to make the finished plug pins.

[0010] As an improvement, said drawing should be carried out for 6 times preferably, first, a cylinder blank with the diameter of 20~25mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 12~16mm and the height of 6-8mm, the work piece is then sent to the next position by a manipulator; after the 2nd drawing, the diameter of the cylinder work piece is 10~13mm and the height is 10~12mm; said cylinder work piece is then drawn into one with the diameter of 8.2~10.2mm and the height of 14~16mm after the 3rd drawing; then drawn into one with the diameter of 6-8mm and the height of 20~23mm after the 4th drawing; then drawn into one with the diameter of 5~7mm and the height of 27-29mm after the 5th drawing; and at last, it is made into the cylinder semi-finished plug pin with the diameter of 4~5mm and the height of 28~36mm after the 6th drawing.

[0011] As a further improvement, said drawing should be carried out for 6 times preferably, first, a cylinder blank with the diameter of 19-21mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 11~13 mm and the height of 6~8 mm, the work piece is then sent to the next position by a manipulator; after the 2nd drawing, the diameter of the cylinder work piece is 9~11mm and the height is 10~12 mm; said cylinder work piece is then drawn into one with the diameter of 7-9mm and the height of 15.5~17.5mm after the 3rd drawing; then drawn into one with the diameter of 5.5~7.5mm and the height of 20.5~22.5mm after the 4th drawing; then the drawn into one with the diameter of 4.2~6.2mm and the height of 26.5~28.5mm after the 5th drawing; and at last, it is made into the cylinder semi-finished plug pin with the diameter of 3.5~4.5mm and the height of 30.5~32.5mm after the 6th drawing.

[0012] As a further improvement, said shrinking cuff and said push pin adopt are made of alloy steel, said tool head also be alloy steel bead.

[0013] Compared with existing technologies, this invention adopts the technology combining progressive die drawing and extrusion forming by auto lathe to produce the finished plug pin conforming to the specifications, which can not only greatly reduce the production cost and save materials, but also ensure fine mechanical strengthen and conducting performance; moreover, with the shrinkage method for plug pins by a shrinking cuff, no material waste in the manufacturing process, which can both save energy sources and keep the cleanness of the workplace so as to meet the requirements of environmental protection and effectively maintain the fine mechanical strength and conductivity of the product, after tests, multiple parameters of the plug pins made in this process, including the mechanical strength and the current capacity, have achieved or even exceeded the performances of copper bar plug pins by auto lathe.

Description of the Drawings

[0014]

Figure 1 is the outside view of a finished plug pin;
Figure 2 is a cutaway view of Figure 3 along the line of A-A;
Figure 3 is a structural diagram reflecting the stamping and drawing technologies in the embodiment of this invention;
Figure 4 is a structural diagram reflecting the extrusion shrinkage technologies in the embodiment of this invention;
Figure 5 is a structural diagram reflecting the product of another specification in the embodiment of this invention;
Figure 6 is a cutaway view of Figure 5 along the line of B-B.
Figure 7 is a sketch of the finished plug pin according to a embodiment of this invention;
Figure 8 is a cutaway view of Figure 7 along the line of A-A;
Figure 9 is a cutaway view of Figure 8 being rotated by 90°;
Figure 10 is a structural diagram reflecting the extrusion shrinkage technologies in the embodiment of this invention;
Figure 11 is a sketch of the hole flanging structure of the embodiment of this invention.

Embodiments

[0015] Detailed description of the present invention will now be described with reference to the drawings.

[0016] Embodiment 1: now we take a manufacture of a cylinder pin 1 of European plug with the diameter of 4.8mm and the height of 31.5mm as an example, the process consists of the following steps:

Step 1: sorting, selecting a copper stripe 6 with the width of 24.5mm and the thickness of 0.5mm and put it on a feeder 5.
Step 2: send the said copper strip to the drawing progressive die with the feeder for continuous progressive drawing
As shown in Figure 1, 3, the pin 1 is made after mul-

tiple times of drawing, say, 5, 6 or more times, according to the specifications of the pin. Now we take 6 times as the example, send the copper strip 6 with the width of 24.5mm and thickness of 0.5mm with the auto feeder 5 into dies 3 continuously according to the stipulations length. First, a cylinder blank with the diameter of 21.5mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 14.5mm and the height of 7.4mm, the work piece is then sent to the next position by a manipulator 4; after the 2nd drawing, the diameter of the cylinder work piece is 11.6mm and the height is 11.4mm; said cylinder work piece is then drawn into one with the diameter of 9.2mm and the height of 15.5mm after the 3rd drawing; then drawn into the diameter of 7.3mm and the height of 21.5mm after the 4th drawing; then drawn into the diameter of 5.8mm and the height of 28mm after the 5th drawing; and at last, it is made into the cylinder work piece with the diameter of 4.8mm and the height of 35mm after the 6th drawing;

Step 3: end cutting

Cut the end of the semi-finished cylinder plug pin 1' even and make it into the cylinder copper tube with the diameter of 4.8mm and height of 31.5mm;

Step 4: extrusion forming on an automatic lathe 7

As the plug pin 1 required to be connected with the insulating base of the socket, it is often provided with a ring groove for diameter shrinkage, plug pin 1 will have different location of the groove according to different speciation. This process is to make the product meeting the requirements of outside dimensions after shrinkage of the cylinder copper tube with the diameter of 4.8mm and height of 31.5mm at the central part 11 and the rear part 12.

[0017] As shown in Figure 4, nip the semi-finished cylinder plug pin 1' breadthwise in a collet of an auto lathe 7 with the rotating speed of 5000rpm, a extrusion tool head 82 is fixed on a tool carrier 8 that can move up and down, said tool carrier 8 is installed on the pulling board that can move from left to right, an alloy steel bead 81 with the diameter of 4.0mm is installed in said extrusion tool head 82 is provided with. During the operation, when the pulling board moved to the location for shrinking the work piece (semi-finished cylinder plug pin 1'), said tool carrier 8 sends the tool forwards, making the extrusion tool head 82 extrude said work piece lengthwise (or cause said alloy steel bead 81 in it for the extrusion), said extrusion tool head 82 extrude contacts with the copper tube that is rotating at a high rate, which produces high temperature and makes the copper tube annealed and softened and shrink into the required size under the extrusion. Similarly, the extrusion by another tool head 71 fixed on the carrier will produce a shrunk section at the center part of the semi-finished cylinder plug pin 1'. At last plug pin 1 is in the shape of a one-block hollow cylinder with cavity 2.

[0018] Embodiment 2: Figure 5 and Figure 6 show the structure of a plug pin of another size made in the process according to the invention, as it is different from the plug pin 1 mentioned in the embodiment above in terms of size and appearance, it will be made by a different process. This embodiment shows a plug pin 1 with the diameter of 4.0mm and the height of 28.5mm, a shrunk section is provided at the central part 13 on the outer surface.

Step 1: sorting

Selecting a copper strip 6 with the width of 22mm and the thickness of 0.5mm and put them on a feeder 5.

Step 2: send the said copper strip 6 to a drawing progressive die with the feeder 5 for continuous progressive drawing

Also as shown in Figure 3, this plug pin 1 is also made after 6 times of drawing continuously. Sending copper strip 6 with the width of 22mm and the thickness of 0.5mm by the auto feeder 5 according to the stipulated pace length into the dies 3. First, a cylinder blank with the diameter of 20.0mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 12.5mm and the height of 7.5mm, the work piece is then sent to the next position by a manipulator 4; after the 2nd drawing, the diameter of the cylinder work piece is 10.0mm and the height is 11.5mm; said cylinder work piece is then drawn into one with the diameter of 8.0mm and the height of 16.5mm after the 3rd drawing; then drawn into the diameter of 6.5mm and the height of 21.5mm after the 4th drawing; then drawn into the diameter of 5.2mm and the height of 27.6mm after the 5th drawing; and at last, it is made into the cylinder work piece with the diameter of 4.0mm and the height of 31.5mm after the 6th drawing.

Step 3: end cutting

Cut the end of the semi-finished cylinder plug pin 1' made above and made it into the cylinder copper tube with the diameter of 4.0mm and height of 28.5mm;

Step 4: extrusion forming on an automatic lathe 7

This step is similar to that of the embodiment 1, fix the cylinder copper tube on a collet of a lathe, shrink the central part 13 of it with the extrusion tool head 82 to make products meeting the requirements of dimensions.

[0019] According to the process above we can make a one-block hollow plug pin 1 with cavity 2 (as shown in Figure 3-Figure 6), this structure can only save material, but also ensure the original conducting performance and mechanical strength of the plug pin 1, moreover, after tests, multiple parameters of the plug pins made in this process, including the mechanical strength and the current capacity, have achieved or even exceeded the performances of solid copper bar plug pins by automatic

lathe.

[0020] Plug pins of different specifications can be made in the process according to this invention and can be equipped on different carriers to be made into various plugs of different countries, including European plugs, French plugs, German plugs and English plugs, etc..

[0021] Embodiment 3: now we take the manufacture of a cylinder pin 1 of European plug with the diameter of 4.8mm and the height of 31.5mm as the example, the process consists of the following steps:

Step 1: sorting, selecting a copper stripe 6 with the width of 24.5mm and the thickness of 0.5mm and put it on a feeder 5.

Step 2: send the copper strip 6 to a drawing progressive die with the feeder for continuous progressive drawing

As shown in Figures 7-10, the pin 1 is made after 6 times of drawing. Send the copper strip 6 with the width of 24.5mm and thickness of 0.5mm with an auto feeder 5 into dies 3 continuously according to the stipulations. First, a cylinder blank with the diameter of 21.5mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 14.5mm and the height of 7.4mm, the work piece is then sent to the next position by a manipulator 4; after the 2nd drawing, the diameter of the cylinder work piece is 11.6mm and the height is 11.4mm; said cylinder work piece is then drawn into one with the diameter of 9.2mm and the height of 15.5mm after the 3rd drawing; then the diameter of 7.3mm and the height of 21.5mm after the 4th drawing; then the diameter of 5.8mm and the height of 28mm after the 5th drawing; and at last, it is made into the work piece with the diameter of 4.8mm and the height of 35mm after the 6th drawing;

Step 3: end cutting

Cut the end of the cylinder semi-finished plug pin 1' even and make it into the cylinder copper tube with the diameter of 4.8mm and height of 31.5mm;

Step 4: extrusion forming on a lathe 7

As the plug pin 1 required to be connected with the insulating base of the socket, it is often provided with a ring groove 16 for diameter shrinkage, This process is to make the product meeting the requirements of outside dimensions after shrinkage of the cylinder copper tube with the diameter of 4.8mm and height of 31.5mm at the end.

[0022] As shown in Figure 10 and Figure 11, nip the semi-finished cylinder plug pin 1' breadthwise in a collet of the auto lathe 7 with the rotating speed of 5000-6000rpm, the tube shrinking cuff 9 is made of alloy steel and is fixed on the pulling board 8, during the operation, move the pull board 8 to the end of the semi-finished plug pin 1' and insert in the plug pin, then proceed to advance leftwards, the tapered hole 92 in the shrinking cuff 9 extrudes the end of the semi-finished plug pin 1 to shrink the end of the semi-finished plug pin 1', see figure 10. And the take out the shrinking cuff 9, and then move the pull board 8 and its moving direction flatly to make the push pin 91 fixed on the other position of the pull board 8 to be directly opposing the semi-finished plug pin 1', said push pin 91 is tapered and made in alloy steel. After that, move the pull board 8 to the left and make the head of the push pin 91 inserted in the hole at the end of the semi-finished plug pin 1' so that the flange of the hole at the end of the semi-finished plug pin 1' can be turned down as shown in figure 9, when the turndown flange of the hole achieves the designed specification, draw back the pull board 8 to take it out, at the same time, the tool head 71 equipped on the lathe 7 that can move up and down extrudes downwards (lengthwise) the semi-finished plug pin 1', which produces a shrunk concave ring 14 at corresponding location at the middle of the semi-finished plug pin 1', and then move the semi-finished plug pin 1' to the driller for drilling the hole 15 to make the finished plug pin 1. Said tool head 71 is a steel ball made of alloy steel.

[0023] A hollow integral finished plug pin 1 can be made following the process above, which both saves materials and can ensure the original conductivity and mechanical strength of the plug pin 1, after tests, multiple parameters of the plug pins made in this process, including the mechanical strength and the current capacity, have achieved or even exceeded the performances of copper bar plug pins by auto lathe.

Embodiment 4,

[0024] The manufacturing of cylinder plug pins for electric connection of this embodiment comprises the following steps:

a: sorting, selecting a copper stripe 6 with the width of 21mm and the thickness of 0.4mm and put it on a feeder 5.

b, stamping and drawing, send the copper strip 6 to the drawing progressive die 3 with the feeder 5 for continuous progressive drawing till the semi-finished cylinder plug pin 1" conforming to the specifications is made; said drawing should be carried out for 6 times preferably, First, a cylinder blank with the diameter of 20mm should be made by stamping on the feeding belt, which should then be drawn into a cylinder work piece with the diameter of 12mm and the height of 6mm, the work piece is then sent to the next position by a manipulator 4; after the 2nd drawing, the diameter of the cylinder work piece is 10mm and the height is 10mm; said cylinder work piece is then drawn into one with the diameter of 9.2mm and the height of 14mm after the 3rd drawing; then the diameter of 6mm and the height of 20mm after the 4th drawing; then the diameter of 5mm and the height of 27mm after the 5th drawing; and at last, it is made

into the work piece with the diameter of 4mm and the height of 28mm after the 6th drawing.
c, End cutting: Cut the end of the conforming cylinder semi-finished plug pin 1' even;
d, extrusion forming on a lathe: nip the semi-finished cylinder plug pin 1' breadthwise in a collet of the auto lathe 7 with the rotating speed of 5000rpm, and extrude the end of the semi-finished plug pin 1' with the shrinking cuff 9 homocentric with the semi-finished plug pin 1' and capable of sliding breadthwise to make the end of the semi-finished plug pin 1' shrunk due to the extrusion, and then take out the shrinking cuff 9 and make a tapered push pin 91 homocentric with the semi-finished plug pin 1' and capable of sliding breadthwise inserted in the hole at the end of the semi-finished plug pin 1' to make the flange of the hole at the end of the semi-finished plug pin 1' turn down, when the turndown flange of the hole achieves the designed specification, draw back the pull board 8 to take it out, at the same time, the tool head 71 equipped on the lathe 7 that can move up and down extrudes lengthwise the semi-finished plug pin 1', which produces a shrunk concave ring 14 at corresponding location at the middle of the semi-finished plug pin 1', and then move the semi-finished plug pin 1' to the driller for drilling the hole 15 to make the finished plug pin 1. Said shrinking cuff 9, tool head 71 and push pin 91are all made of alloy steel. Said push pin 91is made of alloy steel.

Embodiment 5,

[0025] The manufacturing of cylinder plug pins for electric connection of this embodiment comprises the following steps:

a: sorting, selecting a copper stripe 6 with the width of 25mm and the thickness of 0.8mm and put it on a feeder 5.
b, stamping and drawing, send a copper strip 6 to the drawing progressive die 3 with the feeder 5 for continuous progressive drawing till the semi-finished cylinder plug pin 1" conforming to the specifications is made; said drawing should be carried out for 6 times preferably, First, a cylinder blank with the diameter of 25mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 16mm and the height of 8mm, the work piece is then sent to the next position by a manipulator 4; after the 2nd drawing, the diameter of the cylinder work piece is 13mm and the height is 12mm; said cylinder work piece is then drawn into one with the diameter of 10.2mm and the height of 16mm after the 3rd drawing; then the diameter of 8mm and the height of 23mm after the 4th drawing; then the diameter of 7mm and the height of 29mm after the 5th drawing; and at last, it is made into the work piece with the diameter of 5mm and the height of 36mm after the 6th drawing.
c, End cutting: Cut the end of the conforming cylinder semi-finished plug pin 1' even;
d, extrusion forming on the lathe: nip the semi-finished cylinder plug pin 1' breadthwise in a collet of an auto lathe 7 with the rotating speed of 6000rpm, and extrude the end of the semi-finished plug pin 1' with the shrinking cuff 9 homocentric with the semi-finished plug pin 1' and capable of sliding breadthwise to make the end of the semi-finished plug pin 1' shrunk due to the extrusion, and then take out the shrinking cuff 9 and make a tapered push pin 91 homocentric with the semi-finished plug pin 1' and capable of sliding breadthwise inserted in the hole at the end of the semi-finished plug pin 1' to make the flange of the hole at the end of the semi-finished plug pin 1' turn down, when the turndown flange of the hole achieves the designed specification, draw back the pull board 8 to take it out, at the same time, the tool head 71 equipped on the lathe 7 that can move up and down extrudes lengthwise the semi-finished plug pin 1', which produces a shrunk concave ring 14 at corresponding location at the middle of the semi-finished plug pin 1', and then move the semi-finished plug pin 1' to the driller for drilling the hole 15 to make the finished plug pin 1. Said shrinking cuff 9, tool head 71 and push pin 91are all made of alloy steel. Said push pin 91is made of alloy steel.

Embodiment 6,

[0026] The manufacturing of cylinder plug pins for electric connection of this embodiment comprises the following steps:

a: sorting, selecting a copper stripe 6 with the width of 21mm and the thickness of 0.4mm and put it on a feeder 5.
b, stamping and drawing, send the copper strip 6 to the drawing progressive die 3 with the feeder 5 for continuous progressive drawing till the semi-finished cylinder plug pin 1" conforming to the specifications is made; said drawing should be carried out for 6 times preferably, First, a cylinder blank with the diameter of 19mm should be made by stamping on the feeding belt, which should then be drawn into a cylinder work piece with the diameter of 11mm and the height of 6mm, the work piece is then sent to the next position by a manipulator 4; after the 2nd drawing, the diameter of the cylinder work piece is 9mm and the height is 10mm; said cylinder work piece is then drawn into one with the diameter of 7mm and the height of 15.5mm after the 3rd drawing; then the diameter of 5.5mm and the height of 20.5mm after the 4th drawing; then the diameter of 4.2mm and the height of 26.5mm after the 5th drawing; and at last, it is made into the work piece with the diameter of 3.5mm and the height of 30.5mm after the 6th draw-

ing.

c, End cutting: Cut the end of the conforming cylinder semi-finished plug pin 1' even;

d, extrusion forming on a lathe: nip the semi-finished cylinder plug pin 1' breadthwise in a collet of the auto lathe 7 with the rotating speed of 5000rpm, and extrude the end of the semi-finished plug pin 1' with the shrinking cuff 9 homocentric with the semi-finished plug pin 1' and capable of sliding breadthwise to make the end of the semi-finished plug pin 1' shrunk due to the extrusion, and then take out the shrinking cuff 9 and make a tapered push pin 91 homocentric with the semi-finished plug pin 1' and capable of sliding breadthwise inserted in the hole at the end of the semi-finished plug pin 1' to make the flange of the hole at the end of the semi-finished plug pin 1' turn down, when the turndown flange of the hole achieves the designed specification, draw back the pull board 8 to take it out, at the same time, the tool head 71 equipped on the lathe 7 that can move up and down extrudes lengthwise the semi-finished plug pin 1', which produces a shrunk concave ring 14 at corresponding location at the middle of the semi-finished plug pin 1', and then move the semi-finished plug pin 1' to the driller for drilling the hole 15 to make the finished plug pin 1. Said shrinking cuff 9, tool head 71 and push pin 91are all made of alloy steel. Said push pin 91is made of alloy steel.

Embodiment 7,

[0027] The manufacturing of cylinder plug pins for electric connection of this embodiment comprises the following steps:

a: sorting, selecting a copper stripe 6 with the width of 21mm and the thickness of 0.4mm and put it on a feeder 5.

b, stamping and drawing, send the copper strip 6 to the drawing progressive die 3 with the feeder 5 for continuous progressive drawing till the semi-finished cylinder plug pin 1" conforming to the specifications is made; said drawing should be carried out for 6 times preferably, First, a cylinder blank with the diameter of 21mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 13mm and the height of 8mm, the work piece is then sent to the next position by a manipulator 4; after the 2nd drawing, the diameter of the cylinder work piece is 11mm and the height is 12mm; said cylinder work piece is then drawn into one with the diameter of 9mm and the height of 17.5mm after the 3rd drawing; then the diameter of 7.5mm and the height of 22.5mm after the 4th drawing; then the diameter of 6.2mm and the height of 28.5mm after the 5th drawing; and at last, it is made into the work piece with the diameter of 4.5mm and the height of 32.5mm after the 6th drawing.

c, End cutting: Cut the end of the conforming cylinder semi-finished plug pin 1' even;

d, extrusion forming on a lathe: nip the semi-finished cylinder plug pin 1' breadthwise in a collet of an auto lathe 7 with the rotating speed of 6000rpm, and extrude the end of the semi-finished plug pin 1' with the shrinking cuff 9 homocentric with the semi-finished plug pin 1' and capable of sliding breadthwise to make the end of the semi-finished plug pin 1' shrunk due to the extrusion, and then take out the shrinking cuff 9 and make a tapered push pin 91 homocentric with the semi-finished plug pin 1' and capable of sliding breadthwise inserted in the hole at the end of the semi-finished plug pin 1' to make the flange of the hole at the end of the semi-finished plug pin 1' turn down, when the turndown flange of the hole achieves the designed specification, draw back the pull board 8 to take it out, at the same time, the tool head 71 equipped on the lathe 7 that can move up and down extrudes lengthwise the semi-finished plug pin 1', which produces a shrunk concave ring 14 at corresponding location at the middle of the semi-finished plug pin 1', and then move the semi-finished plug pin 1' to the driller for drilling the hole 15 to make the finished plug pin 1. Said shrinking cuff 9, tool head 71 and push pin 91are all made of alloy steel. Said push pin 91is made of alloy steel.

Claims

1. A manufacturing process of cylinder plug pins for electric connection featured by the following steps:

   a) sorting, selecting a copper stripe (6) with the width of 21~25mm and the thickness of 0.4~0.6mm and put it on a feeder (5);

   b) stamping and drawing, send the said copper strip (6) to a drawing progressive die with the said feeder (5) for continuous progressive drawing till a semi-finished cylinder plug pin (1') conforming to a specification is made;

   c) end cutting, evenly cut the end of the said semi-finished cylinder plug pin (1') conforming to the specification;

   d) extrusion forming on a lathe, place the said semi-finished cylinder plug pin (1') with cut end breadthwise on a collet of an auto lathe (7) with the rotating speed of 5000~6000rpm, and then extrude the part of the plug pin to be shrunk lengthwise with a extrusion tool head (82, 71) to form it into the said finished pin (1).

2. A manufacturing process of cylinder plug pins for electric connection according to claim 1 whereby said drawing process should be repeated for 6 times, first, a cylinder blank with the diameter of 21.5mm

should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 14.5mm and the height of 7.4mm, the said work piece is then sent to the next position by a manipulator (4); after the 2nd drawing, the diameter of the cylinder work piece is 11.6mm and the height is 11.4mm; said cylinder work piece is then drawn into one with the diameter of 9.2mm and the height of 15.5mm after the 3rd drawing; then drawn into the diameter of 7.3mm and the height of 21.5mm after the 4th drawing; then drawn into the diameter of 5.8mm and the height of 28mm after the 5th drawing; and at last, it is made into the semi-finished cylinder plug pin (1') with the diameter of 4.8mm and the height of 35mm after the 6th drawing.

3. A manufacturing process of cylinder plug pins for electric connection according to claim 1 whereby said drawing process should be repeated for 6 times, first, a cylinder blank with the diameter of 20.0mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 12.5mm and the height of 7.5mm, the work piece is then sent to the next position by a manipulator (4); after the 2nd drawing, the diameter of the cylinder work piece is 10.0mm and the height is 11.5mm; said cylinder work piece is then drawn into one with the diameter of 8.0mm and the height of 16.5mm after the 3rd drawing; then drawn into the diameter of 6.5mm and the height of 21.5mm after the 4th drawing; then drawn into the diameter of 5.2mm and the height of 27.5mm after the 5th drawing; and at last, it is made into the semi-finished cylinder plug pin (1') with the diameter of 4.0mm and the height of 31.5mm after the 6th drawing.

4. A manufacturing process of cylinder plug pins for electric connection on plugs according to any of Claims 1 to 3 whereby said extrusion tool head (82) mainly comprises an alloy steel bead with the diameter of 1.0mm~6.0mm (81).

5. A plug pin made according to any of Claims 1 to 4 whereby said plug pin is in the shape of a one-block hollow cylinder with cavity (2).

6. A manufacturing process of cylinder plug pins for electric connection featured by the following steps:

a) sorting, selecting a copper stripe (6) with the width of 21~25mm and the thickness of 0.4~0.8mm and put it on a feeder (5)
b) stamping and drawing, send the said copper strip (6) to the drawing progressive die (3) with the feeder (5) for continuous progressive drawing till the semi-finished cylinder plug pin (1') conforming to a specification is made;
c) End cutting, evenly cut the end of the semi-finished cylinder plug pin (1') conforming to the specification;
d) Extrusion forming on a lathe: nip the semi-finished cylinder plug pin (1') breadthwise in a collet of an auto lathe (7) with the rotating speed of 5000-6000rpm, and extrude the end of the semi-finished plug pins (1') with a shrinking cuff (9) homocentric with the semi-finished plug pin (1') and capable of sliding breadthwise to make the end of the semi-finished plug pin (1') shrunk due to the extrusion, and then take out the shrinking cuff (9) and make a tapered push pins (91) homocentric with the semi-finished plug pin (1') and capable of sliding breadthwise inserted in a hole at the end of the semi-finished plug pin (1') to make the flange of a hole at the end of the semi-finished plug pin (1') turn down, when the turndown flange of the hole achieves the designed specification, draw back the pull board (8) to take it out, at the same time, the tool head (71) equipped on the lathe (7) that can move up and down extrudes lengthwise the semi-finished plug pin (1'), which produces a shrunk concave ring (14) at corresponding location at the middle of the semi-finished plug pin (1'), and then move the semi-finished plug pin (1') to a driller for drilling a hole (15) to make the finished plug pin (1).

7. A manufacturing process of cylinder plug pins for electric connection according to claim 6 whereby said drawing should be carried out for 6 times, first, a cylinder blank with the diameter of 20~25mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 12~16mm and the height of 6~8mm, the work piece is then sent to the next position by a manipulator (4); after the 2nd drawing, the diameter of the cylinder work piece is 10~13mm and the height is 10~12mm; said cylinder work piece is then drawn into one with the diameter of 8.2~10.2mm and the height of 14~16mm after the 3rd drawing; then drawn into one with the diameter of 6~8mm and the height of 20~23mm after the 4th drawing; then drawn into one with the diameter of 5~7mm and the height of 27~29mm after the 5th drawing; and at last, it is made into the cylinder semi-finished plug pin (1') with the diameter of 4~5mm and the height of 28~36mm after the 6th drawing.

8. A manufacturing process of cylinder plug pins for electric connection according to claim 6 whereby said drawing should be carried out for 6 times, first, a cylinder blank with the diameter of 19~21mm should be made by stamping on a feeding belt, which should then be drawn into a cylinder work piece with the diameter of 11~13 mm and the height of 6~8 mm, the work piece is then sent to the next position by a manipulator (4); after the 2nd drawing, the diameter

of the cylinder work piece is 9~11mm and the height is 10~12 mm; said cylinder work piece is then drawn into one with the diameter of 7~9mm and the height of 15.5~17.5mm after the 3rd drawing; then drawn into one with the diameter of 5.5~7.5mm and the height of 20.5~22.5mm after the 4th drawing; then drawn into one with the diameter of 4.2~6.2mm and the height of 26.5~28.5mm after the 5th drawing; and at last, it is made into the cylinder semi-finished plug pin (1') with the diameter of 3.5~4.5mm and the height of 30.5~32.5mm after the 6th drawing.

9. A manufacturing process of cylinder plug pins for electric connection according to any of Claims 6 to 8 whereby said shrinking cuff (9) is made of alloy steel.

10. A manufacturing process of cylinder plug pins for electric connection according to any of Claims 6 to 9 whereby said push pin (91) is made of alloy steel.

11. A manufacturing process of cylinder plug pins for electric connection according to any of Claims 6 to 10 whereby said tool head (71) is a bead made of alloy steel.

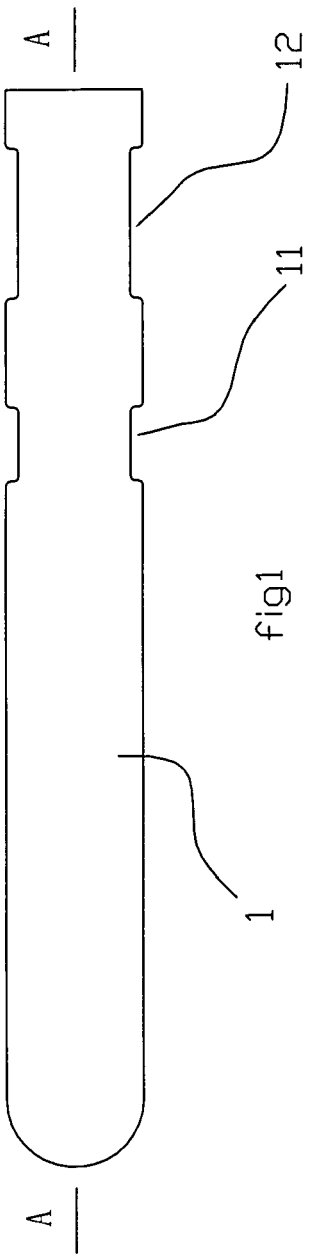
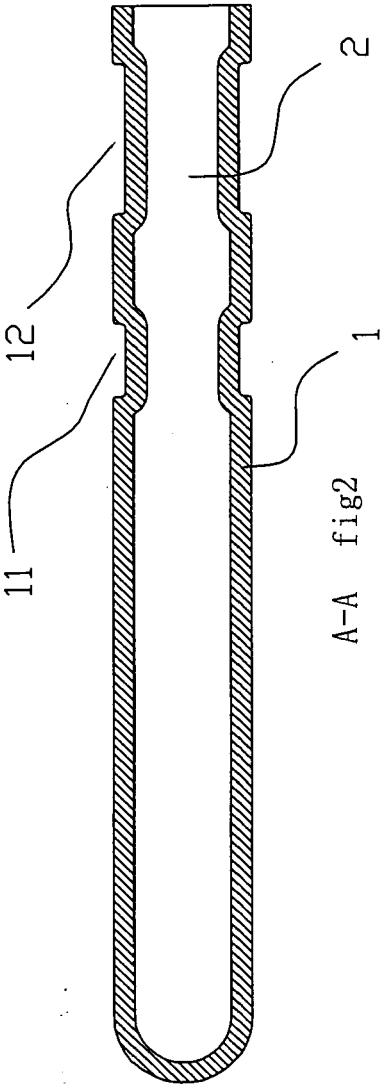


fig1



A-A fig2

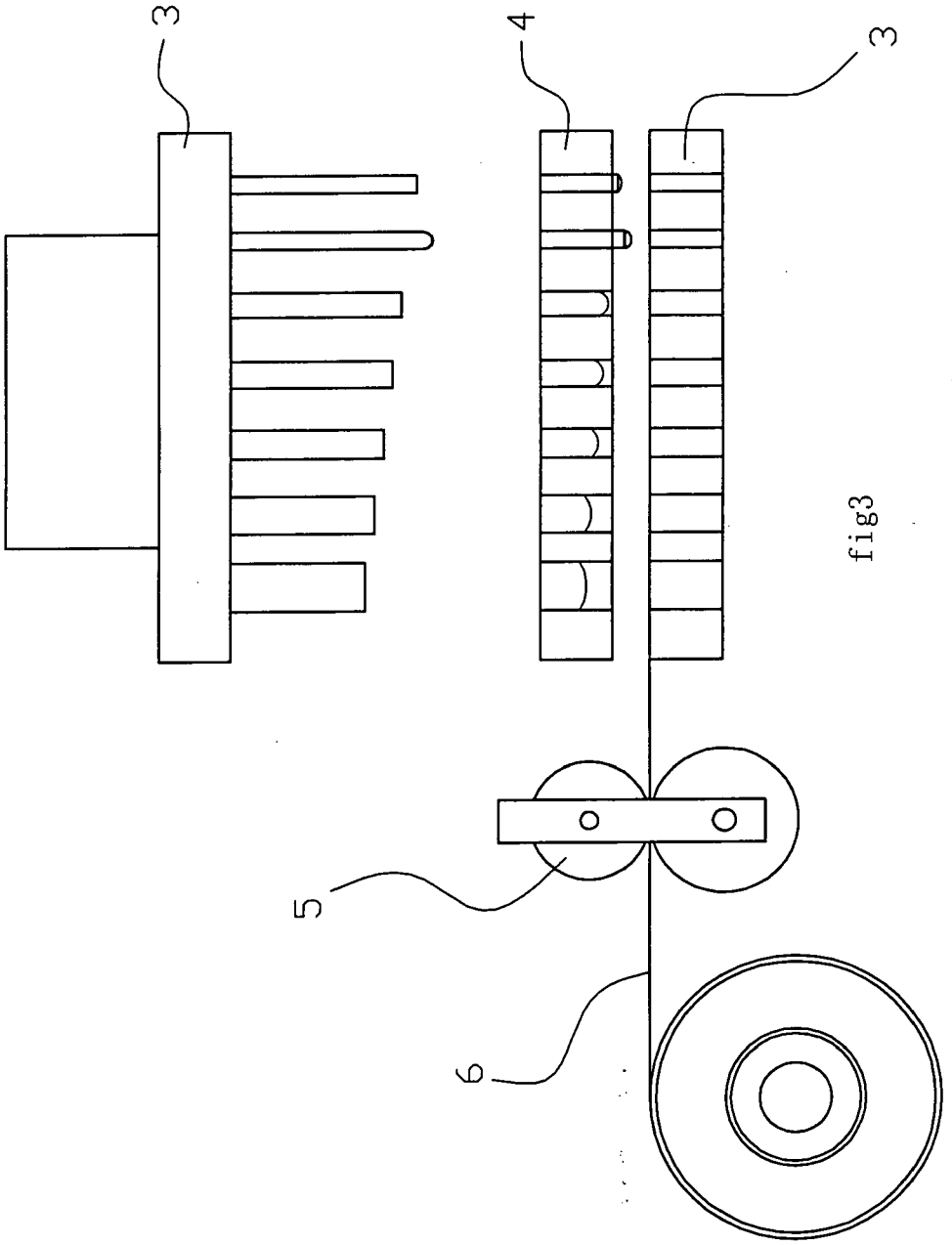


fig3

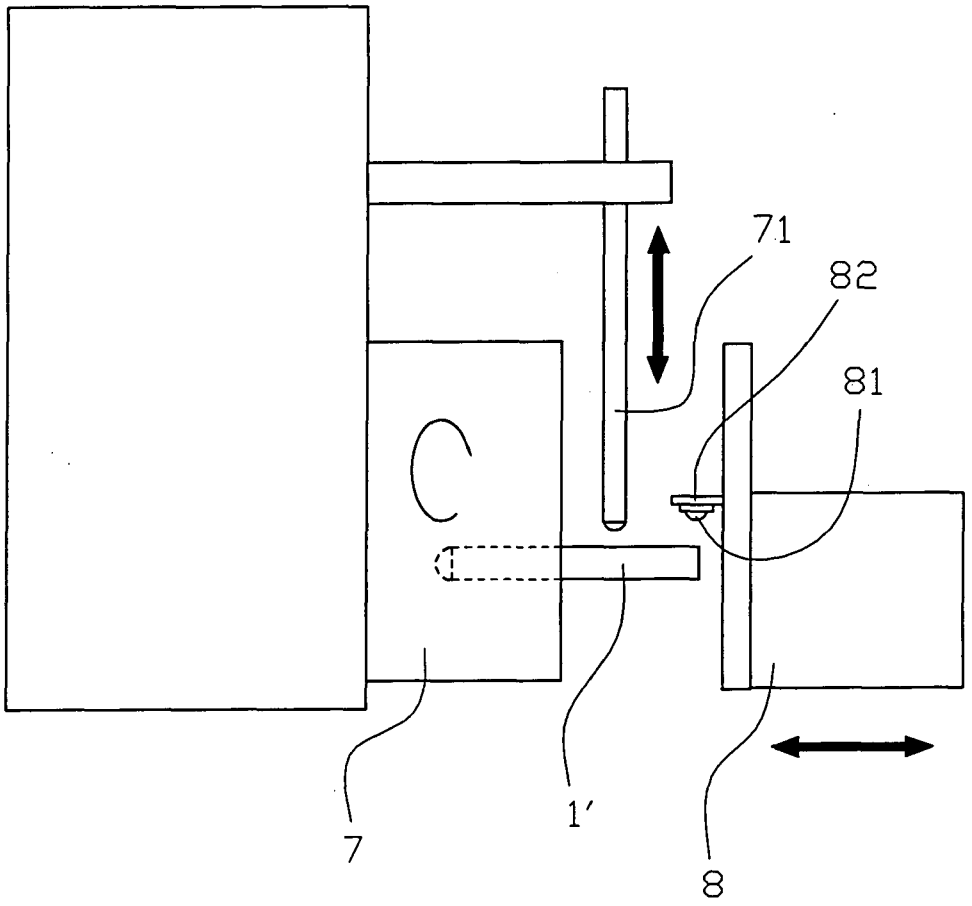


fig4

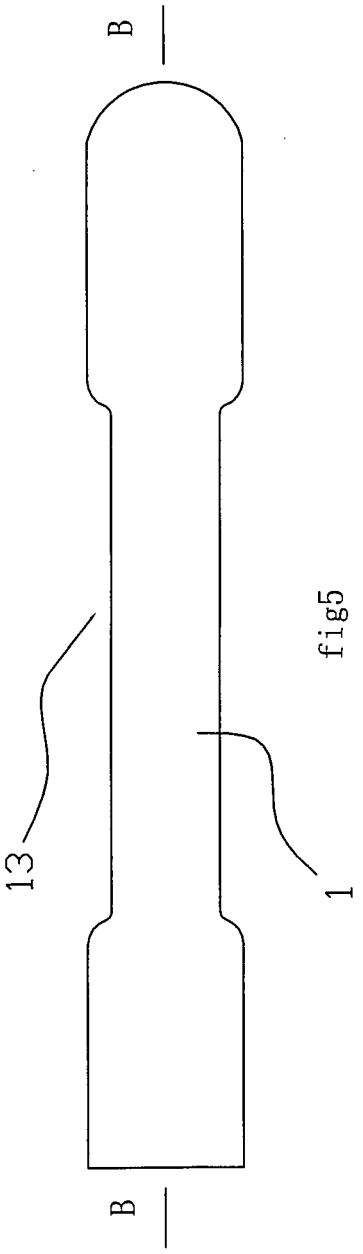
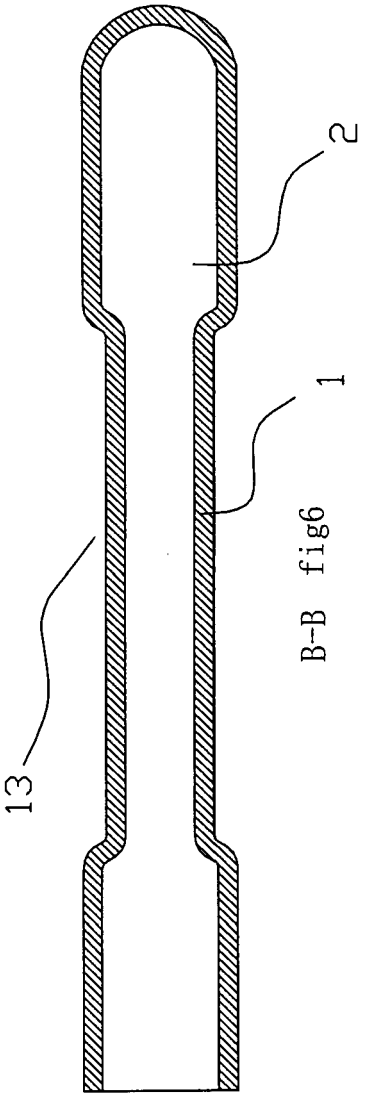


fig5



B-B fig6

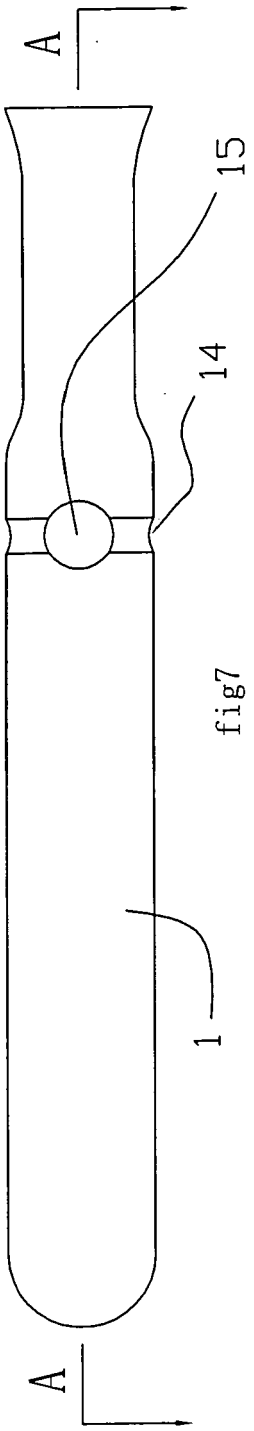
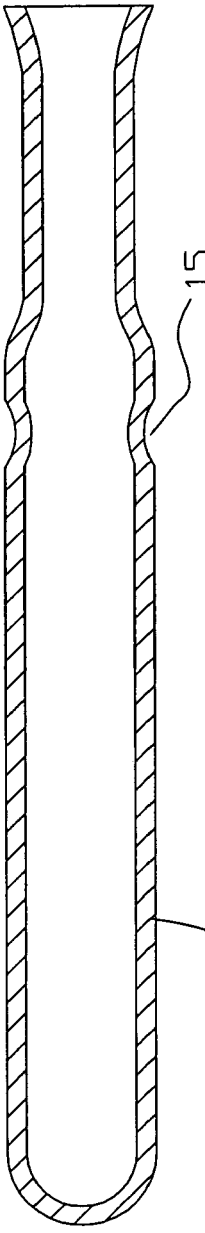


fig7



A-A fig8

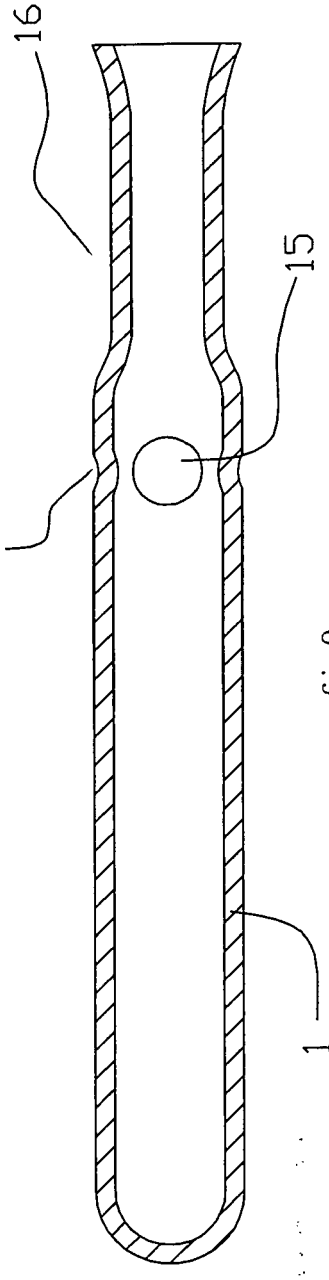


fig9

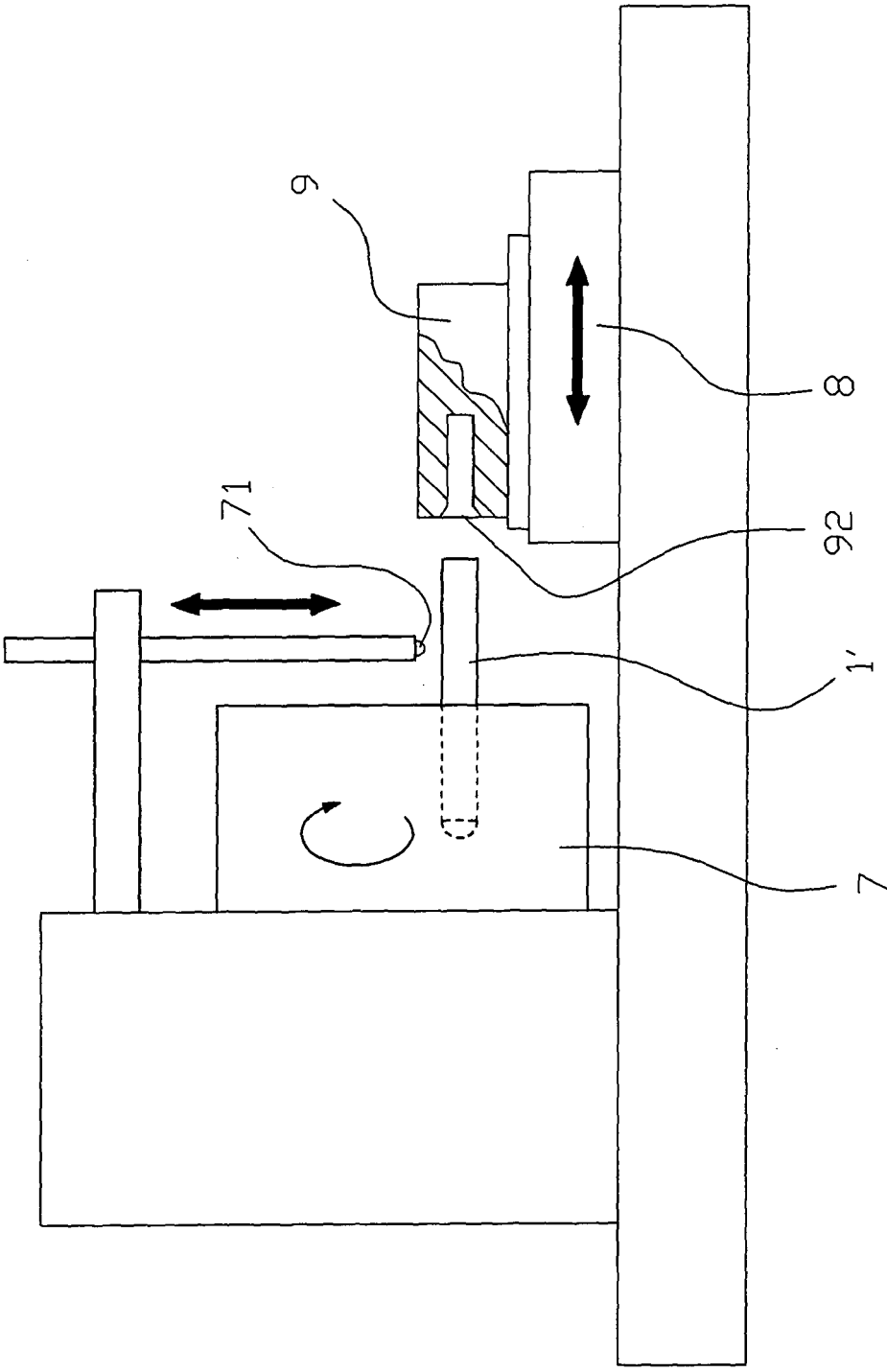


fig10

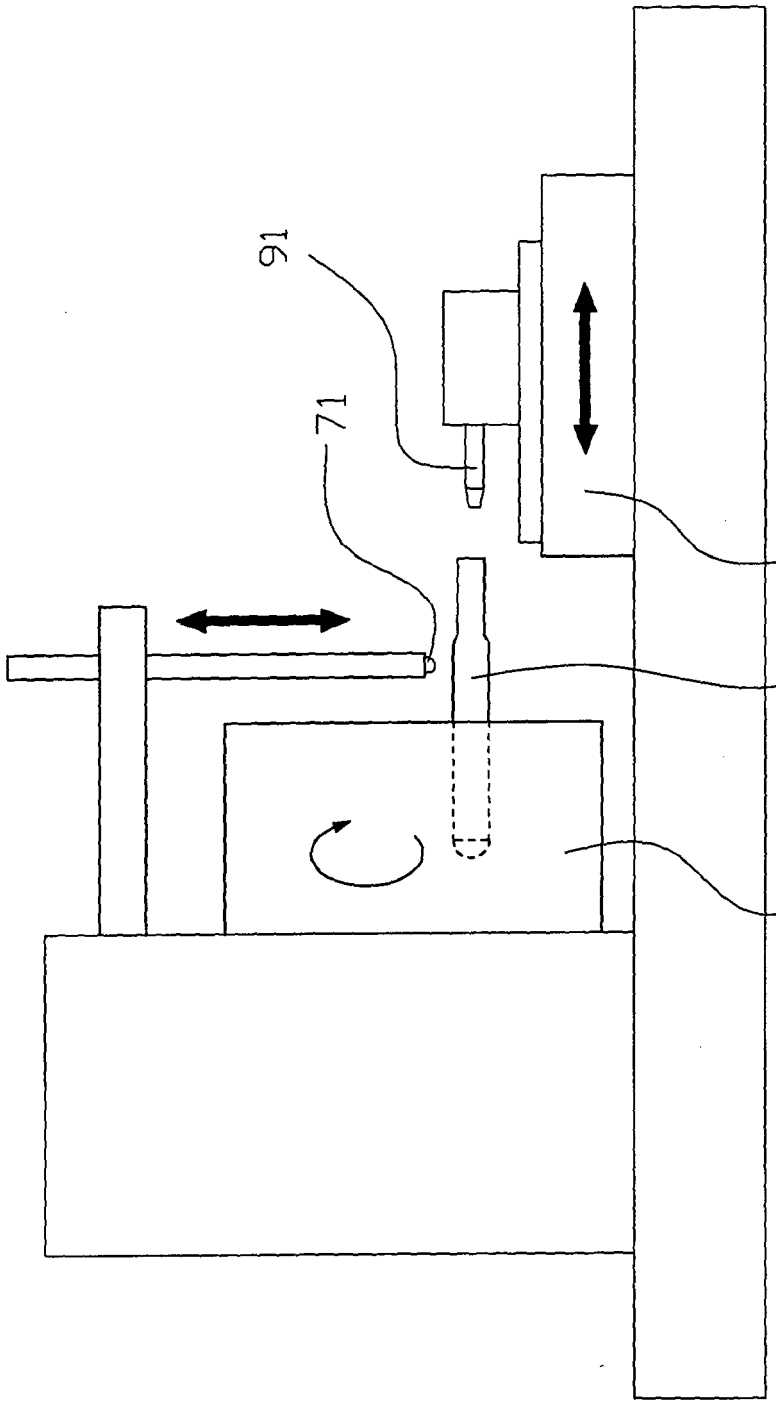


fig11

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 01 4031

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 September 2008	Criqui, Jean-Jacques

CATEGORY OF CITED DOCUMENTS

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