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

Herstellungsverfahren von zylindrischen Steckerstiften für elektrische Steckverbindungen und durch dieses Verfahren hergestellte Steckerstifte

Procédé de fabrication de broches de prise cylindriques pour connexion électrique et broches de prise fabriquées selon ce procédé

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(56) References cited:
EP-A- 0 128 990 EP-A- 1 213 135
WO-A-03/092925 US-A- 4 434 552
US-A- 4 820 207

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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.

[0003] EP 1 213 135 A1 discloses an index-feed processing system comprising a plurality of processing units disposed in the longitudinal feeding direction of a workpiece corresponding to a plurality of processing processes so that the processing processes are performed sequentially as the workpiece is indexed.

[0004] EP 0 128 990 A1 discloses a hollow cylinder to be used as a plug pin, with a round end, a portion with a reduced diameter and a collar, made from a flat blank by deep drawing.

Disclosure of the Invention

[0005] 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.

[0006] 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 mainly comprising an alloy steel bead with the

diameter of 1.0mm~6.0mm to form it into a finished pin.

[0007] 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.

[0008] 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.

[0009] A plug pin made according to the said manufacturing process above is in the shape of a one-block hollow cylinder with cavity.

[0010] Another technical solution of this invention to solve the technical problem mentioned above, but not covered by the set of claims, 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 specifi-

cations;

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 capable 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 iiange 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.

[0011] 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 5–8mm 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.

[0012] As a further improvement, said drawing should be carried out for 6 times preferably, first, a cylinder blank with the diameter of 19-21 mm 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.

[0013] 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.

[0014] 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

[0015]

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

[0016] Detailed description of the present invention will now be described with reference to the drawings.

[0017] 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 multiple 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.

[0018] 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.

[0019] 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.

[0020] 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.

[0021] 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..

[0022] 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.

[0023] 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.

[0024] 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,

[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 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 91 are all made of alloy steel. Said push pin 91 is made of alloy steel.

Embodiment 5,

[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 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 cyl-

inder 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 91 are all made of alloy steel. Said push pin 91 is made of alloy steel.

Embodiment 6,

[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 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 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 91 are all made of alloy steel. Said push pin 91 is made of alloy steel.

Embodiment 7,

[0028] 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 91 are all made of alloy steel. Said push pin 91 is 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), wherein said extrusion tool head (82) mainly comprises an alloy steel bead with the diameter of 1.0mm~6.0mm (81).

2. A manufacturing process of cylinder plug pins for electric connection according to claim 1 wherein 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 wherein 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 plug pin made according to any of Claims 1 to 3 wherein said plug pin is in the shape of a one-block hollow cylinder with cavity (2).

Patentansprüche

1. Herstellungsverfahren für zylindrische Steckerstifte

für elektrische Steckverbindungen, das sich durch die folgenden Schritte auszeichnet:

- a) Auslesen, Auswählen eines Kupferstreifens (6) mit der Breite von 21 - 25 mm und der Dicke von 0,4 - 0,6 mm und Legen von diesem auf eine Zuführungseinrichtung (5);
- b) Stanzen und Ziehen: Befördern des Kupferstreifens (6) mit der Zuführungseinrichtung (5) zu einem fortschreitenden ziehenden Formwerkzeug, um kontinuierlich fortschreitend zu ziehen, bis ein halbfertiger zylindrischer Steckerstift (1'), der einer Spezifikation entspricht, gefertigt ist;
- c) Endschneiden: gleichmäßiges Schneiden des Endes des halbfertigen zylindrischen Steckerstifts (1'), der der Spezifikation entspricht;
- d) Strangpressen bzw. Extrusionsformen auf einer Drehmaschine: Anordnen des halbfertigen zylindrischen Steckerstifts (1') mit der Breite nach geschnittenem Ende auf einer Sammeleinrichtung einer automatischen Drehmaschine (7) mit der Drehzahl von 5000 - 6000 U/Min und dann Extrudieren des Teils des Steckerstifts, welcher der Länge nach geschrumpft werden soll, mit einem Extrusionswerkzeugkopf (82, 71), um ihn zu dem fertiggestellten Stift (1) auszubilden, wobei der Extrusionswerkzeugkopf (82, 71) hauptsächlich ein Legierungsstahlkugeln mit dem Durchmesser von 1,0 mm - 6,0 mm (81) umfasst.

2. Herstellungsverfahren für zylindrische Steckerstifte für elektrische Steckverbindungen nach Anspruch 1, wobei das Ziehverfahren 6 mal wiederholt werden sollte, zuerst sollte durch Stanzen auf einem Zuführungsband ein Zylinderrohling mit dem Durchmesser von 21,5 mm gefertigt werden, der dann in ein Zylinderwerkstück mit dem Durchmesser von 14,5 mm und der Höhe von 7,4 mm gezogen werden sollte, wobei das Werkstück dann durch einen Manipulator (4) zu der nächsten Position befördert wird; nach dem zweiten Ziehen ist der Durchmesser des Zylinderwerkstücks 11,6 mm und die Höhe ist 11,4 mm; dieses Zylinderwerkstück wird dann in eines mit dem Durchmesser von 9,2 mm und der Höhe von 15,5 mm nach dem dritten Ziehen gezogen; dann in den Durchmesser von 7,3 mm und die Höhe von 21,5 mm nach dem vierten Ziehen gezogen; dann in den Durchmesser von 5,8 mm und die Höhe von 28 mm nach dem fünften Ziehen gezogen; und wird zuletzt zu dem halbfertigen zylindrischen Steckerstift (1') mit dem Durchmesser von 4,8 mm und der Höhe von 35 mm nach dem sechsten Ziehen gefertigt.

3. Herstellungsverfahren für zylindrische Steckerstifte für elektrische Steckverbindungen nach Anspruch 1, wobei das Ziehverfahren 6 mal wiederholt werden

sollte, zuerst sollte durch Stanzen auf einem Zuführungsband ein Zylinderrohling mit dem Durchmesser von 20,0 mm gefertigt werden, der dann in ein Zylinderwerkstück mit dem Durchmesser von 12,5 mm und der Höhe von 7,5 mm gezogen werden sollte, wobei das Werkstück dann durch einen Manipulator (4) zu der nächsten Position befördert wird; nach dem zweiten Ziehen ist der Durchmesser des Zylinderwerkstücks 10,0 mm und die Höhe ist 11,5 mm; dieses Zylinderwerkstück wird dann in eines mit dem Durchmesser von 8,0 mm und der Höhe von 16,5 mm nach dem dritten Ziehen gezogen; dann in den Durchmesser von 6,5 mm und die Höhe von 21,5 mm nach dem vierten Ziehen gezogen; dann in den Durchmesser von 5,2 mm und die Höhe von 27,5 mm nach dem fünften Ziehen gezogen; und wird zuletzt zu dem halbfertigen zylindrischen Steckerstift (1') mit dem Durchmesser von 4,0 mm und der Höhe von 31,5 mm nach dem sechsten Ziehen gefertigt.

4. Steckerstift nach einem der Ansprüche 1 bis 3, wobei der Steckerstift die Form eines Ein-Block-Hohlzylinders mit einem Hohlraum (2) hat.

Revendications

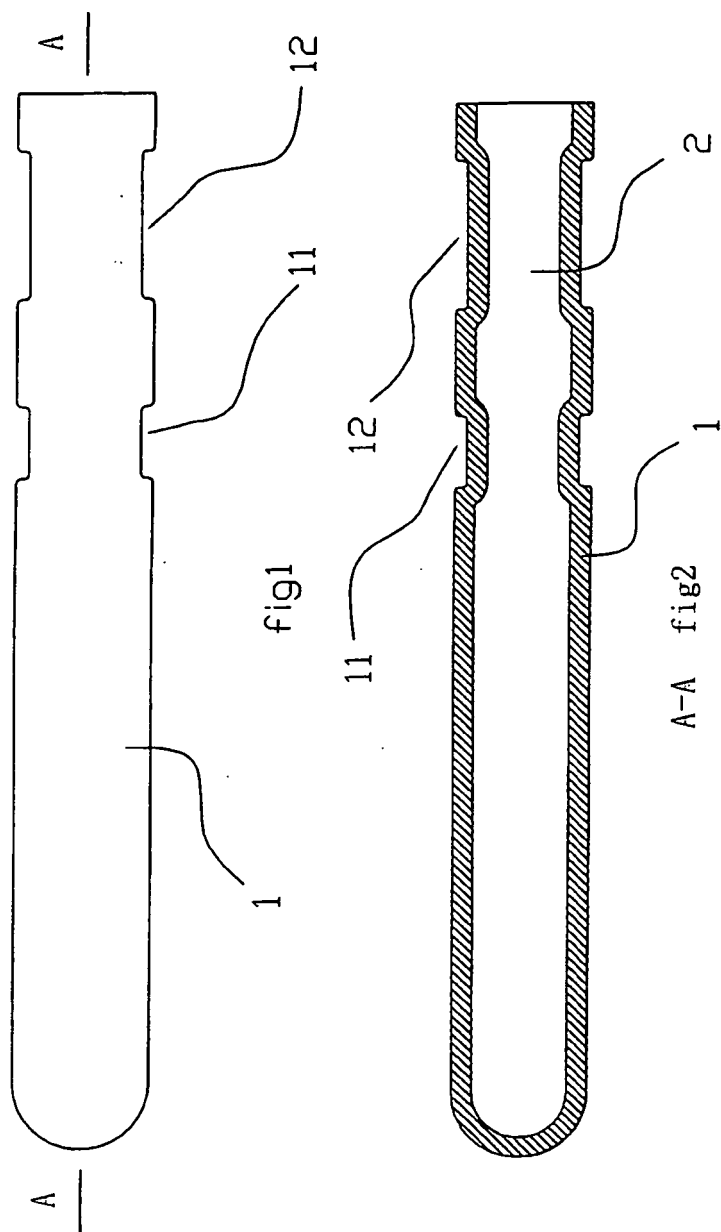
1. Procédé de fabrication de broches de prise cylindriques pour connexion électrique **caractérisé par** les étapes suivantes :

a) le tri, la sélection d'une strie de cuivre (6) présentant la largeur de 21 ~ 25 mm et l'épaisseur de 0,4 ~ 0,6 mm et la mettre sur un dispositif d'alimentation (5);
 b) l'estampage et l'emboutissage, envoyer ladite strie de cuivre (6) vers une filière progressive d'emboutissage avec ledit dispositif d'alimentation (5) pour un emboutissage progressif continu jusqu'à ce qu'une broche de prise cylindrique semi-finie (1') conformément à une spécification soit fabriquée ;
 c) le découpage d'extrémité, découper uniformément l'extrémité de ladite broche de prise cylindrique semi-finie (1') conformément à la spécification ;
 d) le formage par extrusion sur un tour, placer ladite broche de prise cylindrique semi-finie (1') avec l'extrémité coupée dans le sens de la largeur sur une pince de serrage d'un tour automatique (7) présentant la vitesse de rotation de 5000 ~ 6000 tours/minute, puis extruder la partie de la broche de prise devant être rétrécie dans le sens de la longueur avec une tête d'outil d'extrusion (82, 71) pour la former en ladite broche finie (1), dans lequel ladite tête d'outil d'extrusion (82) comprend principalement une bille d'acier allié présentant le diamètre de 1,0 ~ 6,0 mm (81).

2. Procédé de fabrication de broches de prise cylindriques pour connexion électrique selon la revendication 1, dans lequel ledit procédé d'emboutissage doit être répété 6 fois, d'abord un flan cylindrique présentant le diamètre de 21,5 mm doit être fabriqué par estampage sur une courroie d'alimentation, qui doit ensuite être embouti en une pièce de fabrication cylindrique présentant le diamètre de 14,5 mm et la hauteur de 7,4 mm, ladite pièce de fabrication est ensuite envoyée au poste suivant par un manipulateur (4) ; après le deuxième emboutissage, le diamètre de la pièce de fabrication cylindrique est de 11,6 mm et la hauteur est de 11,4 mm ; ladite pièce de fabrication cylindrique est ensuite emboutie en une pièce présentant le diamètre de 9,2 mm et la hauteur de 15,5 mm après le troisième emboutissage; puis emboutie pour atteindre le diamètre de 7,3 mm et la hauteur de 21,5 mm après le quatrième emboutissage ; puis emboutie pour atteindre le diamètre de 5,8 mm et la hauteur de 28 mm après le cinquième emboutissage ; et enfin, elle est transformée en la broche de prise cylindrique semi-finie (1') présentant le diamètre de 4,8 mm et la hauteur de 35 mm après le sixième emboutissage.

3. Procédé de fabrication de broches de prise cylindriques pour connexion électrique selon la revendication 1, dans lequel ledit procédé d'emboutissage doit être répété 6 fois, d'abord un flan cylindrique présentant le diamètre de 20,0 mm doit être fabriqué par estampage sur une courroie d'alimentation, qui doit ensuite être embouti en une pièce de fabrication cylindrique présentant le diamètre de 12,5 mm et la hauteur de 7,5 mm, la pièce de fabrication est ensuite envoyée au poste suivant par un manipulateur (4) ; après le deuxième emboutissage, le diamètre de la pièce de fabrication cylindrique est de 10,0 mm et la hauteur est de 11,5 mm ; ladite pièce de fabrication cylindrique est ensuite emboutie en une pièce présentant le diamètre de 8,0 mm et la hauteur de 16,5 mm après le troisième emboutissage; puis emboutie pour atteindre le diamètre de 6,5 mm et la hauteur de 21,5 mm après le quatrième emboutissage ; puis emboutie pour atteindre le diamètre de 5,2 mm et la hauteur de 27,5 mm après le cinquième emboutissage ; et enfin, elle est transformée en la broche de prise cylindrique semi-finie (1') présentant le diamètre de 4,0 mm et la hauteur de 31,5 mm après le sixième emboutissage.

4. Broche de prise fabriquée selon l'une quelconque des revendications 1 à 3, dans laquelle ladite broche de prise est sous la forme d'un cylindre creux d'un bloc avec une cavité (2).



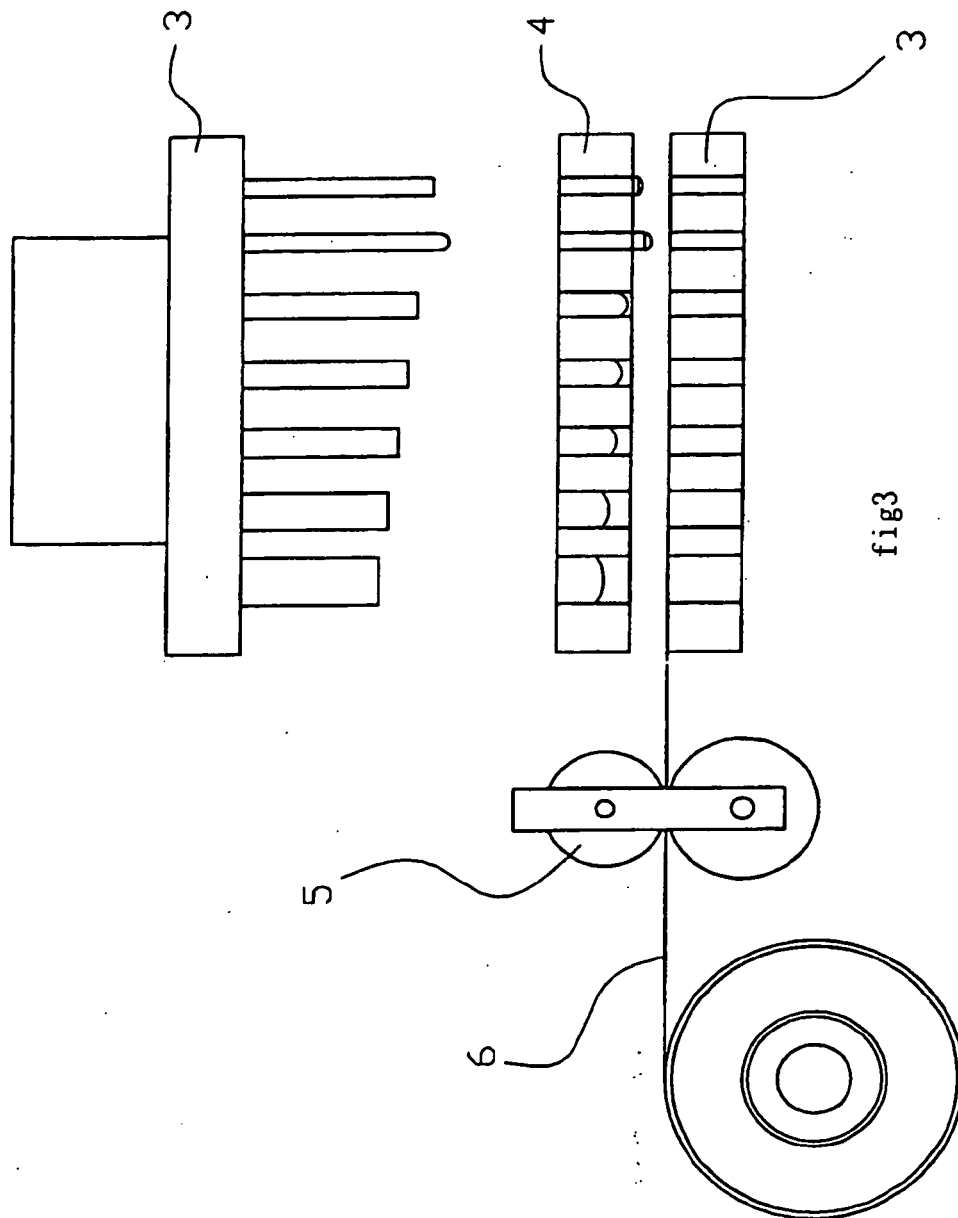


fig3

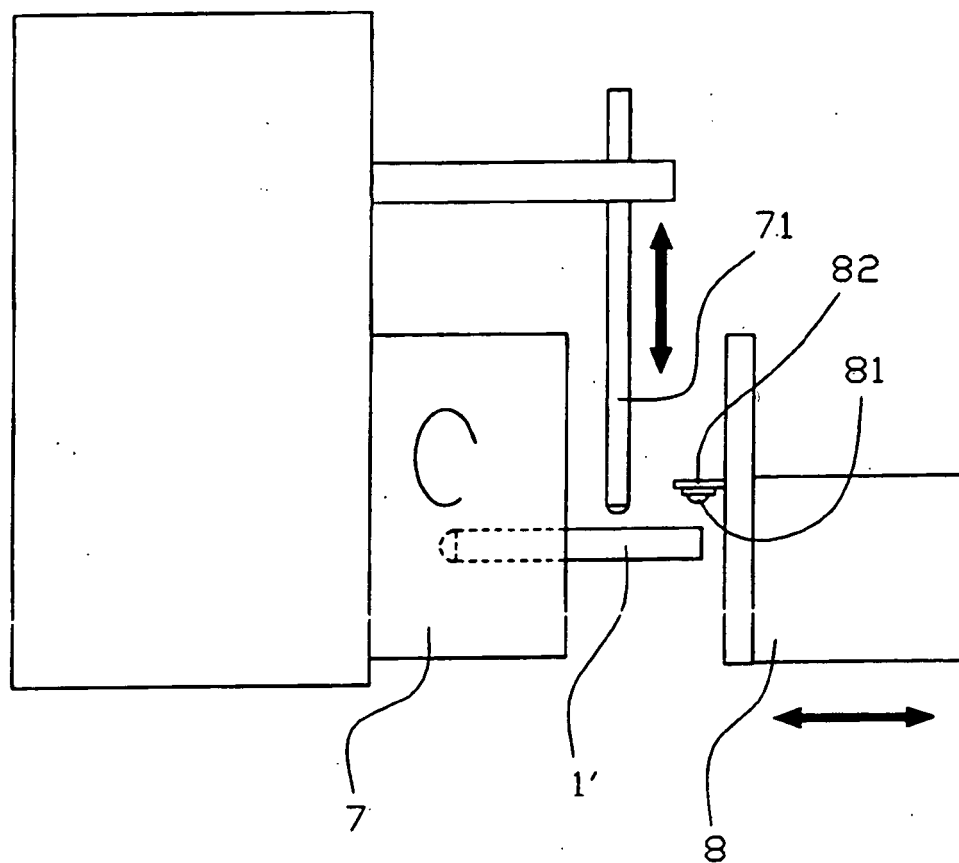
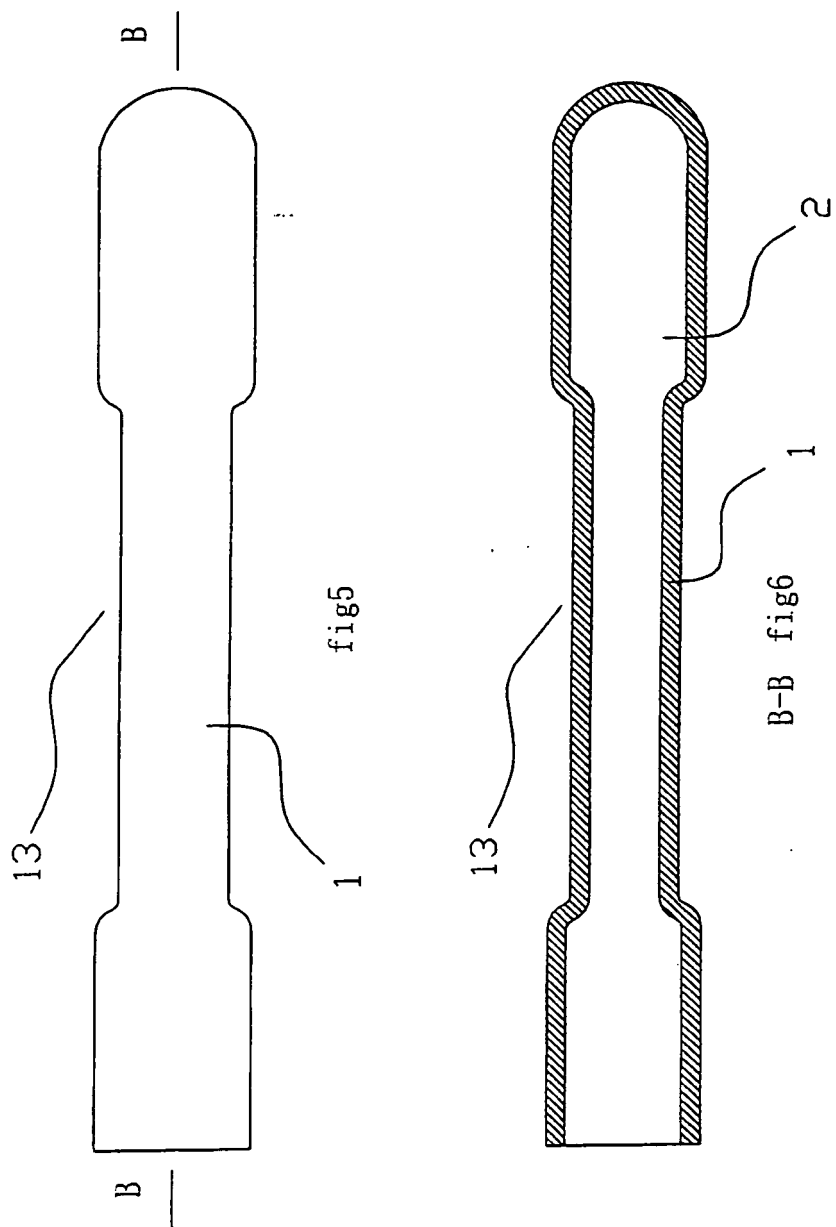
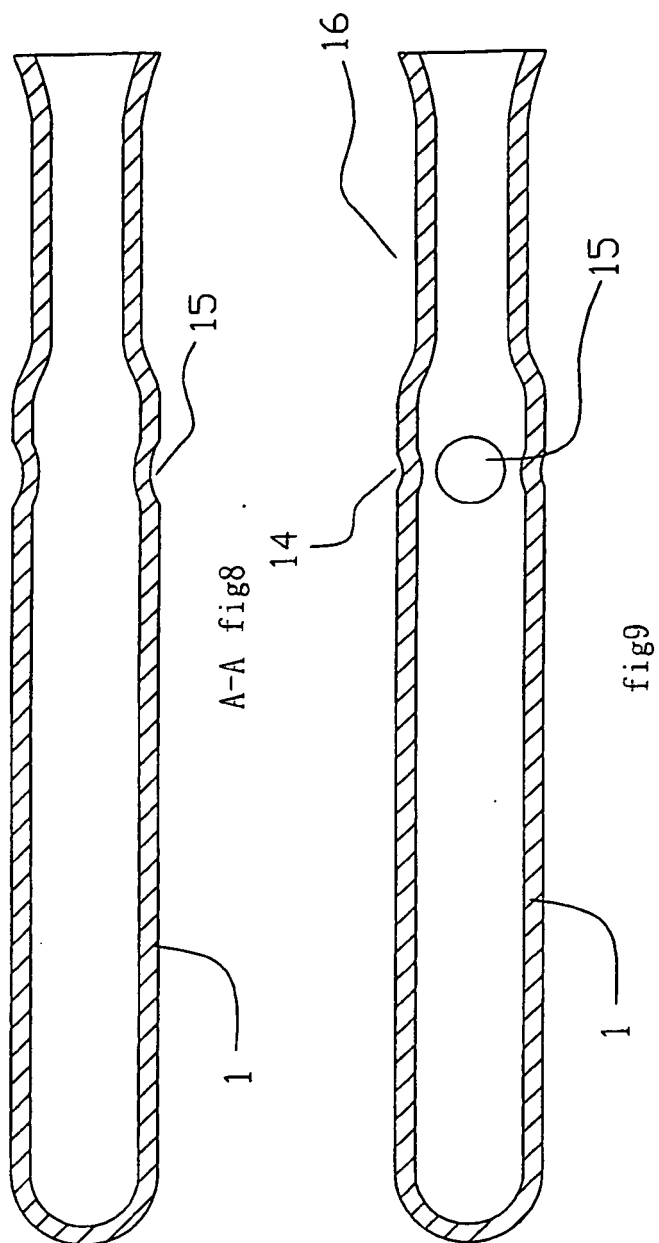
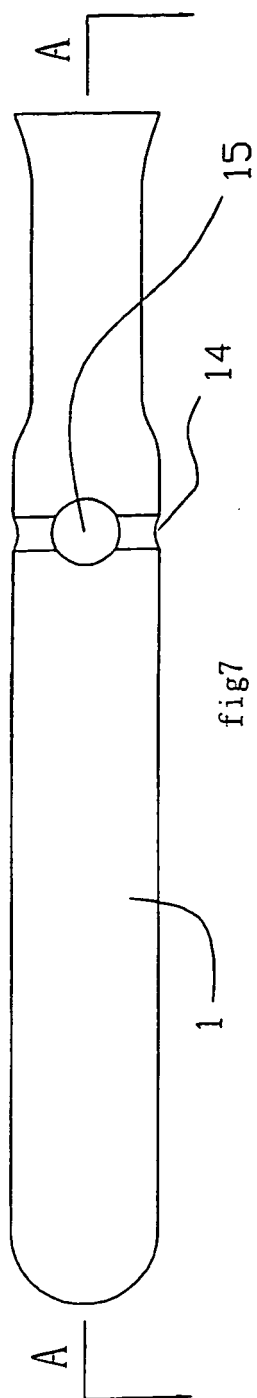
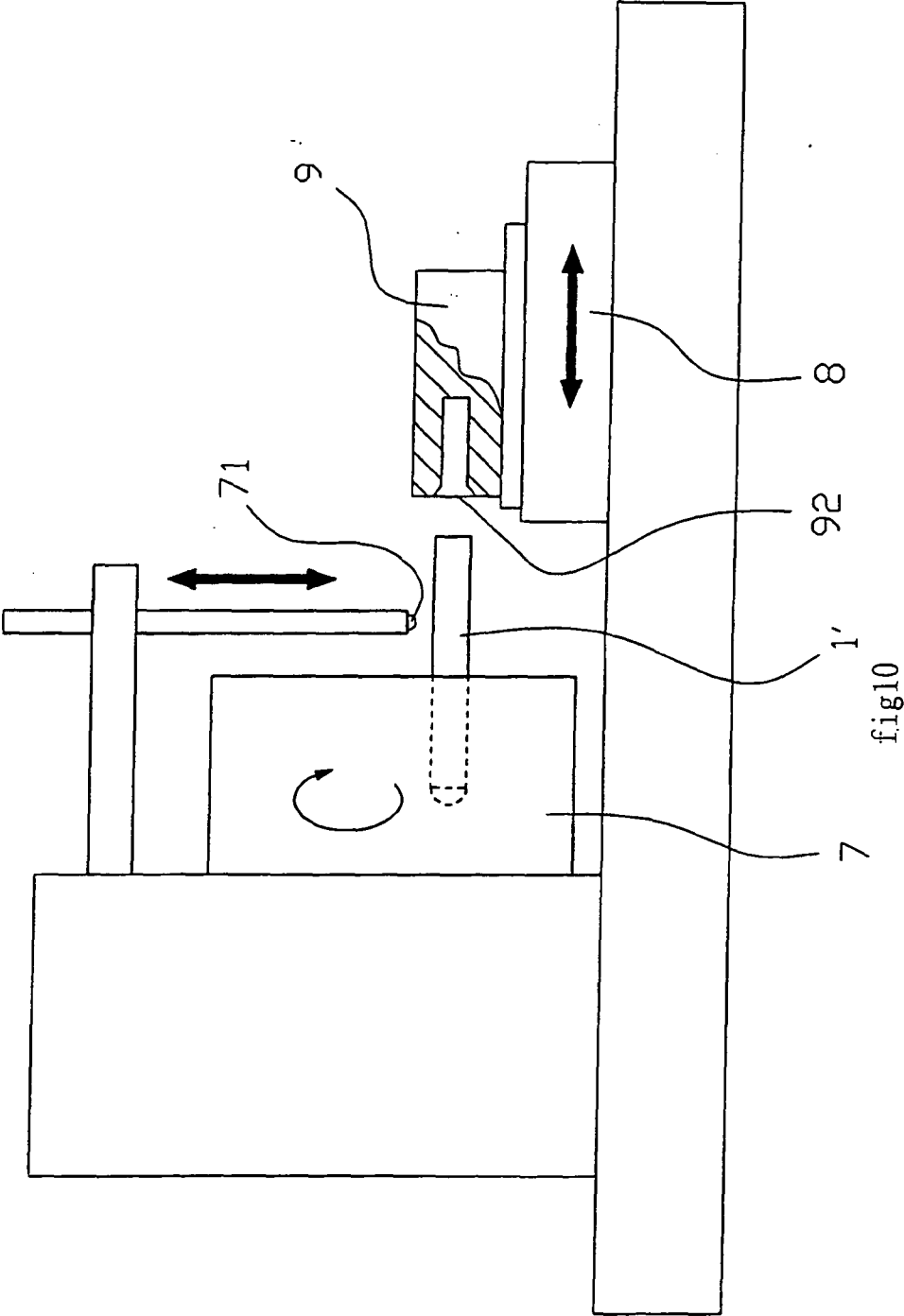
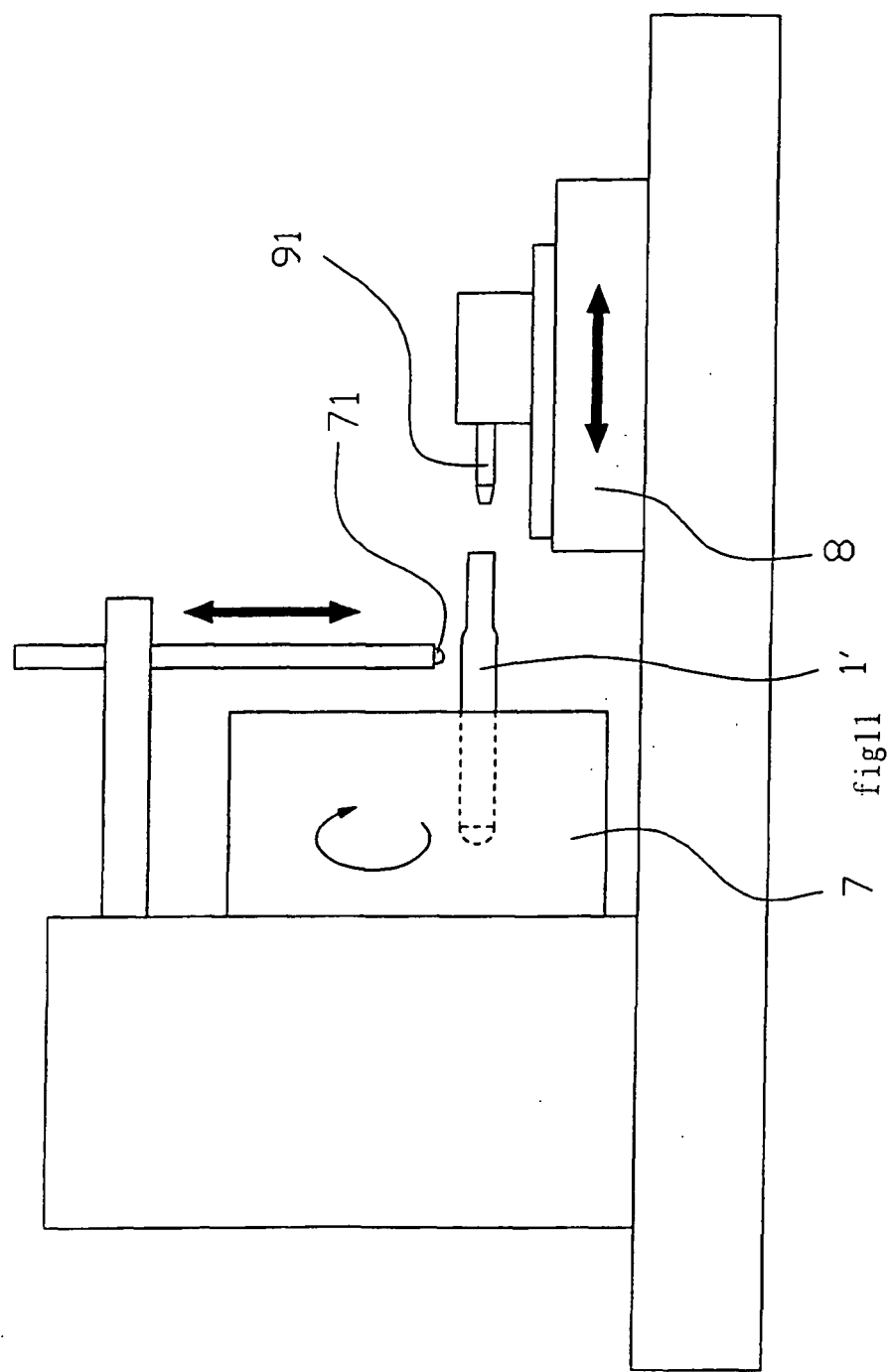


fig4









REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1213135 A1 [0003]
- EP 0128990 A1 [0004]