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Remarks:
•In accordance with Article 14(2), second sentence, EPC the applicant has filed a text with which it is intended to bring the translation into conformity with the original text of the application.
•Amended claims in accordance with Rule 137(2) EPC.

(54) Method for shaping containers and a device for production thereof

(57) Method for shaping metal containers by means of a tool plate (24) under elevated temperatures, wherein the hollow body of the container (1) is brought into contact with a heating tool (26) fixed in the tool plate (24) in the first step of the process, the heating tool (26) comprising a spring-back element (8) which is gradually compressed into a predetermined end position, whereby the hollow body of the container (1) remains in contact with the heating tool (26) for a certain period of time, whereupon the heating tool (26) along with the hollow body of the container (1) return into their initial positions causing the spring-back element (8) to relieve, the hollow body of the container (1) being left subjected to the heat both during the unloading period of the spring-back element (8) and during withdrawing period of the heating tool (26).

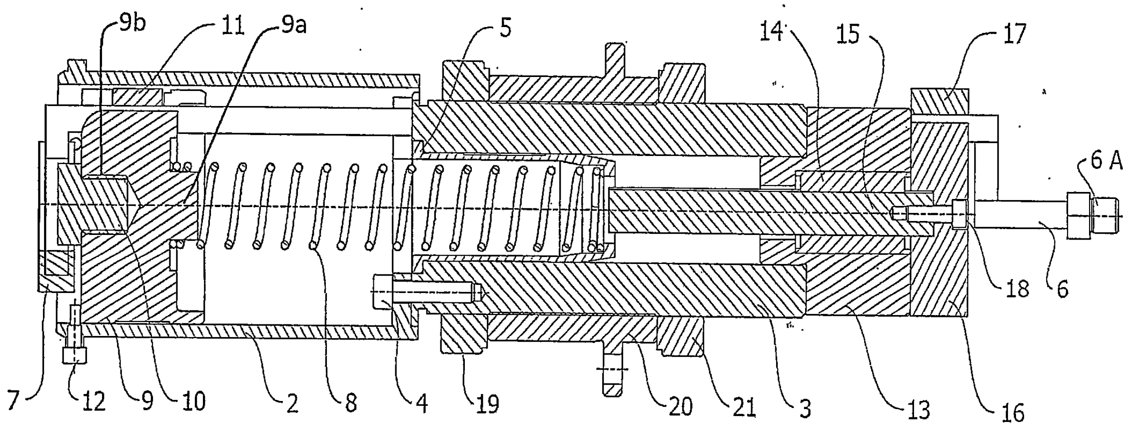

Fig.5

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Description

Background of the invention

[0001] Metal containers, such as those made of aluminium, aluminous alloys and steel, are widely used in the packaging industry, particularly for drinks, food and cosmetic products, as well as in diverse technical applications. A significant share belongs to the pressure aerosol containers which contain various substances, such as deodorants, hair styling products, shaving foams, varnishes, paints, oils etc. Drink cans pose another important portion of the overall production volume.

[0002] At the present, such containers are mass product which need to be manufactured in an most efficient manner and in highest quantities. Therefore, special production lines have been developed, enabling highly optimized production processes to be carried out. Such production lines are described, in their entirety or in parts, for example in the documents EP 2 103 370 B1, EP 0 275 369 B1, US 3,646,840 or US 3,878,743

[0003] With respect to the method of production, one-piece (monoblock) or multi-piece containers are distinguished.

[0004] During the production of monoblock containers, first the fed blanks are shaped in order to assume the form of a hollow cylindrical body. Typically, the backward extrusion method and/or the drawing technology is used. Such methods or technological processes are described, e.g., in the documents EP 1 531 952 B1, EP 1 731 239 B1 or 1 461 232 B1.

[0005] In the case of the backward extrusion technology, the initial blank is the so-called calotte which is reshaped into a hollow body during a single stroke of the press slide. The diameter of the calotte is approximately equal to that of the formed container. In the case of the drawing technology, the initial blanks are disk, which have been prepared by punching an uncoiled sheet-metal strip. Such a disk is then shaped into the form of a cup (using a cupper machine) and subsequently further reduced in the following drawing operations in order to assume the desired diameter and wall thickness (using a body maker machine). The diameter of a disk prepared by punching is much greater than that of the corresponding finished container.

[0006] Multi-piece containers are mostly composed of three parts: the top piece, the bottom piece and the cylindrical side wall, the latter having a weld seam extending along the entire length of the same. The finished container consists of the above parts in the assembled state.

[0007] After having been shaped, the cylindrical hollow body of a monoblock container is provided with a varnish layer applied onto the internal surface thereof in order to make the container resistant to aggressive constituents of the contents as well as to propellant gases. The external surface of the hollow body is provided with a printed pattern and then with a varnish layer, as well. An important prerequisite for the external printing is the rotationally symmetric form of the body. That is why the final shaping of the container can be carried out only after the cylindrical hollow body of the same has been provided with the printed pattern. During the production of multi-piece containers, the above mentioned varnishes are typically applied before the final assembly of the container. The applied varnish layers also serve as sliding ones facilitating the subsequent forming operations.

[0008] Afterwards, the monoblock containers but also some types of assembled multi-piece ones undergo the process of forming the open end of the container according to the desired shape specification. Different methods of forming such open ends are described, e.g., in the document EP 2 010 342 B1.

[0009] The most common technical solution for the above forming process comprises is based on the use of a necking machine posing the prior art. The known necking machine, which is shown in Figs. 1 and 2 comprises the revolving plate 22 which performs rotational intermittent or stepping motion and is equipped with a plurality of clamping stations 23 arranged along its circumference. The purpose of the clamping stations 23 is to temporarily hold the containers 1, typically by means of pneumatically expandable rings. The machine further comprises the opposite tool plate 24 which is capable of performing reciprocating motion and carries the forming tools 25 arranged in fixed positions along its circumference. The individual tools serve for shaping the upper edge of the hollow body of the container in a progressive manner until the latter assumes its final shape including a rim.

[0010] When being transferred into the space between the plates, the hollow bodies of the containers 1 are in the horizontal position, each of the hollow bodies being firmly held in one of the clamping stations 23 a having its open end directed towards the tool plate 24. Depending on the progressive stepping motion of the revolving plate 22, the tool plate 24 performs its reciprocating motion.

[0011] Fig. 1 shows the necking machine with the hollow body of the future container 1 already inserted in a clamping station 23, the latter being, in the present particular case, the basic clamping station shown in the lower position. The tool plate 24 holding the corresponding forming tool 25 for the first operation is arranged on the opposite side. It is apparent that a relatively simple tool can be still used for the first operation. The same figure also shows the upper clamping station 23 where the hollow body of the container has already reached a more advanced state of forming. Here, it is apparent that the neck of the hollow body of the container 1 has been reshaped in a certain degree, the corresponding tool being shown in the opposite location. In this stage, the plate 22 with the clamped hollow bodies and the tool plate 24 are still distant from each other.

[0012] Fig. 2 shows the situation where the plate 22 with the clamped hollow bodies and the tool plate 24 have moved into the smallest mutual distance and the respective tools are forming the hollow bodies of the container 1.

[0013] While the tool plate 24 is moving into its final extended position, the wall of the hollow body of the container 1 is being reshaped at the open end of the same. The tools 25, which are fixed in the individual tool stations, will consecutively perform the corresponding steps of the forming process. This process is generally well known in the art, frequently being referred to as necking process. The machines are know as transfer necking machines. The more or less detailed descriptions of the process can be found in the above mentioned documents EP 1 531 952 B1 or EP 1 731 239 B1.

[0014] Due to the effect of the plastic deformation occurring during the individual forming operations used for manufacturing thin-wall containers, the material work-hardens. This provides the advantage consisting in obtaining an increased stiffness and compressive strength of the containers. On the other hand, the correspondingly reduced ductility of the containers is unfavourable.

[0015] With respect to the desired formability, the wall thickness of the hollow body of a container to be processed by a necking machine is typically designed by up to 0.2 mm greater at the open end of the hollow body in comparison with the bottom portion of the same. After having been formed in a necking machine, however, further work-hardening of the wall of the hollow body occurs due to plastic deformation. Simultaneously, the wall thickness further increases due to the progressive reduction of the diameter of the hollow body. This may result in a significant increase of the deformational resistance at the open end of the upper portion of the container. When the resistance exceeds the strength of the container, both the wall in the lower portion of the container and the shoulder of the same get distorted.

[0016] The objective of the invention is to present a method for shaping metal containers which would eliminate the above described risk of wall distortions when the upper portion of a container is shaped in the known necking machines during the production of the same.

Summary of the invention

[0017] The above drawbacks are largely eliminated by the method for shaping metal containers according to the invention, wherein the hollow body of the container is brought into contact with a heating tool fixed in the tool plate in the further step of the process, the heating tool comprising a spring-back element which is gradually compressed into a predetermined end position, whereby the hollow body of the container remains in contact with the heating tool for a certain period of time, whereupon the heating tool along with the hollow body of the container return into their initial positions causing the spring-back element to relieve, the hollow body of the container being left subjected to the heat both during the unloading period of the spring-back element and during withdrawing period of the heating tool.

[0018] The scope of the invention also includes a heating tool for shaping metal containers under elevated temperatures in accordance with the above method, wherein the heating tool comprises a threaded body clamped in a bushing and positioned by means of nuts, the heating tool further comprising an inductor, which is adjustable in parallel to the longitudinal axis of the heating tool and has one end separably attached to the supporting portion of the same by means of a clamping member, the other end of the inductor being attached to a cylinder by means of another clamping member, the supporting portion of the heating tool accommodating a central shaft fixed by means of a bolt, the tool further comprising a spring-back device arranged inside the same, the one end of the device resting on the bottom of the spring bush and the other end of the same being arranged in a seat formed on the cylinder, the opposite face of the latter being provided with a fixed end stop surrounded by the induction sleeve of the inductor, the cylinder being slidably arranged inside a drum which is firmly attached to the body, the opposite side of the body being firmly connected to a holder, the latter accommodating a fixed splined guide bush enabling the sliding movement of the central shaft, the holder freely adjoining the inner surface of the supporting portion, the body being further provided with a longitudinal guideway for the arms of the inductor and the free end of the drum being provided with end stops for restricting the movement of the cylinder.

[0019] In a preferred embodiment, the inductor is provided with an induction sleeve arranged at the one end of the arms of the inductor, the other end of the arms being provided with a rear clamping portion adjoined by a connecting clevis.

[0020] In another preferred embodiment, the sleeve of the inductor is provided with deflecting sheets arranged thereon

[0021] In yet another preferred embodiment, the spring-back device comprises a compression spring.

Brief description of the drawings

[0022] The invention will be further explained with reference to the accompanying drawings, wherein Fig. 1 is a schematical view of the working area of the necking machine with a known tool arrangement, the latter being shown in a moment when a new hollow container body is being inserted into one of the clamping stations of the revolving plate spaced from the corresponding tool plate, each of the clamping stations being assigned to a different degree of reshaping up to the final shape of the container, Fig. 2 shows the arrangement according to Fig. 1 after having advanced into the stage, during which the tools are shaping the hollow bodies of the containers, Fig. 3 shows a schematical view of the working area of the necking machine in a situation corresponding to that shown in Fig. 1 except for the arrangement of the tool plate, which is provided with a heating tool according to the invention, the latter being not engaged in the meantime, Fig. 4 shows the arrangement according to Fig. 3 after having advanced into the stage, during which the heating tools is acting on the hollow body of the container and the remaining tools are shaping the hollow bodies of the other containers being processed, Fig. 5 shows the auxiliary heating tool according to the invention in a sectional view where the tool is assuming its initial position, Fig. 6 show the sectional view of Fig. 5 where the tool is assuming its working position, Fig. 7 shows the inductor of the heating tool in a detailed view and Fig. 8 shows a functional diagram of the heating tool according to Figs. 5 and 6.

Preferred embodiment of the invention

[0023] Fig. 5 shows the heating tool 26 according to the invention. The functional principle of the tool is based on induction heating. The heating tool 26 is shown in its initial position, i.e. in a moment when the revolving plate 22 with its clamping stations 23, which are occupied by the hollow bodies of the containers 1 assuming different degrees of reshaping up to the final shape if the container 1, is spaced from the tool plate 24, the latter also accommodating the heating tool 26 according to the invention. Preferably, the heating tool 26 is directly fixed in the tool plate of a necking machine.

[0024] Fig. 3 shows the necking machine with the built-in heating tool 26 assuming its initial, i.e. retracted position, which corresponds to the arrangement of the components of the tool according to Fig. 5, and Fig. 4 shows the same in its working, i.e. extended position, that is in the moment when the tool is heating up the hollow body of the container, which corresponds to the arrangement of the components of the tool according to Fig. 6.

[0025] The above described heating tool 26 is suitable for heating up the upper end portion of the container 1 before the open end of the same is flanged.

[0026] Figs. 5 and 6 show the heating tool 26 itself in detailed view. It is apparent that the heating tool 26 is directly fixed in the tool plate 24 of the necking machine by means of the clamping bush 20. The clamping bush 20 accommodates the threaded body 3 of the heating tool 26, the body being inserted thereto. The correct position of the heating tool 26 is secured by means of the adjusting nuts 19 and 21.

[0027] The heating tool 26 further comprises the adjustable inductor 6. The inductor, which is shown in Fig. 7 in a detailed view, consists of the induction sleeve 30 arranged on the one end of the supporting arms 39a and 39b, the rear clamping portion 31 arranged on the other end of the supporting arms 39a and 39b and the connecting clevis 32 adjoining the ear clamping portion. The rear clamping portion 31 of the arms 39a and 39b enables the inductor 6 to be separably attached to the supporting portion 16 of the heating device by means of the clamping member 17. The sleeve 30 is surrounded by deflecting plates 7. The plates 7 deflect induced eddy currents and thereby direct the heat into the predetermined location on the container 1. The deflecting plates are used when only a particular small portion is to be heated up, such as the neck of the container in the present case.

[0028] The threaded terminal 6A of the inductor 6 serves for connecting two water-cool leads 27 which supply electric power and a cooling medium into the inductor 6. The leads are schematically depicted in Fig. 8.

[0029] In the case that only a short end portion of the hollow container body should be heated up, the inductor 6 may be preferably positioned in a manner that enables the entire working stroke of the tool plate 24 to be utilized. In the presented embodiment, this is achieved by means of the spring 8. During the movement of the tool plate 24 from its initial retracted position, see Fig. 3 to its final extended position, see Fig. 4, the face of the hollow body of the container 1 is brought into contact with the face of the end stop 10, which is accommodated in the recess 9b formed in the cylinder 9, whereby a displacement of the cylinder 9 is initiated, the latter being firmly attached to the arms 39a and 39b of the inductor 6 by means of the clamping member 11. Thus, the induction sleeve 30 along with the cylinder 30 are held in the desired heating position.

[0030] In the course of the subsequent displacement of the tool plate 24, the cylinder 9, and consequently the inductor 6 along with the induction sleeve 30, are pushed farther away into the drum 3, whereby the period of time needed for heating up the hollow body of the container 1 is prolonged. The process of heating up the hollow body of the container 1 is initiated by inducing the eddy currents in the wall of the hollow body of the container 1 by the induction sleeve 30. The body 3 is connected to the drum 3 by means of the bolt 4.

[0031] The working range of the cylinder depends on the constructional arrangement of the respective necking machine, on the stroke of the same, on the height of the processed container as well as on the temperature that is required for transformation of the material properties.

[0032] The correct operation of the inductor 6 is ensured by means of the supporting portion 16 of the heating tool 26. The motion of the supporting portion 16 is restricted by the splined guide 14 fixed in the holder 13. Consequently, the supporting portion 16 can only move in the axial direction. The holder 13 is attached to the threaded body 3 by means of fixing bolts. Owing to that, the inductor 6 is firmly attached to the heating tool 26 in two points and thus any possible twisting of the supporting arms in the guiding slots is avoided which could otherwise result in increasing the axial force acting on the neck of the container 1.

[0033] In the course of the displacement of the tool plate 24 back into its initial position, see Fig. 3, the inductor 6 along with the cylinder 9 are also returning to their initial positions due to the restoring force which can be preferably induced by the spring 8. Then, the cylinder 9 reaches its initial position in which it adjoins the end stop 12. The end stop 12 defines the position of the inductor 6 when the spring 8 is in its unloaded extended state. While the inductor is being retracted, the central shaft 15 is extending along with the supporting portion

16. This arrangement prevents the rear portion of the inductor 6 from being excessively extended. Otherwise, it could be bent or twisted due to the effect of the weight of the movable water-cooled leads 27 which are connected to the terminal 6A. The supporting portion 16 and the central shaft 15 are firmly interconnected by means of the bolt 18. The spring bush 8, in which the spring 8 is arranged, is firmly clamped between the drum and the threaded body 3. When loaded, the spring 8 rests on the bottom of the spring bush 8. After having been unloaded, the spring 8 remains in contact with the bottom of the spring bush. The opposite end of the spring is accommodated in the seat 9a formed in the cylinder.

[0034] The motion of the supporting portion 16 is restricted by the splined guide 14 fixed in the holder 13. Consequently, the supporting portion 16 can only move in the axial direction. The holder 13 is attached to the threaded body 3 by means of fixing bolts. The splined guide bush 14 accommodates the axially movable splined shaft 15 which is attached to the supporting portion 16 by means of the bolt 18. Owing to that, the inductor 6 is firmly attached to the heating tool 26 in two points and thus any possible twisting of the arms 39 in the guiding slots is avoided which could otherwise result in increasing the axial force acting on the neck of the container 1.

[0035] Fig. 8 shows the wiring diagram of the heating tool 26. The heating tool 26 is connected to the mid-frequency transformer 28 by means of the water-cooled leads 27 which are, in turn, connected, to the threaded terminal 6A of the inductor 6. The mid-frequency transformer 28 is preferably attached to the tool plate 24.

[0036] The frequency converter 33 is fed by the main power supply 34 and interconnected with the mid-frequency transformer 28 by means of the cables 29.

[0037] The water inlet 38 of the cooling circuit of the frequency converter 33 is connected to a water supply. The cooling water is also distributed by the non-conductive hoses 35, 36 to the primary and secondary windings of the mid-frequency transformer 28. The inductor 6 of the heating tool 26 is supplied with cooling water by means of the water-cooled leads 27.

[0038] After returning from the cooling circuit, the cooling water is leaving the frequency converter 33 through the water outlet 37. Afterwards, it is either flowing into a drain or, in the case of a closed circuit, through a cooling box and then back to the water inlet 38.

[0039] A simple adaptation of the length of the inductor 6 and of the diameter of the induction sleeve 30 enables the heating tool 26 to be used for heating up any desired portion of the container or, as the case may be, the entire container. This can be accomplished, e.g., by increasing the number of turns of the inductor coil.

List of reference signs

[0040]

1 -	container /hollow body
2 -	drum
3 -	threaded body
4 -	bolt
5 -	spring bush
6 -	inductor
6A -	terminal for connecting to the power and water supply
7 -	deflecting plates
8 -	spring
9 -	cylinder
9a -	seat for the spring 8
9b -	recess for the end stop 10
10 -	end stop of the cylinder 9
11 -	clamping member
12 -	end stop of the drum 2
13 -	holder
14 -	guide bush
15 -	shaft
16 -	supporting portion (carrier)
17 -	clamping member
18 -	bolt
19 -	adjusting nut
20 -	clamping bush
21 -	adjusting nut
22 -	plate
23 -	clamping station
24 -	tool plate
25 -	forming tool
26 -	heating tool
27 -	movable water-cooled leads
28 -	transformer
29 -	cables
30 -	induction sleeve
31 -	rear clamping portion
32 -	connecting clevis
33 -	frequency converter
34 -	main power supply
35 -	non-conductive hose
36 -	non-conductive hose
37 -	cooling water outlet
38 -	cooling water inlet
39 -	water-cooled conductive arms

[0041] With respect to the temperature of the reshaped material and to the course of the physical and metallurgic processes, the following forming technologies are distinguished: hot forming, forming under elevated temperatures and cold forming.

➢ Cold forming
The process is typically performed under temperatures which are lower than 0.2 - 0.3 MP. (where MP refers to Melting Point)
➢ Forming under elevated temperatures
The process is typically performed under temperatures ranging between 0.2 and 0,6 MP.
➢ Hot forming

The forming temperatures typically exceed 0.6 - 0.7 MP (the temperatures are above the recrystallization ones, i.e. work hardening is eliminated by the simultaneous recovery processes).

[0042] With regard to the temperature resistance, particularly to that of printing pastes, the present technologies used for shaping metal containers work with forming temperatures which are limited by a short term at a temperature of about 200°C. Hence, suitable heating can be applied for shaping containers made of aluminium or aluminous alloys where, with respect to the definition of the forming process, such temperature falls into the group of the forming processes performed under elevated temperatures. Nevertheless, the process performed under elevated temperatures may also be applied to steel containers.

[0043] The main advantages of forming process performed under elevated temperatures with respect to the shaping of containers:

- improved reshaping capability in comparison with cold forming
- reduction of deformational resistances
- possibility of obtaining special mechanical and physical properties, improved accuracy and surface finish
- reduction of the wall thickness of finished containers
- reduction of the weight of finished containers (material consumption)

Claims

1. Method for shaping metal containers by means of a tool plate under elevated temperatures, **characterized in that** the hollow body of the container is brought into contact with a heating tool fixed in the tool plate in the first step of the process, the heating tool comprising a spring-back element which is gradually compressed into a predetermined end position, whereby the hollow body of the container remains in contact with the heating tool for a certain period of time, whereupon the heating tool along with the hollow body of the container return into their initial positions causing the spring-back element to relieve, the hollow body of the container being left subjected to the heat both during the unloading period of the spring-back element and during withdrawing period of the heating tool.

2. Heating tool for shaping metal containers under elevated temperatures using the method according to claim 1, **characterized in that** the heating tool comprises the threaded body (3) clamped in the bushing (20) and positioned by means of the nuts (19, 21), the heating tool (26) further comprising the inductor (6), which is adjustable in parallel to the longitudinal axis of the heating tool (26) and has one end separably attached to the supporting portion (16) of the same by means of the clamping member (17), the other end of the inductor (6) being attached to the cylinder (9) by means of the clamping member (11), the supporting portion (16) of the heating tool accommodating the central shaft (15) fixed by means of a bolt, the tool further comprising a spring-back device arranged inside the same, the one end of the device resting on the bottom of the spring bush (5) and the other end of the same being arranged in the seat (9a) formed on the cylinder (9), the opposite face of the latter being provided with a fixed end stop (10) surrounded by the induction sleeve (30) of the inductor (6), the cylinder (9) being slidably arranged inside the drum (9) which is firmly attached to the body (3), the opposite side of the body (3) being firmly connected to the holder (13), the latter accommodating the fixed splined guide bush (14) enabling the sliding movement of the central shaft (15), the holder (13) freely adjoining the inner surface of the supporting portion (16), the body (3) being further provided with a longitudinal guideway for the arms of the inductor (6) and the free end of the drum (2) being provided with the end stops (12) for restricting the movement of the cylinder (9).

3. Tool according to claim 2, **characterized in that** the sleeve (30) of the inductor (6) is provided with the deflecting sheets (7) arranged thereon.

4. Tool according to claim 2, **characterized in that** the inductor (6) is provided with the induction sleeve (30) arranged at the one end of the arms (39a, 39b) of the inductor, the other end of the arms being provided with the rear clamping portion (31) adjoined by the connecting clevis (32).

5. Tool according to claim 2, **characterized in that** the spring-back device comprises the compression spring (8).

Amended claims in accordance with Rule 137(2) EPC.

1. Method for shaping metal containers by means of a tool plate under elevated temperatures, **characterized in that** the hollow body of the container is brought into contact with a heating tool fixed in the tool plate in the first step of the process, *the inductor is arranged in the heating tool as a fixed element or* a spring-back element in heating tool is gradually compressed into a predetermined end position, whereby the hollow body of the container remains in contact with the heating tool for a certain period of time, whereupon the heating tool along with the hollow body of the container return into their initial positions causing the spring-back element to relieve,

the hollow body of the container being left subjected to the heat both during the unloading period of the spring-back element and during withdrawing period of the heating tool.

2. Heating tool for shaping metal containers under elevated temperatures using the method according to claim 1, **characterized in that** the heating tool comprises the threaded body (3) clamped in the bushing (20) and positioned by means of the nuts (19, 21), the heating tool (26) further comprising the inductor (6), which is adjustable in parallel to the longitudinal axis of the heating tool (26) and has one end separably attached to the supporting portion (16) of the same by means of the clamping member (17), the other end of the inductor (6) being attached to the cylinder (9) by means of the clamping member (11), the supporting portion (16) of the heating tool accommodating the central shaft (15) fixed by means of a bolt, the tool further comprising a spring-back device arranged inside the same, the one end of the device resting on the bottom of the spring bush (5) and the other end of the same being arranged in the seat (9a) formed on the cylinder (9), the opposite face of the latter being provided with a fixed end stop (10) surrounded by the induction sleeve (30) of the inductor (6), the cylinder (9) being slidably arranged inside the drum (9) which is firmly attached to the body (3), the opposite side of the body (3) being firmly connected to the holder (13), the latter accommodating the fixed splined guide bush (14) enabling the sliding movement of the central shaft (15), the holder (13) freely adjoining the inner surface of the supporting portion (16), the body (3) being further provided with a longitudinal guideway for the arms of the inductor (6) and the free end of the drum (2) being provided with the end stops (12) for restricting the movement of the cylinder (9).

3. Tool according to claim 2, **characterized in that** the sleeve (30) of the inductor (6) is provided with the deflecting sheets (7) arranged thereon.

4. Tool according to claim 2, **characterized in that** the inductor (6) is provided with the induction sleeve (30) arranged at the one end of the arms (39a, 39b) of the inductor, the other end of the arms being provided with the rear clamping portion (31) adjoined by the connecting clevis (32).

5. Tool according to claim 2, **characterized in that** the spring-back device comprises the compression spring (8).

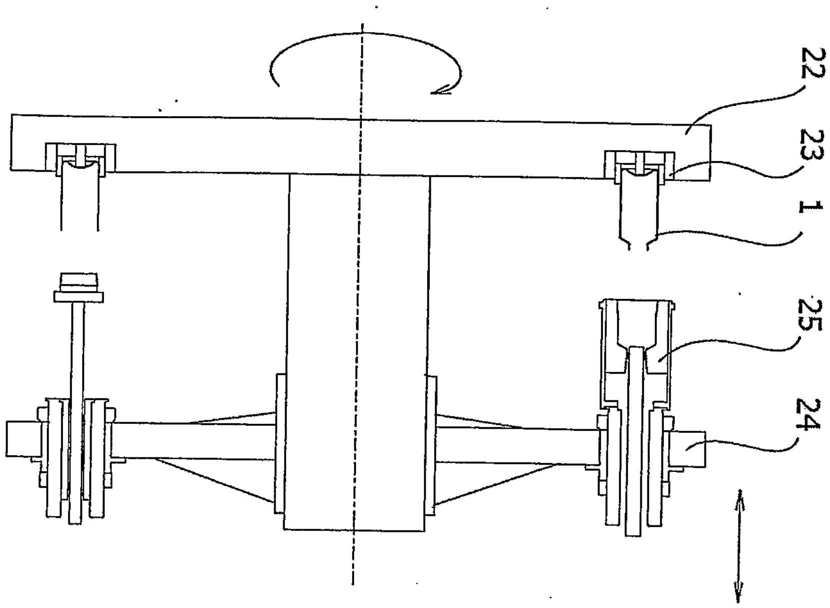

Fig.1

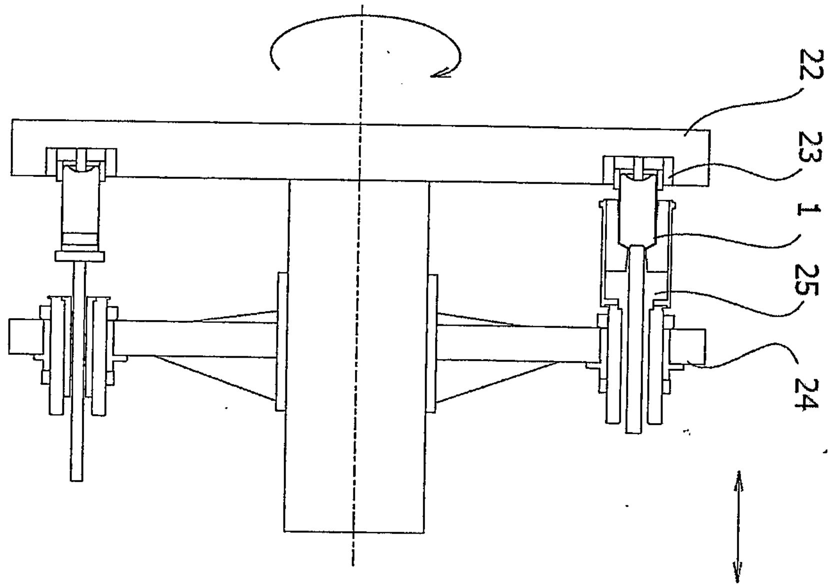

Fig.2

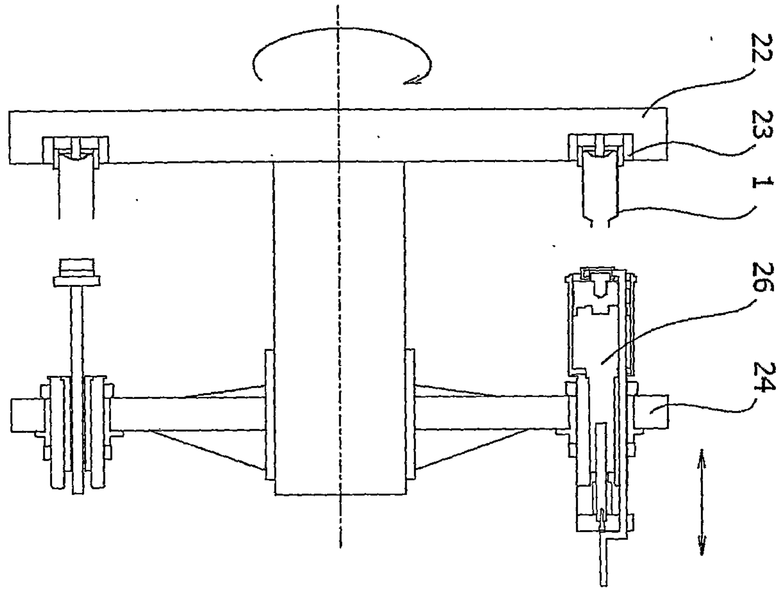

Fig.3

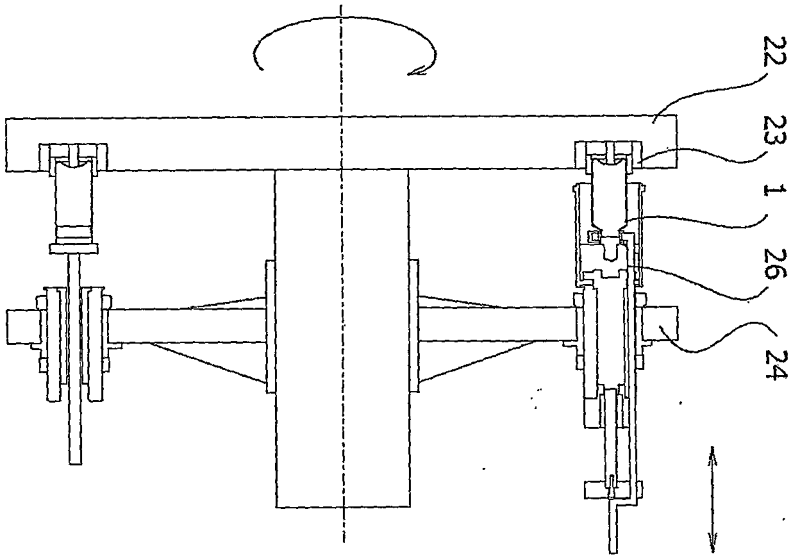

Fig.4

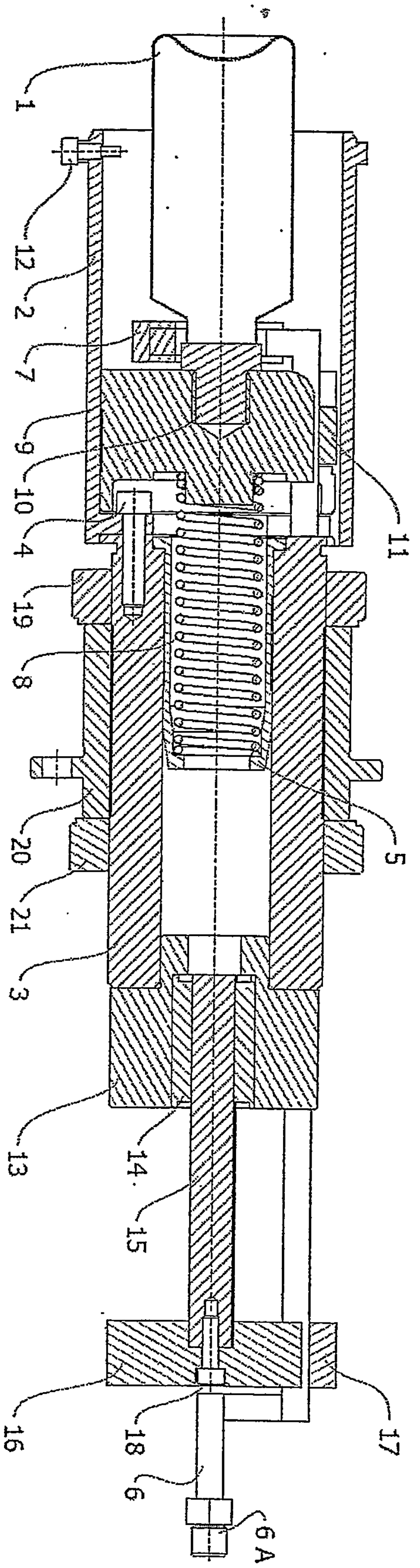
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Fig.6

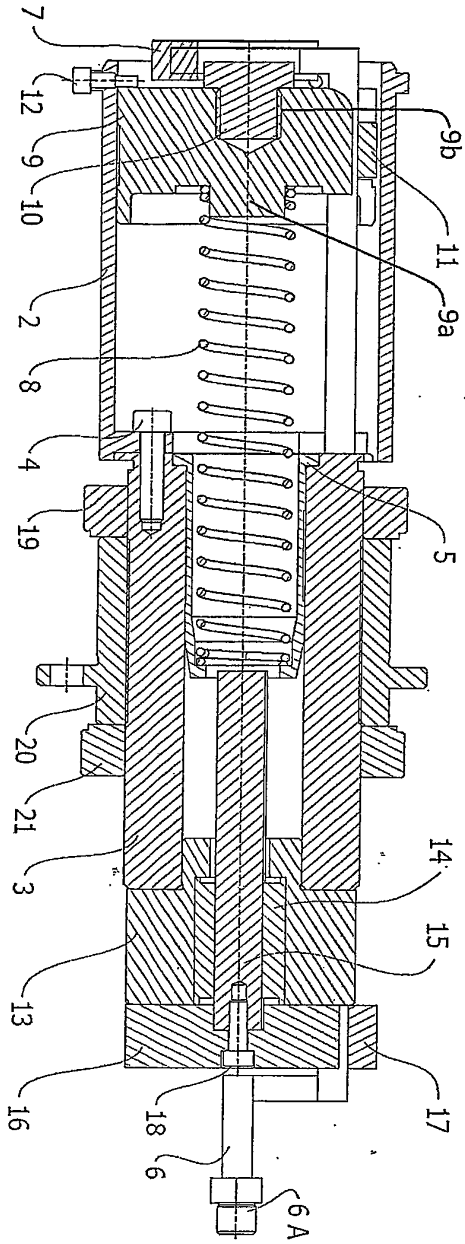
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Fig.5

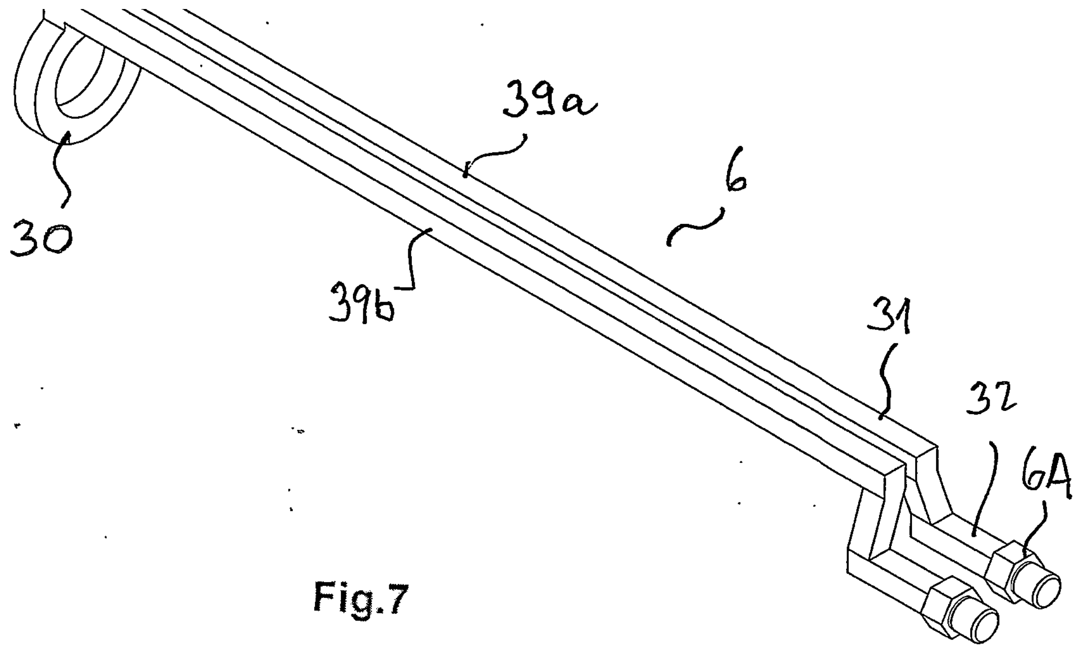

Fig.7

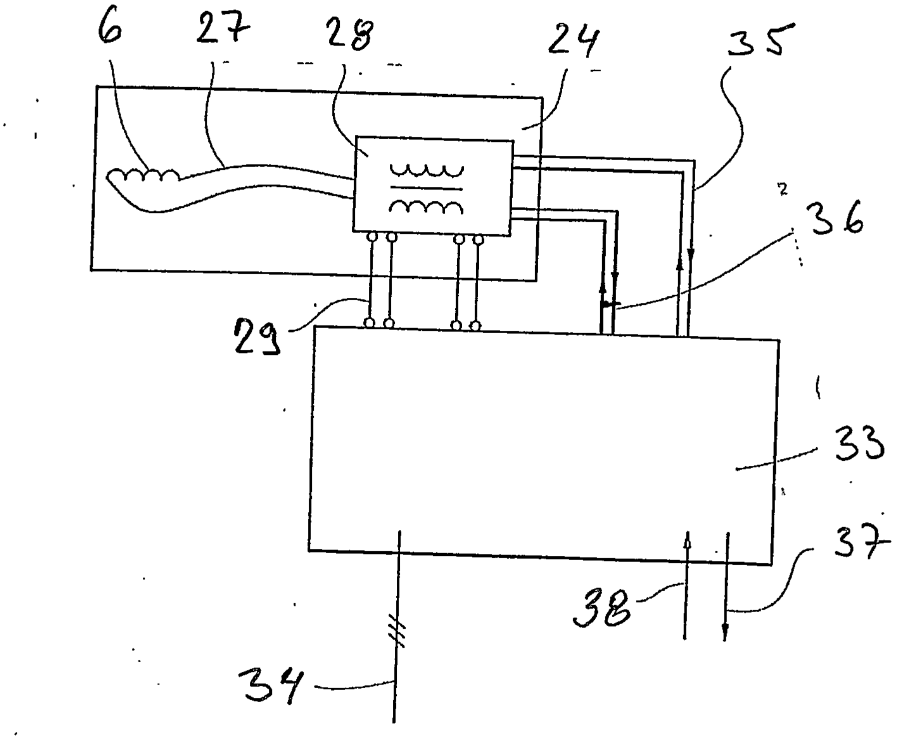

Fig.8

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EUROPEAN SEARCH REPORT

Application Number
EP 13 46 6022

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Place of search	Date of completion of the search	Examiner
Munich	3 December 2013	Cano Palmero, A

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