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(54) **EQUIPMENT FOR SHAPING CONNECTOR TUBES**

(57) The present invention refers to an apparatus (1) for conforming connecting tube (6), pertaining to the field of industrial apparatuses, wherein said apparatus was developed to render the production of these elements more efficient, practical and optimized. Said apparatus (1) comprises at least a surface (7) on which at least four production stages (10, 20, 30 or 40, and 50) are disposed; said at least four production stages comprise a feed stage (10), a deburring or reaming stage (20), a forming reduc-

tion stage (30), a flange forming stage (40) and a dimensional control stage (50); many production stages (10, 20, 30 ou 40 and 50) being interconnected with at least a longitudinal trail(8) on which at least four claws (9) slide; wherein at the end of the process, in the case that the dimensions of the connecting tube do not meet the predetermined specifications, an electronic signal is sent to a control element (3) of the apparatus (100) and said tube (6) is discarded.

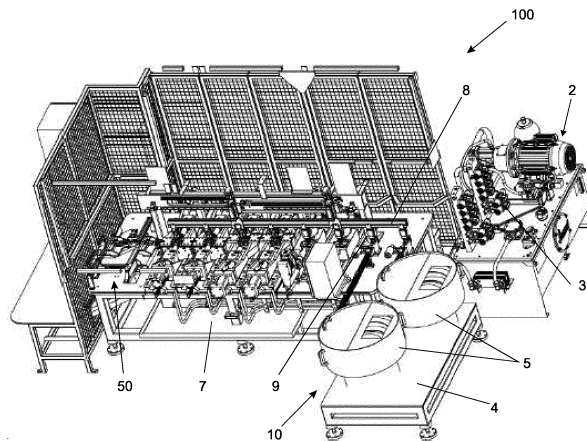


FIG. 1

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DescriptionField of the Invention

[0001] The present invention refers to a apparatus for forming commonly known connecting tubes, also known as passing tubes, intended to be used in compressors to connect said apparatus to suction and discharge lines to which they couple. Therefore, the present invention pertains to the field of industrial apparatuses and was more specifically developed to render the production of these apparatuses more effective, practical and optimized.

Background of the Invention

[0002] As generally known, compressors are apparatuses used in refrigeration systems to cause the refrigerant to circulate through the system pipes, which couple thereto by means of suction or discharge connecting tubes (or passing tubes), wherein said connecting tubes are usually made of copper or steel and to assure the suitable sealing of the system they are usually provided with flanges near one of the edges thereof.

[0003] Nevertheless, it occurs that the process for forming said connecting tubes is nowadays conducted in a complex way, involving many apparatuses and productive stages requiring a long time of production and, consequently, a significant increase in costs is involved since from a cylindrical tube which will serve as raw material for making passing tubes the following processing stages are required: removing burrs from the tube cuts, forming variable diameters along the length thereof, forming a flange - these two last stages being commonly conducted in different apparatuses.

[0004] An example of the present state of the art is an apparatus disclosed in JP Patent Application 2003/205340 which teaches forming tubes with variable diameter along their length. In this case, the method of diametrically forming tubes is made by a combination of compression forces with thermal molding, wherein, however, the method of forming flange is not performed in the apparatus and therefore the resulting product has to be sent to a specifically suitable apparatus.

[0005] Complementarily, the apparatus disclosed in US Patent 5,651,173 forms tubes, more specifically flanges are formed, but in many processing stages, more precisely 9 stages, using mechanical impact.

[0006] Other documents also teach apparatuses exclusively intended to manufacture tubes per se; see, for example, EP Patent 0004989 (manufacture of cylindrical tubes) and US Patent 3,257,836 (forming tubes with asymmetrical cross-section).

[0007] It is observed that the present state of the art requires using many apparatuses to form connecting tubes, wherein each of these apparatuses refers to one specific manufacturing stage and involves unique techniques - or thermal molding or mechanical forming (by

means of impacts).

[0008] Therefore, the present state of the art lacks a technological solution capable of optimizing, accelerating and even standardizing the methods of manufacturing connecting tubes for refrigeration systems so as:

- to permit forming reductions and flanges into one same apparatus;
- to permit manufacturing two or more different products into a single apparatus by simply substituting punctures, dies, and parameters with no need to use many individual apparatuses; and
- to permit large-scale production to fulfill demand of hermetic compressor industry with accuracy and standardization.

Objects of the Invention

[0009] Therefore, an object of the present invention is to provide an apparatus for forming connecting tubes, said apparatus being capable of simultaneously forming a flange and other regions of connecting tubes for hermetic compressors and other similar applications.

[0010] Another object of the present invention is to provide a configuration of an apparatus for forming connecting tubes, wherein said apparatus can produce at least one connecting tube with specification features. Further, the stages can be multiplied such that two or more connecting tubes having the same or different features can be simultaneously made, thereby imparting a great versatility to the process.

[0011] Yet another object of the present invention is to provide an apparatus to form connecting tubes by a machining and mechanical forming process, wherein the working temperature can be cold, warm or hot, this being determined by the homologous temperature of the material being formed.

Summary of the Invention

[0012] The above-mentioned objects are achieved by means of an apparatus for forming connecting tubes operating interconnected with an electric system comprising at least a motor and control elements, and a modulus in which at least one reservoir for storing tubes to be formed with reduction regions and flanges are disposed.

[0013] According to a preferred embodiment of the present invention, said apparatus for forming connecting tubes comprises:

- at least a surface on which at least four production stages are disposed;
- said at least four production stages comprise a feed stage, a deburring or reaming stages, a forming stage (forming reduction and/or forming flange) and a dimensional control stage;
- many production stages being interconnected with at least one longitudinal trail on which at least four

claws slide;

at the end of the process, in the case that the dimensions of the connecting tube do not meet the predetermined specifications, an electronic signal is sent to a control element of the apparatus and said tube is discarded.

[0014] According to a preferred embodiment of the present invention, the feed stage comprises at least one vibratory pan cooperating with a conveyor which can be, for example, a conveyor belt.

[0015] The deburring stage is composed of support elements and drill bits driven by drills which, by sliding on the axes, move toward the edges of the connecting tube such that the drill bits in a rotary movement remove the material and form chamfers or grooves on said edges.

[0016] Preferably, the forming stage comprises at least a system to secure the tube and at least one tool selected from die and puncture element, wherein said at least one tool has a profile corresponding to the profile of the connecting tube to form one of the sides of said connecting tube. One of the dies has a diameter corresponding to the diameter required in the reduction region of the connecting tube and the other die acts to form a flange.

[0017] Said at least two dies are also preferably movable and replaceable by other distinct dimensional features.

[0018] In a conceptual configuration, the dimensional control stage comprises at least one bipartite cavity having an inner diameter corresponding to the outer diameter of the connecting tube flange, wherein said at least one bipartite cavity cooperates with a sensor system and a measurement column programmed with the possible variation limits for the connecting tube.

[0019] Preferably, the apparatus is composed of four double stages so as to comprise 8 stages for simultaneously producing connecting tubes having distinct features. It should be pointed out that this preferred configuration is not limitative and permit that further stages of similar or distinct features are used in the apparatus, or single stages can also be used, that is, no double stages. By virtue of the multiplication of stages it is possible to obtain simultaneous production of connecting tubes having distinct or similar features, thus rendering the disclosed apparatus versatile.

[0020] The disclosed objects are, therefore, achieved by means of an apparatus for forming connecting tubes, said apparatus being characterized in that it comprises means for forming reductions and flanges of connecting tubes in a single and simultaneous production stage.

[0021] The present invention further relates to a process for forming connecting tubes in an apparatus as defined above for conducting the following steps:

- individually and sequentially positioning the tube through a continuously sequential feed, aligned by the tube length through a vibratory pan and conveyor belt, making the tube ready for further handling;

- conveying the connecting tube from the feed stage to the deburring stage by means of at least one claw sliding on at least one longitudinal trail;
- displacing the drill bits driven by drills by sliding on the axes toward the connecting tube edges such that said drill bits, in rotary movement, remove burrs and form chamfers or grooves on said tube edges;
- conveying the connecting tube from the deburring stage to the forming stage by means of a claw sliding on at least one longitudinal trail;
- applying force to cause the connecting tube to pass by a die having a diameter corresponding to the diameter required for the forming region such that through a forward movement said connecting tube rests on the die bottom and the material is forced to retrieve, filling other die with a shape corresponding to the flange;
- additionally, depending on the profile defined on the product, the connecting tube passes through a second tool (puncture tool or die) to alter the profile of the opposite tip of the connecting tube;
- conveying the connecting tube of the forming stage to the flange forming stage by means of the at least one claw sliding on the at least one longitudinal trail;
- carrying out an optional operation; forming chamber on the connecting tube edge by using a puncture element driven forward the edge corresponding to the reduction edge;
- carrying out an optional expansion operation for the opposite edge of the connecting tube, comprising moving forward a second puncture element having a diameter corresponding to the outer diameter of the expanded tube, also by a die corresponding to the outer diameter of the expanded connecting tube;
- conveying the connecting tube from the flange forming stage to the dimensional control stage of said apparatus by means of said at least one claw sliding on said at least one longitudinal trail;
- positioning the connecting tube into a bipartite cavity having an inner diameter corresponding to the outer diameter of the tube flange;
- driving the actuator such that the bipartite cavity closes, wherein after such closing a sensor system sends collected information to a measurement column programmed with the possible variation limits to the connecting tube;
- in the case that the product dimensions do not fulfill predetermined specifications an electronic signal is sent to the apparatus controller and the connecting tube is discarded and thrown by the automated claw or by other suitable device to a discard tray or similar compartment;
- in the case that the product dimensions fulfill the required and accepted specifications, the ready connecting tube is sent to a storage place.

Brief Description of the Drawings

[0022] Next, the present invention will be described in detail based on the drawings, wherein:

Fig. 1 is a perspective view of an apparatus for forming connecting tubes in accordance with a preferred embodiment of the present invention;

Fig. 2 is an enlarged detail view of the feed stage of the apparatus illustrated in Fig. 1;

Fig. 3 is an enlarged detail view of the deburring stage of the apparatus illustrated in Fig. 1;

Fig. 4 is an enlarged detail view of the forming apparatus illustrated in Fig. 1;

Figs. 5.1 and 5.2 show representative schemes of the press jaw in the apparatus forming stages illustrated in Fig. 1;

Fig. 6 is an enlarged detail view of dimension control stage of the apparatus illustrated in Fig. 1; and

Figs. 7.1, 7.2 and 7.3 are examples of connecting tubes formed in the apparatus illustrated in Fig. 1.

Detailed Description of the Invention

[0023] The invention will be described in detail based on the attached drawings, containing reference numerals, for a better comprehension.

[0024] An apparatus 100 for forming connecting tubes, in accordance with the invention, is shown in Fig. 1 which depicts one of its preferred embodiments, wherein it is possible to note that the same is composed of several stages, each of them configuring the die (or blank) which will form the final product or connecting tube depicted in Figs. 7.1, 7.2 and 7.3. Thus, upon driving drill bits, punctures and dies commanded as specified by the design of the workpieces to be formed, connecting tubes 6 provided with reductions in diameter 61 and flanges 52 are produced.

[0025] In the preferred embodiment of the invention as illustrated in Fig. 1, the apparatus 100 comprises five stages 10, 20, 30, 40, and 50, which are shown in detail and individually represented in Figs. 2 to 6. It should be pointed that optionally said apparatus 100 can be composed of double stages, that is, 10 stages, for example, such that there would comprise five pairs of stages, wherein such flexible possibility allows for a significant increase in the production rate and/or also permit to create arrangements for the simultaneous manufacture of two or more different products in one single apparatus. This is possible due to the fact that it refers to an apparatus having ten stages, wherein five of them can be parameterized to a product having determined features whereas the other five stages are parameterized to have distinct final features, thus rendering a highly versatile production. Further, it is worth to say that, as previously mentioned, the apparatus can be produced with only four stages, i.e., having only one forming stage (30 or 40).

[0026] Generally, the apparatus 100 for forming con-

necting tubes 6 is connected to a hydraulic system comprising a motor 2 and elements 3 which are responsible for the operation of many production stages, wherein near said apparatus 100 there is a module 4 at which two vibratory pans 5 are disposed for storing copper or steel tubes to be formed, wherein said vibratory pans 5 cooperate with a conveyor belt 11.

[0027] It should be clear that over a surface or table 7 on which several production stages are disposed, there will be disposed at least one longitudinal trail 8 whereby claws 9, which can be automated, convey the tubes between the several production stages such that at no moment in the production process human interference is required and, therefore, process acceleration and process safety are enhanced.

[0028] According to a preferred embodiment of the invention, the first production stage, that is, feed stage 10 that is illustrated in detail in Fig. 2, comprises an individualized raw material feed system; in this case the tube 6 had already been cut in the required dimension. Such individualization is preferably, but not limitative, carried out by means of vibratory pans which can be operated in synchronism with a conveyor belt 11, thereby releasing the tubes 6 in a specific position to be further conveyed.

[0029] As can be observed in more detail from Fig. 3, in the deburring stage 20 the reaming process takes place to remove burrs from the cut of tube 6 (or blank) formerly conducted by other apparatus (not shown). To this effect, same is placed between support 21 and drill bits 22 driven by drills 23 moving toward, by sliding on trails 24, the edges 63 of said tube 6 such that said drill bits 22, in rotary movement, remove the material and form chamfers on said edges 63.

[0030] In the product deburring stage 30, as illustrated in Fig. 5.1, there is the formation of reductions 61 and flange 62. To this effect, tube 6 which had been processed in the deburring stage 20 is conveyed with the aid of claw 9 to the forming stage 30 wherein it is forced to pass through a die 31 having a diameter corresponding to diameter required in the reduction region 61. Thus, by means of forward movement, said tube 6 rests on the bottom of die 31 and the material is forced to retrieve, filling another die 32 to a shape corresponding to flange 62.

[0031] Therefore, it is noted that said forming stage 30 of the apparatus 100 forms in one sole step the reduction 61 and flange 62 of the connecting tube 6, in a significantly more rapid, effective and practical way than that of the state of the art.

[0032] Therefore, the production deburring stage 30 comprises at least a tube securing system and at least a tool - die (31, 32) and/or puncture element (41) -, wherein such tool has a profile corresponding to the profile of the connecting tube 6 at which one of the sides is formed. Depending on the product features, there can be provided a second tool serving to form the opposite side of the connecting tube 6. Said tools are movable and replaceable by other tools having distinct dimension-

al features. Furthermore, depending on the product or raw material features there may be necessary to implant at least one additional stage with features similar to that of the forming stage 30, aiming at the final profile of the product in question.

[0033] Next, said tube 6 being formed is sent to flange forming stage 40 illustrated in Fig. 5.2 in which through a process involving the puncture element (41) of the tube 6 and its driving toward the edge 63A corresponding to the reduction edge, a chamfer is formed.

[0034] At the opposite edge 63 of tube 6, the expanding operation can be optionally conducted, where it is formed by advancing a second puncture element 42 having a diameter corresponding to the outer diameter of the expanded tube, also by a die 43 corresponding to the outer diameter of the expanded tube 6, wherein a clearance is added.

[0035] By this way, passing the connecting tube 6 through the flange forming stage 40 is an indication of the end of the forming process, and the next step comprises a new stage, that is, dimensional control stage 50 shown in detail in Fig. 6, where the previously formed tube 6 is measured to control the diameter of flange 62. It should be pointed out that, to this effect, claw 9 collects the tube 6 from the die of the flange forming stage 40 and sends it to be positioned into a bipartite cavity 51 having an inner diameter corresponding to the outer diameter of flange 82 of tube 6. Thus, said tube 6 is positioned, the actuator 52 is driven such that the bipartite cavity 51 closes, and after such closing a strategically positioned sensor system sends collected information to a measurement column programmed with possible variation limits for the connecting tube 6. In the case that the product dimensions do not fulfill the predetermined specifications, an electronic signal is sent to the apparatus controller and the workpiece is discarded and thrown by the claw 9 or by other suitable means onto a discard tray or similar compartment.

[0036] Analogously, in the case that the product dimensions meet the required and accepted specifications, the product is sent to a storage place.

[0037] It should be emphasized that another patent application was filed and assigned to the same owner as the one of the present patent application to claim patent protection for said stage 50, which separately comprises the dimensional control system for connecting tubes.

[0038] Further, it should be clarified that the main advantages of the present invention reside in the capacity of forming reduction 61 and flange 62 in one same production stage in a practically simultaneous mode, thus significantly optimizing the product process, thereby providing a produced volume much higher than that obtained by known similar apparatuses at the same period of time.

[0039] Another advantage refers to the flexible possibility of producing two or more connecting tubes having different features in a single apparatus 100 by simple replacement of puncture elements 41, 42, dies 31, 32, and 43, and parameters, according to the design of each

product to be formed.

[0040] Finally, it should be herein assured that the highest technological gain of said apparatus 100 disclosed herein is the possibility of manufacturing the final product in a large scale production, which is capable of meeting demand of hermetic compressor manufacturers.

[0041] It should be emphasized that although the preferred embodiments of the present invention have been shown, it is to be understood that eventual omissions, substitutions, electric pole inversion, and construction modifications can be made by a person skilled in the art without departing from the spirit and claimed scope of protection. It is also expressly predicted that all combinations of elements that perform the same function substantially in the same form to achieve the same results are within the scope of the invention. Substitutions of elements of a described embodiment by others are also fully intended and contemplated.

Claims

1. Apparatus for forming connecting tubes, wherein said apparatus (100) is interconnected with an electric system comprising at least a motor (2) and control means (3) and a modulus (4), at which at least one reservoir is disposed for storing tubes (6) to be formed in reduction regions (61) and flanges (62), said apparatus being **CHARACTERIZED in that** it comprises:

at least a surface (7) on which at least four production stages (10, 20, 30 or 40, and 50) are disposed;

said at least four production stages comprise a feed stage (10), a deburring or reaming stage (20), at least one forming stage - forming reduction stage (30) and/or flange forming stage (40) and a dimensional control stage (50);

many production stages (10, 20, 30 ou 40 and 50) are interconnected with at least a longitudinal rail(8) on which at least four claws (9) slide; at the end of the process, in the case that the dimensions of the connecting tube (6) do not meet the predetermined specifications, an electronic signal is sent to a control element (3) of the apparatus (100) and said tube (6) is discarded.

2. Apparatus, in accordance with claim 1, **CHARACTERIZED in that** the feed stage (10) comprises at least one vibratory pan (5) cooperating with a conveyor (11).

3. Apparatus, in accordance with claim 1, **CHARACTERIZED in that** said deburring stage (20) comprise support elements (21) and drill bits (22) driven by drills (23) which, sliding on axes (24) moves toward

the edges (63) of the connecting tubes (6) such that the drill bits (22) in a rotary movement remove the material and form chamfers or grooves on said edges.

4. Apparatus, in accordance with claim 1, **CHARACTERIZED in that** the forming stage (3) comprises at least a tube securing system and at least one tool selected from a die (31, 32) and a puncture element (41), wherein said at least one tool (31, 31, 41) has a profile corresponding to the profile of said connecting tube (6) to form one of the sides of said connecting tube (6).
5. Apparatus, in accordance with claim 4, **CHARACTERIZED in that** said die (31) has a diameter corresponding to the diameter required for the reduction region (61) of said connecting tube (6), and the die (32) acts on forming the flange (62).
6. Apparatus, in accordance with claims 4 and 5, **CHARACTERIZED in that** said at least two dies (31, 32) are movable and replaceable by other dies having different dimensional features.
7. Apparatus, in accordance with claim 1, **CHARACTERIZED in that** the dimensional control stage (50) comprises at least one bipartite cavity (51) having an inner diameter corresponding to the outer diameter of the flange (62) of said connecting tube (6), wherein said at least one bipartite cavity (52) cooperates with a sensor system and a measurement column programmed with the possible variation limits for the connecting tube (6).
8. Apparatus, in accordance with claim 1, **CHARACTERIZED in that** said apparatus (100) comprises at least four double stages (10, 20, 30 or 40 and 50) so as to comprise 8 stages for simultaneous production of connecting tubes (6) having distinct features.
9. Apparatus for forming connecting tubes, **CHARACTERIZED in that** it comprises means for forming reductions (61) and flanges (62) of connecting tubes (6) in a single and simultaneous production step.
10. Process for forming connecting tubes, **CHARACTERIZED in that** it comprises an apparatus as defined in any of claims 1 to 5 for carrying out the following steps:
 - individually and sequentially positioning the connecting tube (6) through a continuously sequential feed, aligned by the length of the connecting tube (6) through a vibratory pan (5) and conveyor belt (11), making the connecting tube (6) ready for further handling;
 - conveying the connecting tube (6) from the

feed stage (20) to the deburring stage by means of at least one claw (9) sliding on at least one longitudinal trail (8);

- displacing the drill bits (22) driven by drills by sliding on the axes (24) toward the edges (63, 63A) of the connecting tube (6) such that said drill bits (22), in rotary movement, remove burrs and form chamfers or grooves on said edges (63) of said tube (6);

- conveying the connecting tube (6) from the deburring stage (20) to the forming stage (30) by means of a claw (9) sliding on at least one longitudinal trail (8);

- applying force to cause the connecting tube (6) to pass by a die (31) having a diameter corresponding to the diameter required for the forming region (61) such that through a forward movement said connecting tube (6) rests on the bottom of the die (31) and the material is forced to retrieve, filling other die (32) with a shape corresponding to the flange;

- additionally, depending on the profile defined on the product, the connecting tube (6) passes through a second puncture tool or die tool to alter the profile of the opposite tip of the connecting tube (6);

- conveying the connecting tube (6) from the forming stage (30) to the flange forming stage (40) by means of the at least one claw (9) sliding on the at least one longitudinal trail (8);

- forming a chamfer on the edge (63A) of the connecting tube (6) through a puncture element (41) driven toward the edge (63A) corresponding to the reduction edge;

- carrying out an optional expansion operation for the opposite edge (63) of the connecting tube (6), comprising moving forward a second puncture element (42) having a diameter corresponding to the outer diameter of the expanded tube, also by a die (43) corresponding to the outer diameter of the expanded connecting tube (6);

- conveying the connecting tube (6) from the flange forming stage (40) to the dimensional control stage (50) by means of said at least one claw (9) sliding on said at least one longitudinal trail (8);

- positioning the connecting tube (6) into a bipartite cavity (51) having an inner diameter corresponding to the outer diameter of the flange (62) of the tube (6);

- driving the actuator (52) such that the bipartite cavity (51) closes, wherein after such closing a sensor system sends collected information to a measurement column programmed with the possible variation limits for the connecting tube (6);

- in the case that the product dimensions do not fulfill predetermined specifications, an electron-

ic signal is sent to the apparatus controller and the connecting tube (6) is discarded and thrown by the automated claw or by other suitable device to a discard tray or similar compartment;

- in the case that the product dimensions fulfill the required and accepted specifications, the ready connecting tube is sent to a storage place.

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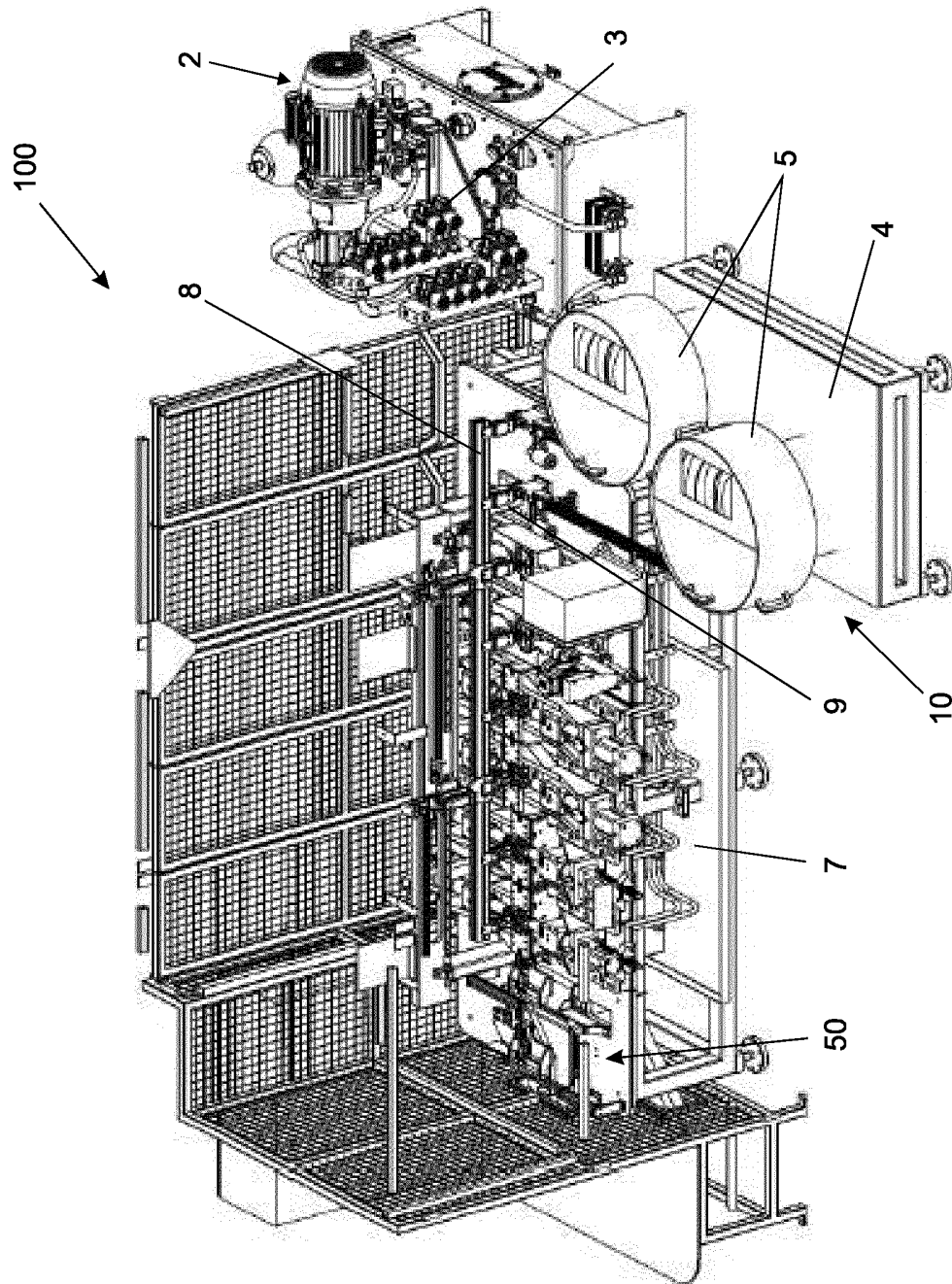


FIG. 1

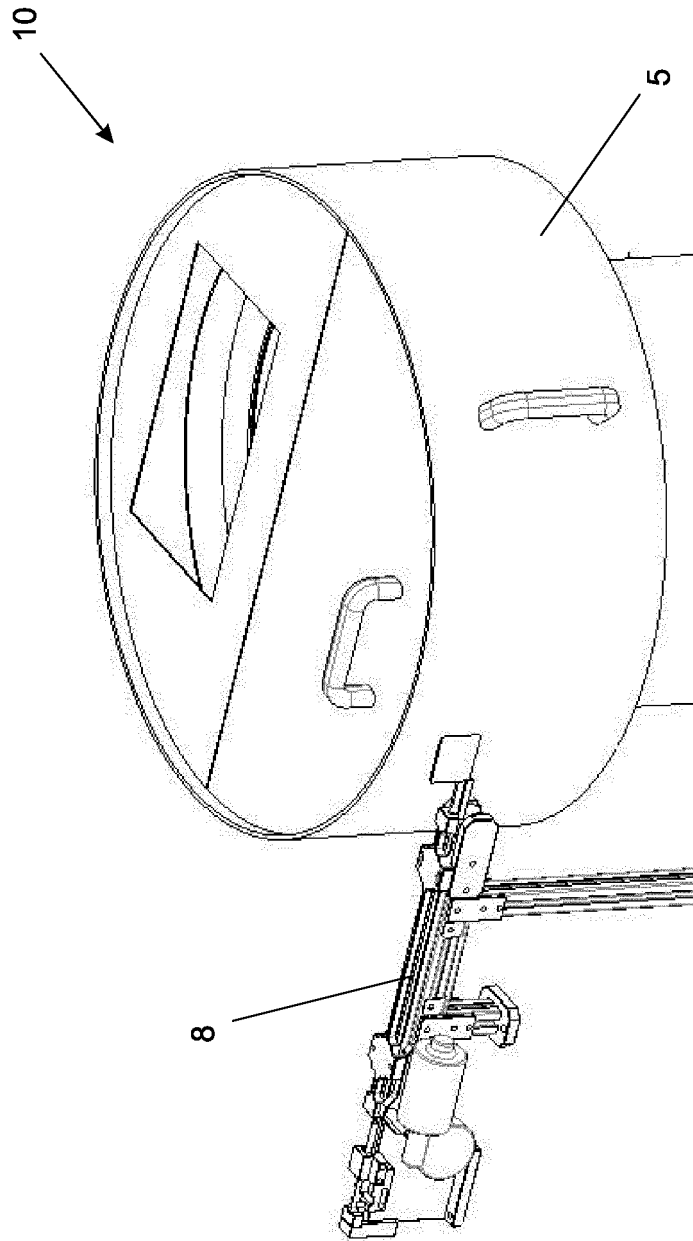


FIG. 2

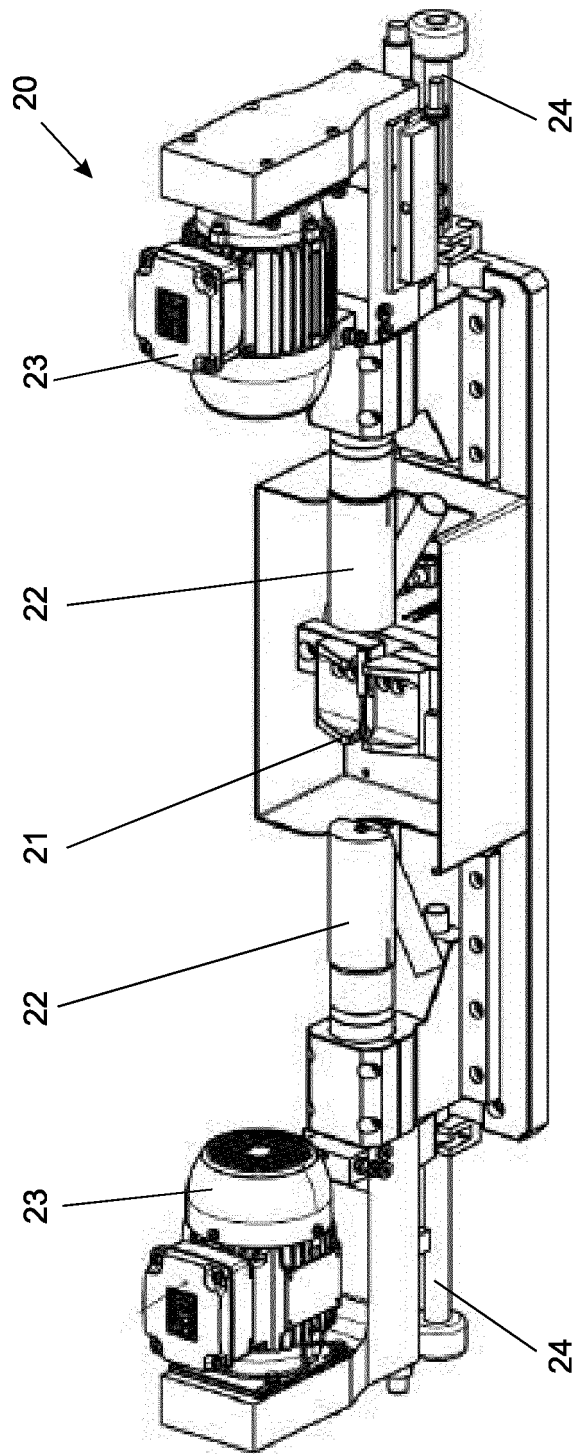


FIG. 3

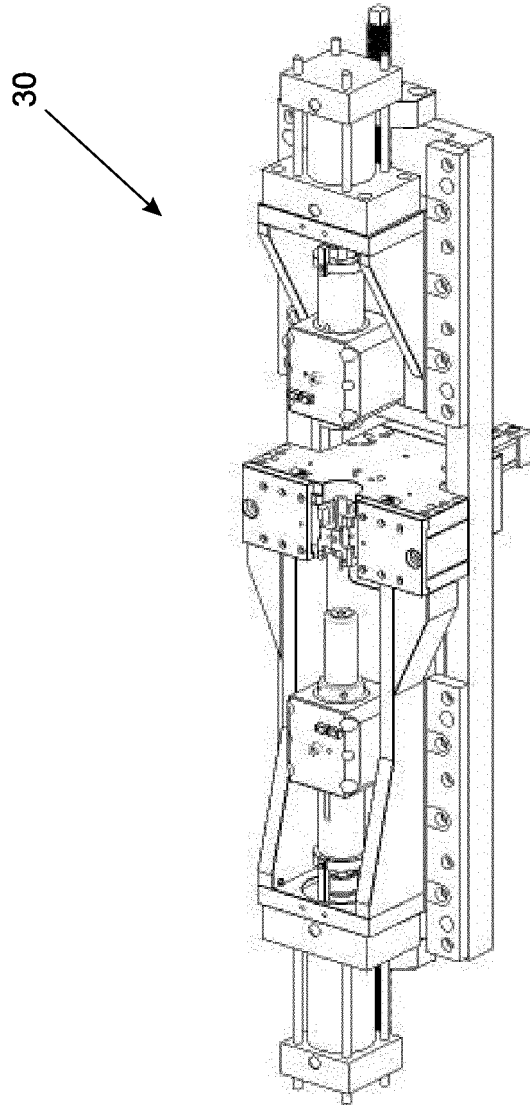


FIG. 4

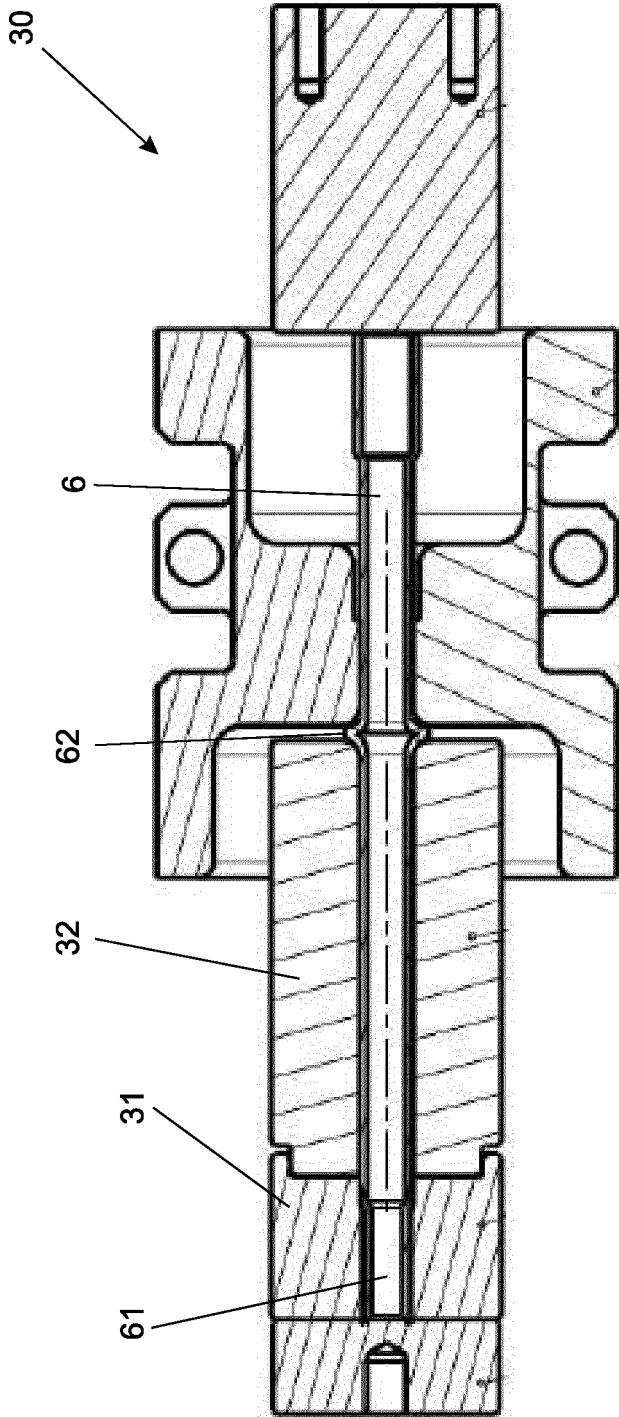


FIG. 5.1

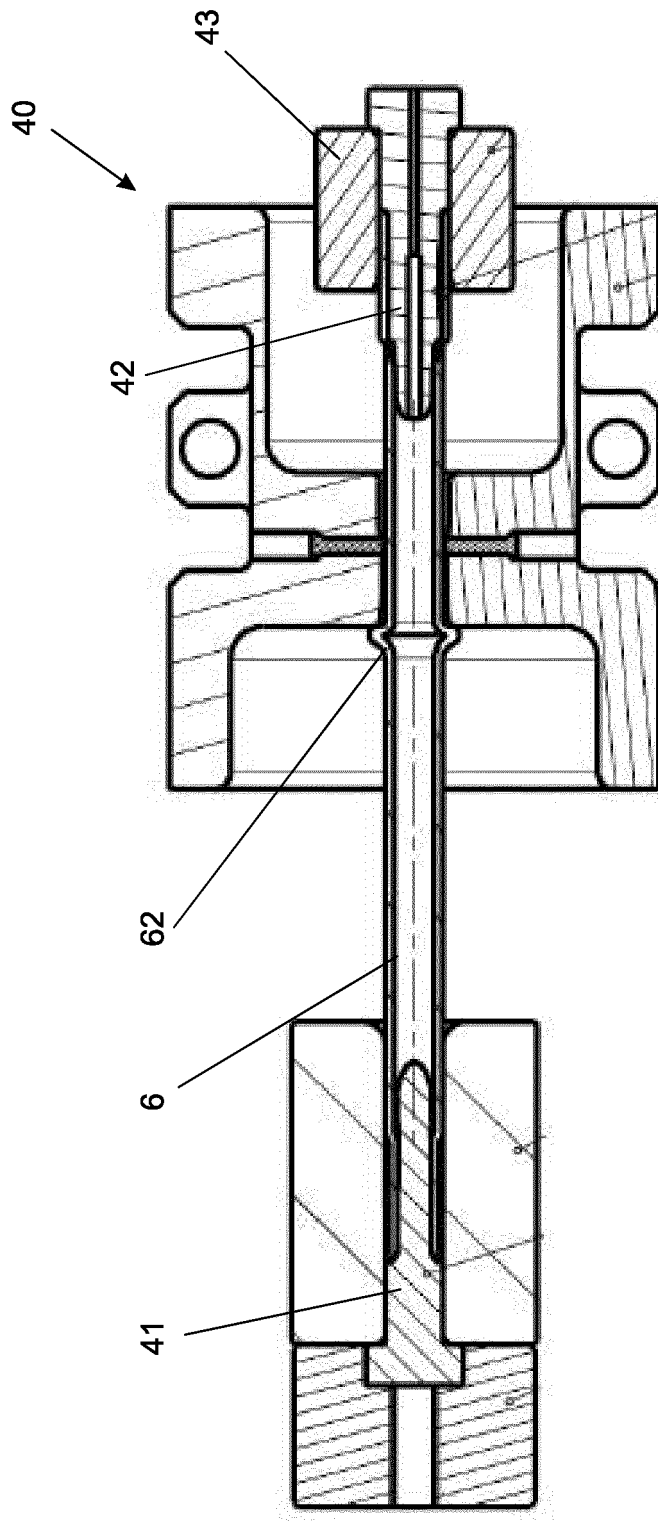


FIG. 5.2

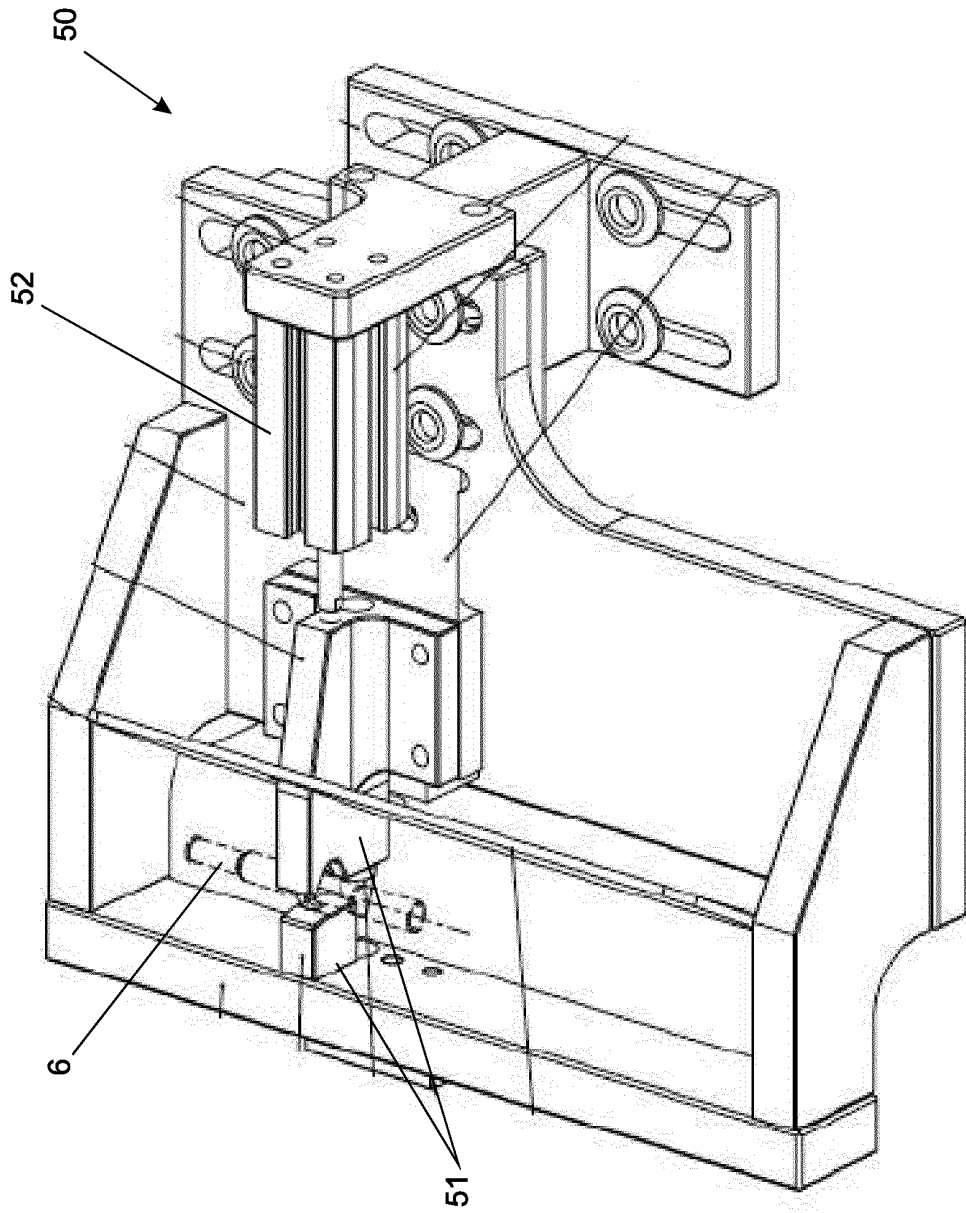


FIG. 6

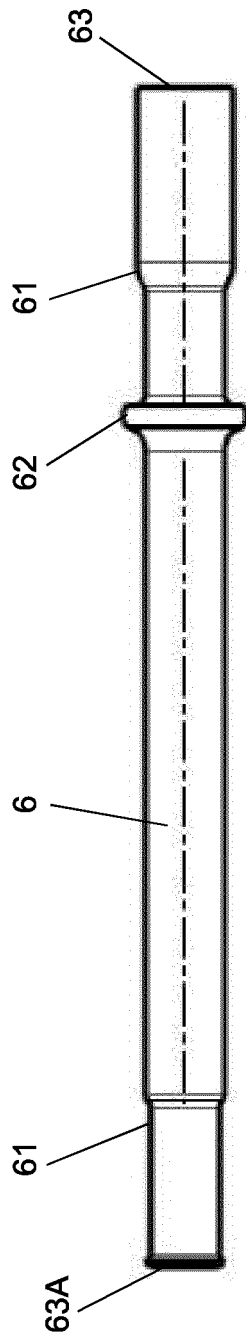


FIG. 7.1

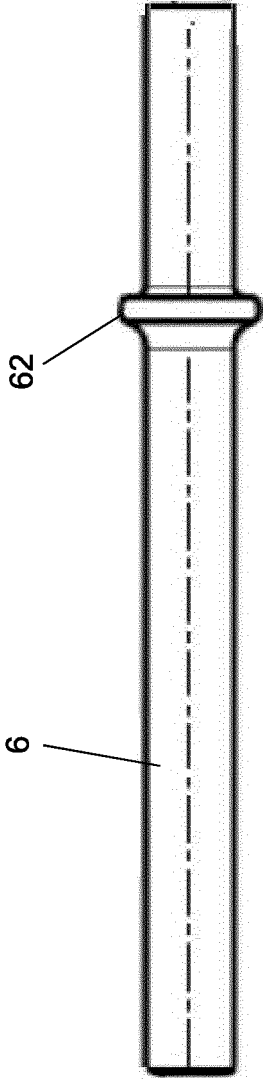


FIG. 7.2

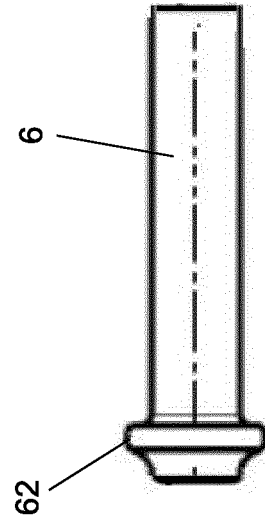



FIG. 7.3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/BR2013/000478

5	A. CLASSIFICATION OF SUBJECT MATTER	
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	According to International Patent Classification (IPC) or to both national classification and IPC	
10	B. FIELDS SEARCHED	
	Minimum documentation searched (classification system followed by classification symbols)	
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	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched	
15	SINPI	
	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)	
	EPODOC e ESPACENET.	
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT	
	Category*	Citation of document, with indication, where appropriate, of the relevant passages
		Relevant to claim No.
25	A	DE 102007024357 B 09 October 2008 (2008-10-09)
	A	WO 2012/174626 A1 27 December 2012 (2012-12-27)
30	A	CN 2615475 Y (GREEN ENERGY SCIENCE TECHNOL [CN]) 12 May 2004 (2004-05-12)
35		
40	<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.	
45	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
50	Date of the actual completion of the international search	Date of mailing of the international search report
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55	Name and mailing address of the ISA/BR  INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL Rua Sao Bento n° 1, 17° andar cep: 20090-010, Centro - Rio de Janeiro/RJ +55 21 3037-3663 Facsimile No.	Authorized officer Jorge Carlos Fernandes Campos +55 21 3037-3493/3742 Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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REFERENCES CITED IN THE DESCRIPTION

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