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(54) **Wire drawing machine**

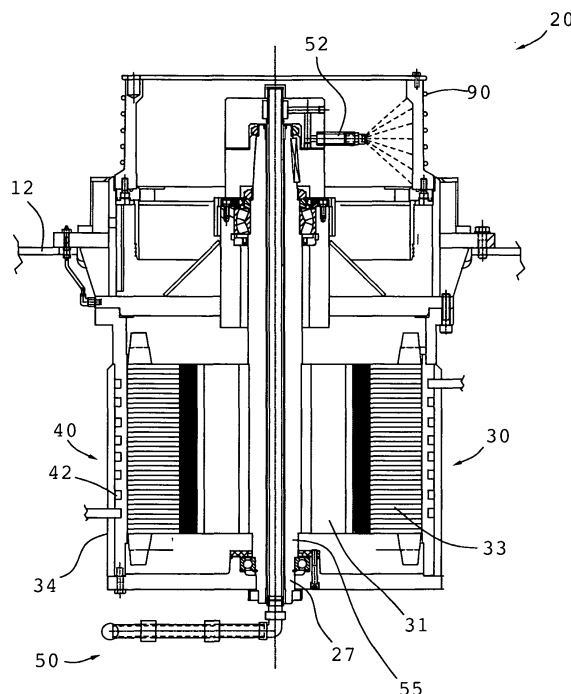
(57) Wire drawing machine (10) comprising a plurality of stations (20) which starting from a first station (20) towards next stations (20) are able to reduce gradually a section of a metallic wire (90), each station (20) comprises a rotatable drum (22) on which the metallic wire is wrapped, a tool (25), in particular a die or a draw box, and pulling means connected to the rotatable drum (22) which are able to rotate the same forcing consequently the passage of the metallic wire (90) through the tool (25) in such a way to reduce the section of the metallic wire (90), the pulling means comprise an alternate current electric motor (30), in particular asynchronous or with permanent magnet.

The electric motor (30) of the pulling means of the first station (20) comprises a number of poles equal or greater than 8, in particular equal or greater than 12.

Besides, at least the first three stations (20) show pulling means which are provided of an electric motor (30) having a number of poles equal or greater than 12, and in particular equal or greater than 18.

In other terms, none of the wire drawing stations (20) shows a belt transmission and/or a reduction gear connected to said electric motor (30).

**FIG. 2**



## Description

**[0001]** The present invention refers to a wire drawing machine able to reduce gradually the section of a metallic wire.

**[0002]** In particular the present invention refers to a multiple-step wire drawing machine preferably of the dumping hose type.

**[0003]** In the existing multiple wire drawing machine the section of a metallic wire is gradually reduced through a plurality of wire drawing stations.

**[0004]** Each station or wire drawing group is provided of pulling means comprising an alternate current electric motor.

**[0005]** Said pulling means are connected between a transmission and a reduction gear to a capstan or rotatable drum on which is wrapped said metallic wire.

**[0006]** Between the metallic wire and each rotatable drum take place friction forces when this is rotated by correspondent pulling means.

**[0007]** Said friction forces permit to force the passage of said metallic wire through a tool determining a reduction of section by means of a plastic deformation of said metallic wire.

**[0008]** With the reduction of the section said metallic wire become longer, consequently the speed of each rotatable drum have to increase going from the first wire drawing stations to the following wire drawing stations.

**[0009]** For obtaining an uniform reduction of section of said metallic wire are instead necessary low rotation speed of said rotatable drum, in particular in the first wire drawing stations.

**[0010]** Consequently in the known wire drawing machines the pulling means of each wire drawing stations commonly comprises a trapezoidal or toothed belt transmission, and a toothed reduction gear.

**[0011]** Each electric motor is connected to a correspondent belt transmission, in such a way to have a first reduction of the number of revolutions per minute.

**[0012]** Besides the transmission is connected to a correspondent reduction gear in such a way to reduce further on the number of revolutions per minute.

**[0013]** A disadvantage of the known wire drawing machine is that show an elevated numbers of components.

**[0014]** Another disadvantage is that having many moving elements these during the time are subjected to the wear, and consequently they need a control and periodical service for maintaining a correct working of the wire drawing machine.

**[0015]** A further disadvantage is that lots of elements have to be assembled and disassembled, determining high costs and time for the service and also a reduction of the productivity of the wire drawing machine.

**[0016]** Besides after some number of hours of functioning some elements subjected to wearing have to be replaced.

**[0017]** Further another disadvantage is that electric motors are often connected to an air cooling system

which generate an high noise in the working ambient, in particular in proximity of the wire drawing machine.

**[0018]** Purpose of the present invention is that to realize a wire drawing machine that avoid the necessity a transmission and also a reduction gear in each wire drawing station of said wire drawing machine.

**[0019]** Another purpose is that to realize a wire drawing machine having a reduced number of components.

**[0020]** Another purpose is that to realize a wire drawing machine having reduced time and costs of service.

**[0021]** Still another purpose is that to have a wire drawing machine having low noisy.

**[0022]** Further purpose is that to realize a wire drawing machine that can be economically advantageous.

**[0023]** These purposes according to the present invention are reached realizing a wire drawing machine according to claim 1.

**[0024]** Further features of the invention are pointed out in the following claims.

**[0025]** The features and the advantages of a wire drawing machine according to the present invention will appear more evident from the following illustrative and not limitative description, referred to the attached schematic drawings in which:

figure 1 is a schematic raised lateral right side view of a preferred form of embodiment of a wire drawing device according to the present invention;

figure 2 is a schematic partially sectioned raised lateral right side view of a particular of figure 1;

figure 3 is a schematic partially sectioned raised frontal view of a preferred form of embodiment of a wire drawing machine according to the present invention.

**[0026]** With reference to the figure, it is shown a wire drawing machine 10 for the gradual drawing of a metallic wire 90 through plastic deformation.

**[0027]** Said wire drawing machine 10 comprises a plurality of wire drawing stations 20 which, starting from a first station toward the following stations 20, are able to gradually reduce a section of said metallic wire 90.

**[0028]** In particular said plurality of stations 20 are connected in series between them and besides are connected to a fixed structure 12 of which said wire drawing machine 10 is provided.

**[0029]** According to a preferred form of embodiment each station 20 comprises a capstan or rotatable drum 22 on which is wrapped said metallic wire 90, a tool 25 which in particular a die or a draw box, and pulling means connected to said rotatable drum 22 which are able to rotate said rotatable drum 22 forcing consequently the passage of said metallic wire 90 through said tool 25 in such a way to reduce said section of said metallic wire 90.

**[0030]** In particular said wire drawing machine 10 is a multi-step wire drawing machine 10 preferably of the dumping hose type.

**[0031]** Said pulling means comprise an alternate current electric motor 30, in particular asynchronous or with

permanent magnet, and preferably powered by a correspondent inverter.

**[0032]** According to the present invention said electric motor 30 of said pulling means of said first station 20 comprises a number of poles equal or greater than 8, in particular equal or greater than 12.

**[0033]** Preferably said electric motor 30 of said pulling means of said first station 20 comprises a number of poles equal or greater than 20.

**[0034]** Preferably at least the first three stations 20 of said plurality of stations 20 show pulling means which are provided of a correspondent electric motor 30 having a number of poles equal or greater than 12, and in particular equal or greater than 18.

**[0035]** According to a preferred form of embodiment said electric motor 30 of said pulling means of said first station 20 and of a second station 20 and of a third station 20 of said plurality of stations 20 shows a number of poles equal or greater than 12 and in particular equal or greater than 18.

**[0036]** This because are necessary low rotation speeds in particular in the first stations 20, that is in the stations 20 that firstly meet said metallic wire 90.

**[0037]** With the reduction of the section of said metallic wire 90 in the last stations 20 result instead necessary greater and greater rotation speed of each rotatable drum 22, for which motors having an high number of poles could not be necessary in order to make rotate each rotatable drum 22 to a correct number of revolutions per minute.

**[0038]** Advantageously in this way it is possible to obtain directly from each electric motor 30 a number of revolutions per minute sufficiently low in order to make rotate slow said rotatable drum 22 in such a way to reduce in a homogeneous way said section of said metallic wire 90.

**[0039]** Besides in each station 20 said electric motor 30 is directly connected to said rotatable drum 22.

**[0040]** Advantageously this avoid the necessity of a transmission and also of a reduction gear in each wire drawing station 20.

**[0041]** In other terms no one wire drawing station 20 shows a belt transmission and or a reduction gear connected to said electric motor 30.

**[0042]** Advantageously this reduce notably the encumbrance, increase the reliability of said wire drawing machine 10, and besides determines an high reduction of costs and times for service.

**[0043]** According to a preferred form of embodiment said electric motor 30 comprises an external structure 34, and first liquid cooling means 40 in particular integrated internally to said external structure 34.

**[0044]** In other terms said electric motor 30 comprises first liquid cooling means 40 integrated internally to the same.

**[0045]** Advantageously this determines an high cooling efficiency of said electric motor 30 respect to an air cooling.

**[0046]** Advantageously this determines also a notably

reduction of the noise emissions also to a short distance.

**[0047]** Besides the integration of said first liquid cooling means 40 with said external structure 34 of said electric motor 30 reduce further on the encumbrance of said wire drawing machine 10.

**[0048]** Preferably each station 20 comprises second liquid cooling means 50 able to cool said rotatable drum 22 and said metallic wire 90.

**[0049]** Preferably said second liquid cooling means 50 comprises at least a liquid distributor 52 which is housed internally to said rotatable drum 22 for cooling from the inside the same and also said metallic wire 90.

**[0050]** Advantageously this simplify a lot the cooling of said electric motor 30 and in particular of said rotatable drum 22 and of said metallic wire 90.

**[0051]** In particular according to a preferred form of embodiment each station 20 comprises an hollow shaft 27 which connect directly said electric motor 30 to said rotatable drum 22.

**[0052]** Advantageously this also permit to feed internally to said rotatable drum 22 a cooling liquid in such a way to obtain a better cooling of said metallic wire 90 during the plastic deformation.

**[0053]** In particular according to a preferred form of embodiment said second liquid cooling means 50 of each station 20 includes a feeding conduit 55 of a cooling liquid which is inserted internally to said hollow shaft 27 and which is preferably connected to said at least a liquid distributor 52.

**[0054]** Besides this reduce the encumbrances, simplify the cooling of said wire drawing machine 10 and determine also an increase of the reliability.

**[0055]** In particular said first liquid cooling means 40 of said electric motor 30 comprises at least a liquid cooling circuit 42 which is integrated in the external structure 34 of said electric motor 30.

**[0056]** According to a preferred form of embodiment said pulling means comprise coupling means able to constrain and to transmit a rotating movement of said electric motor 30 directly to said rotatable drum 22.

**[0057]** According to a preferred form of embodiment of the present invention, not shown in the figures, said coupling means are integrated in the external structure 34 of said electric motor 30 and in an internal portion of said rotatable drum 22.

**[0058]** Advantageously in this way it is possible to couple and to constrain directly said rotatable drum 22 to said external structure 34 obtaining an electric motor 30 at least partially inserted internally to said rotatable drum 22, and in particular integral and rotatable with the same.

**[0059]** Preferably said coupling means are releasable coupling means.

**[0060]** In particular said coupling means comprises a bayonet coupling.

**[0061]** Advantageously in this way it is possible to quickly decouple said electric motor 30 from said rotatable drum 22 for performing service operations.

**[0062]** In particular according to a preferred form of

embodiment said electric motor 30 comprises a stator 33 fixed to said external structure 34, and a rotor 31 constrained or fixed to a fixed structure 12 of said wire drawing machine 10.

[0063] Preferably each station 20 comprises fixing means able to constrain and to make integral said external structure 34 of said electric motor 30 to said rotatable drum 22.

[0064] In this way it is possible to put in rotation said stator 33 of said electric motor 30 determining directly the rotation of said rotatable drum 22 constrained to the same.

[0065] Preferably said coupling means are integrated with said fixing means.

[0066] In particular according to a preferred form of embodiment said external structure 34 is fitted together or however made integral internally to said rotatable drum 22.

[0067] According to a preferred form of embodiment said electric motor 30 is integrated with said rotatable drum 22.

[0068] Preferably said electric motor 30 is at least partially inserted in the inside of said rotatable drum 22.

[0069] In particular said electric motor 30 is totally inserted in the inside of said rotatable drum 22.

[0070] In particular said external structure 34 of said electric motor 30 is integrated with an internal portion of said rotatable drum 22.

[0071] Preferably said first liquid cooling means 40 are at least partially integrated within said external structure 34 of said electric motor 30 and are able to cool at the same time said electric motor 30 and said rotatable drum 22.

[0072] Advantageously by means of a wire drawing machine according to any one preferred form of embodiment of the present invention it is achieved a notably reduction of the components and a notably simplification of said wire drawing machine 10.

[0073] This besides imply an advantageous increase of the reliability because there are less components subjected to the wear, consequently this determines a reduction of costs and times necessary for the service operations.

[0074] Advantageously in this way also it is obtained a bigger productivity that derives from the reduction of the times necessary for the service of the same wire drawing machine 10.

[0075] In this way it has been seen that a wire drawing machine according to the present invention achieves the objectives previously mentioned.

[0076] The wire drawing machine of the present invention thus conceived can undergo to numerous modifications and variations, all included in the same inventive concept.

[0077] Furthermore, in practice the materials used, as well as their dimensions and the components, can vary according to the technical needs.

## Claims

1. Wire drawing machine (10) comprising a plurality of stations (20) which starting from a first station (20) toward the following stations (20) are able to reduce gradually a section of a metallic wire (90), each station (20) comprises a rotatable drum (22) on which is wrapped said metallic wire (90), a tool (25) which in particular a die or a draw box, and pulling means connected to said rotatable drum (22) which are able to rotate said rotatable drum (22) forcing consequently the passage of said metallic wire (90) through said tool (25) in such a way to reduce said section of said metallic wire (90), said pulling means comprises comprise an alternate current electric motor (30), in particular asynchronous or with permanent magnets, and preferably powered with a correspondent inverter, said wire drawing machine (10) **characterized in that** said electric motor (30) of said pulling means of said first station (20) comprise a number of poles equal or greater than 8, and in particular equal or greater than 12.
2. Wire drawing machine (10) according to claim 1, **characterized in that** said electric motor (30) of said pulling means of said first station (20) comprises a number of poles equal or greater than 20.
3. Wire drawing machine (10) according to claim 1 or 2, **characterized in that** at least the first three stations (20) of said plurality of stations (20) show pulling means which are provided of a correspondent electric motor (30) having a number of poles equal or greater than 12, and in particular equal or greater than 18.
4. Wire drawing machine (10) according to any one of the claims from 1 to 3, **characterized in that** in each station (20) said electric motor (30) is directly connected to said rotatable drum (22).
5. Wire drawing machine (10) according to any one of the claims from 1 to 4, **characterized in that** said electric motor (30) comprises an external structure (34), and first liquid cooling means (40) in particular integrated in the inside of said external structure (34).
6. Wire drawing machine (10) according to any one of the claims from 1 to 5, **characterized in that** each station (20) comprises second liquid cooling means (50) able to cool said rotatable drum (22) and said metallic wire (90).
7. Wire drawing machine (10) according to any one of the claims from 1 to 6, **characterized in that** each station (20) comprises an hollow shaft (27) which connect directly said electric motor (30) to said rotatable drum (22).

8. Wire drawing machine (10) according to any one of the claims from 5 to 7, **characterized in that** said second liquid cooling means (50) of each station (20) comprise a feeding conduit (55) of cooling liquid which is inserted internally to said hollow shaft (27). 5
9. Wire drawing machine (10) according to any one of the claims from 4 to 8, **characterized in that** said first liquid cooling means (40) of said electric motor (30) comprise at least a liquid cooling circuit (42) which is integrated in the external structure (34) of said electric motor (30). 10
10. Wire drawing machine (10) according to any one of the claims from 1 to 9, **characterized in that** said pulling means comprise coupling means able to constrain and to transmit a rotating movement of said electric motor (30) directly to said rotatable drum (22). 15  
20
11. Wire drawing machine (10) according to claim 10, **characterized in that** said coupling means are releasable coupling means.
12. Wire drawing machine (10) according to claim 10 or 11, **characterized in that** said coupling means are integrated in said external structure (34) of said electric motor (30) and in an internal portion of said rotatable drum (22). 25  
30
13. Wire drawing machine (10) according to any one of the claims from 4 to 12, **characterized in that** said electric motor (30) comprises a stator (33) integral to said external structure (34), and a rotor (31) constrained or fixed to a fixed structure (12) of said wire drawing machine (10). 35
14. Wire drawing machine (10) according to any one of the claims from 10 to 14, **characterized in that** each station (20) comprises fixing means able to constrain and make integral said external structure (34) of said electric motor (30) to said rotatable drum (22). 40
15. Wire drawing machine (10) according to any one of the claims from 1 to 14, **characterized in that** said electric motor (30) is integrated with said rotatable drum (22). 45
16. Wire drawing machine (10) according to any one of the claims from 4 to 15, **characterized in that** said external structure (34) of said electric motor (30) is integrated with an internal portion of said rotatable drum (22). 50
17. Wire drawing machine (10) according to any one of the claims from 4 to 16, **characterized in that** said first liquid cooling means (40) are partially integrated within said external structure (34) of said electric motor (30) and are able to cool at the same time said electric motor (30) and said rotatable drum (22). 55

FIG. 1

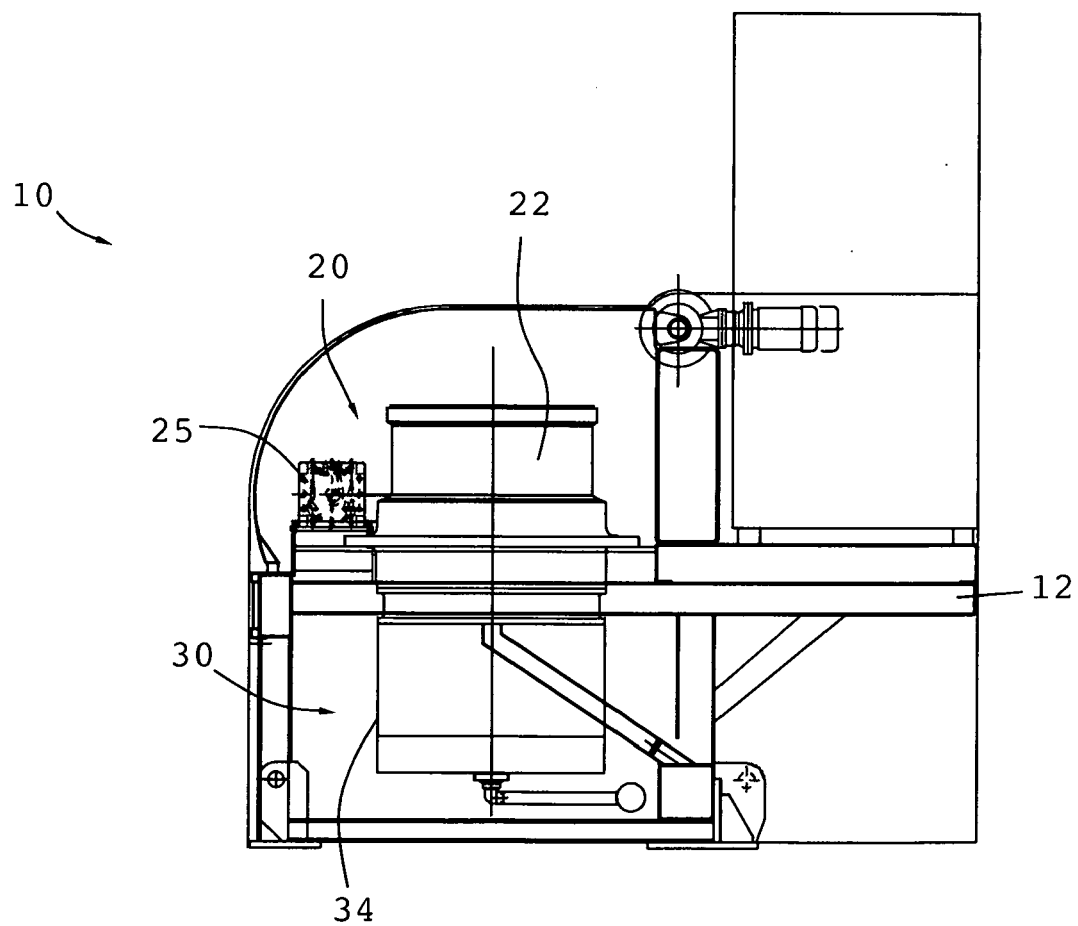


FIG. 2

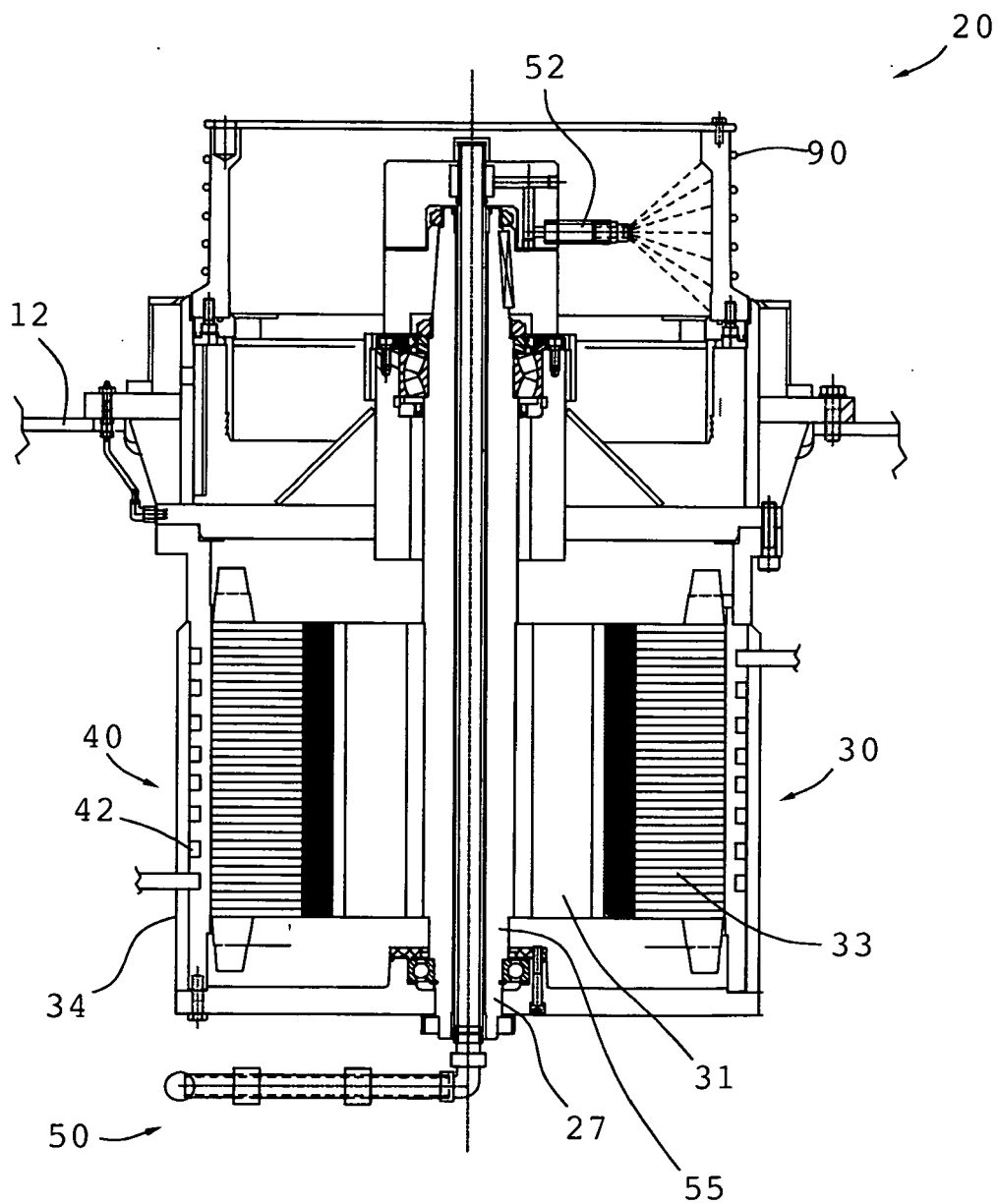
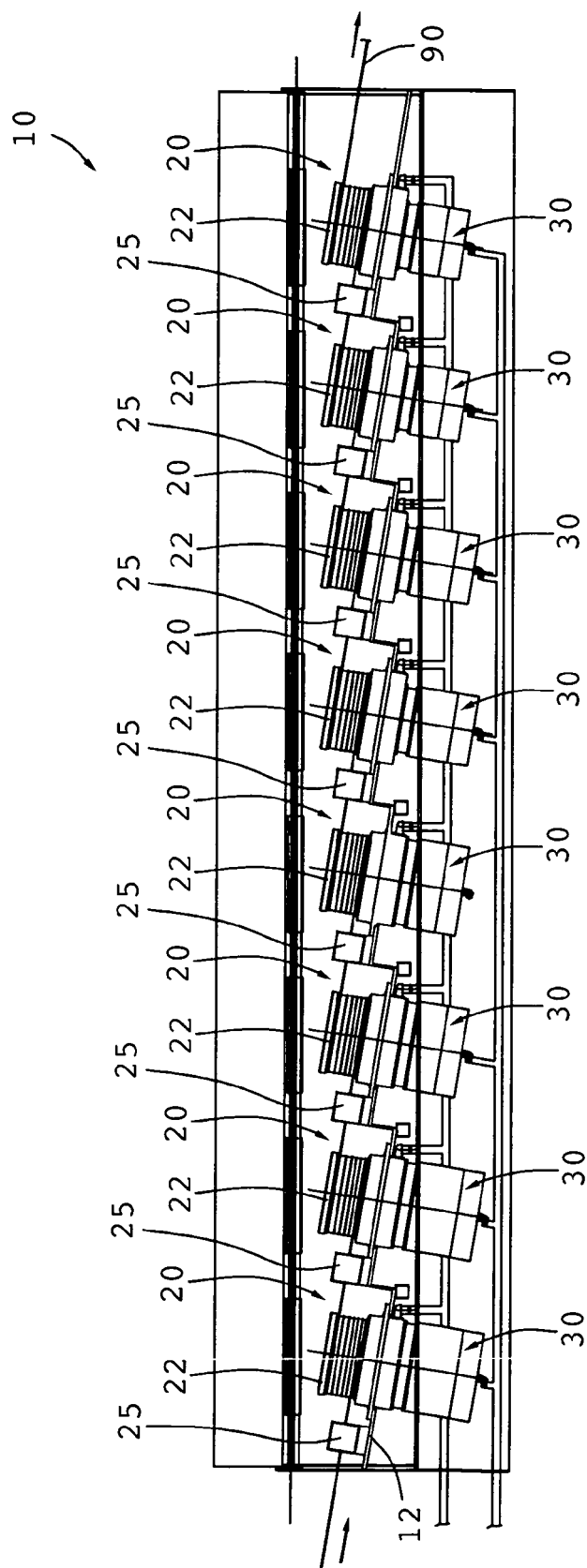


FIG. 3







## EUROPEAN SEARCH REPORT

Application Number  
EP 08 02 0204

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>12 March 2009</b>	Examiner <b>Ritter, Florian</b>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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