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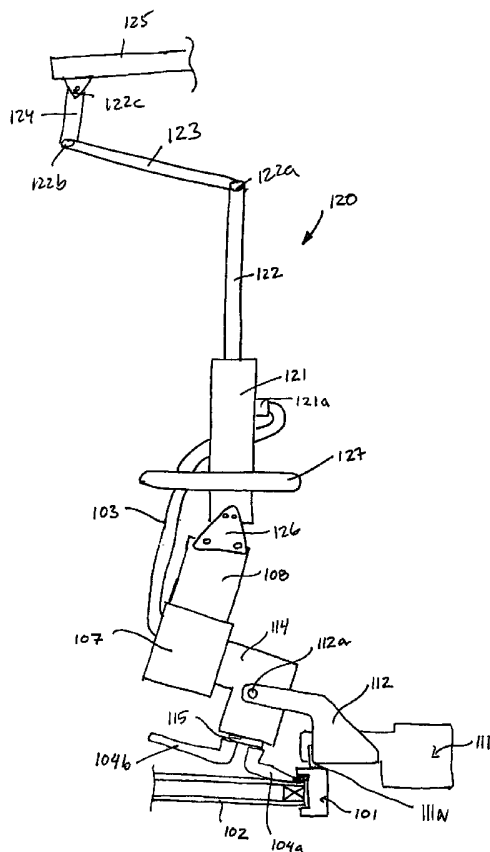
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(54) Title: METHOD AND ARRANGEMENT FOR APPLYING A VISCOUS MATERIAL WITH MEANS FOR REGULATING THE MATERIAL SUPPLY



(57) Abstract: In order to apply a viscous material, such as a sealant, along an application path, the arrangement comprises a nozzle (104a,104b) and a pump (107). The inlet side of the pump is connected with a container (103) for the supply of sealant, and the outlet side of the pump is directly connected with the nozzle. The pump is connected with a motor (108) which is controlled by control means. The arrangement comprises an assembly that may be moved manually, and the control means are connected with an encoder (111) for activating and deactivating the motor in response to signals from the encoder.



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Title of the invention

METHOD AND ARRANGEMENT FOR APPLYING A VISCOUS MATERIAL WITH MEANS FOR REGULATING THE MATERIAL SUPPLY.

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Field of the invention

The present invention relates to a method and an arrangement for applying a viscous material, in particular a sealant such as silicone, along an application path.

Background of the invention

Apparatus for dispensing a viscous material, such as sealant, putty or mastic materials, e.g. in glazing, caulking, jointing or general sealing, are well-known in the prior art within a wide range of designs. In the case of simple, hand-held applicator guns, such apparatus comprises a container or reservoir in the form of a dispensing cartridge having a nozzle and an internal plunger. The cartridge is loaded into an extrusion device and when the plunger is urged from one end of the cartridge to the other by means of any mechanical or pneumatic means which are activated by e.g. a trigger member, the sealant is discharged from the nozzle. Such a prior art device is disclosed in DE publication No. 35 15 101.

In other types of applicators, the container may be separated from the gun itself, and the viscous material is supplied to the gun via a hose or similar means, as is disclosed in e.g. US patent No. 4,096,973.

It is a well-known problem in such applicators that the application process in itself is difficult to control accurately, i.a. due to the viscosity of the material which requires a rather high pressure in order to discharge the material through the nozzle. In order to secure that the joint is adequate the material is usually applied in a thicker and/or wider

layer than necessary, and excess material is removed during the finishing of the window. This problem is particularly pronounced in start-and-stop situations which cannot be avoided entirely due to fact that the
5 process is normally used in discrete products and not in continuous lines. In addition to the waste of material, the removal of excess material is cumbersome and thereby increases production costs.

In the above-mentioned DE publication, an attempt
10 has been made to reduce the problem of subsequent outflow of material by providing a pressure relieving conduit leading from the chamber behind the plunger and which is opened for passage of pressurized air contained in the chamber as a result of the trigger
15 member being moved to its non-activating position.

Apparatus for automatic application of a sealant on e.g. a glazing assembly are known as well. Traditionally, such apparatus comprise a moving device for moving the glazing assembly with respect to the nozzle, or vice versa, which moving device is motor-driven and controlled by any suitable means, such as a program control according to a predefined and pre-programmed geometry of the glazing assembly. GB 2 016
20 960 discloses such an apparatus, by means of which
25 edge joints of insulating glazing assemblies are sealed automatically.

However, automatic application of sealant by moving the glazing assembly with respect to the nozzle, e.g. along a predefined and pre-programmed path, is
30 not always desirable or appropriate, especially in the case of frequent shifts in the manufacturing line regarding the size or geometrical shapes of the elements to which sealant is to be applied. For instance, small or medium-sized business units having
35 series of only a few elements, maybe even only one element, of the same dimensions and geometrical shape would have to use a disproportionate amount of time in order to adapt and reprogrammed such an apparatus

to the actual individual element.

Summary of the invention

5 With this background, it is an object of the invention to provide a method and an arrangement by which it is possible to apply sealant along an arbitrary application path on individual elements in a simple and cost-effective manner.

10 In a first aspect of the invention, this object is met by a method for applying a viscous material, in particular a sealant such as silicone, along an application path in relation to individual elements, in which at least said nozzle is moved along said application path, the viscous material is transferred
15 from a container accommodating the material to a nozzle and the viscous material is discharged from said nozzle in a longitudinally extending joint along the application path by means of a pressure acting on said viscous material, said pressure being relieved
20 in order to reduce the discharge of viscous material from the nozzle, said pressure being applied by and said transfer between the container and the nozzle performed by a pumping means having an inlet side and an outlet side, the inlet side being connected with
25 said container, the viscous material being supplied directly from the outlet side of the pumping means to said nozzle, said pumping means being driven by a motor which is controlled by control means, said method being characterized in that the movement along the
30 application path is performed manually, and that said control means activate and deactivate said motor in response to signals from at least one encoder which detects the movement of at least the nozzle along the application path thereby causing automatic interrup-
35 tion of the pumping means.

By allowing the movement along the application path to be performed manually in combination with the fact that the discharge of viscous of material may be

stopped instantaneously and regulated automatically when the movement of the encoder, which follows the application path, is stopped, the application process may be controlled in a simple manner by an operating
5 person.

Preferably, detecting means are provided for detecting the thickness and/or width of the applied joint, and the discharged amount may be decreased or increased in response to signals from the detecting
10 means. In this manner, e.g. manufacturing tolerances or local variations along the application path may be compensated for automatically.

In order to ease the intake of material to the pump, the container may be subjected to a slight
15 pressure.

In another aspect of the invention, the object is met by an arrangement for applying a viscous material, in particular a sealant such as silicone, along an application path, comprising a container for ac-
20 commodating said viscous material, a nozzle through which the viscous material is discharged to provide a longitudinally extending joint along the application path, pressure providing means acting on said material, means for reducing the pressure on said mate-
25 rial, a pump having an inlet side connected with said container and an outlet side which is directly connected with said nozzle, said pump being connected with a motor which is controlled by control means, said arrangement being characterized in that said ar-
30 rangement comprises an assembly that may be moved manually, and that said control means are connected with at least one encoder for activating and deactivating said motor in response to signals from said at least one encoder.

35 The pump is preferably a displacement pump, such as e.g. a gear pump, a screw pump or an impeller or vane pump. This kind of pump provides a substantially linear flow with only insignificant pulsations

in the discharged amount.

The nozzle may be manufactured of a substantially non-yielding material. This results in a particularly stiff nozzle portion, which, in turn, entails that the residual stress in this portion is reduced in comparison to prior art devices, and the nozzle does not contribute to the outflow of material when the pump has been stopped.

In order to be able to apply viscous material on elements having differing dimensions, the at least one encoder may be rotationally connected with an arm mounted on said movable assembly.

In a simple embodiment for use in situations, in which the amount of viscous material is relatively limited, the nozzle and the container are mounted on a respective side of the housing of the pump to form a portable assembly.

For other applications, at least the movable assembly may be suspended on a supporting structure.

20

Brief description of the drawings

In the following, the invention will be described in more detail with reference to the schematic drawings, in which

25 Fig. 1 shows a perspective view of a window;

Fig. 2 is a sectional view of the window of Fig. 1 along the line II-II, showing a schematic view of a prior art arrangement for providing a sealing joint;

Fig. 3 is a view corresponding to Fig. 2 of an embodiment of an arrangement according to the invention; and

30 Fig. 4 is a side view of a further embodiment of an arrangement according to the invention.

35 Description of a preferred embodiment

The window shown in Fig. 1 comprises a frame 1 which carries a glazing element 2, e.g. in the form of a glass unit, preferably an insulating glass unit.

The glazing element 2 is received in the frame in any suitable manner, eg. as shown in a recess formed in the frame between a projection 1a and a frame portion 1b. In order to provide a weather-proof connection
5 between the frame 1 and the glazing element 2, the gap between the glazing element 2 and the frame portion 1b is filled by an appropriate sealant, such as silicone, along an application path extending along the sides of the window.

10 In the prior art applicator arrangement shown in Fig. 2, a dispensing cartridge comprising a container 3 having a nozzle 4 and an internal plunger (not shown) is loaded into an extrusion device such as an applicator gun symbolized by the compressed-air hose
15 5. By application of pressure the plunger is urged from one end of the cartridge whereby the sealant contained in the container 3 is discharged from the nozzle 4 to provide a joint 6 when the applicator arrangement is moved along the sides of the window.

20 During use of the prior art arrangement, a string 6a of excess material is generated, which may be due to overfilling of the gap in order to secure adequate sealing or which is the result of stopping and subsequent starting of the movement of the applicator
25 along the application path. The excess material is subsequently removed.

In Fig. 3 an embodiment of the arrangement according to the invention is shown, in which elements having the same or analogous function as in the prior
30 art arrangement carry the same reference numerals.

Between the container 3 and the nozzle 4 of the applicator arrangement, a pump 7 is inserted. In this respect, it is noted the term "container" should be interpreted to comprising any containing means, such
35 as a cartridge and hose means for conducting the viscous material from a supply source to the pump. The pump 7 is preferably a gear pump but any other suitable type of displacement pump may be utilized. Pref-

erably, but not necessarily the pump provides a substantially linear flow, examples of such a pump being e.g. a screw pump or an impeller or vane pump. By the provision of appropriate control means, other types
5 of pumps are usable as well, such as a piston pump having a number of cylinders, in which the variation in the resulting flow is compensated for by means of e.g. a cam arrangement. The pump 7 is connected with a motor 8 which is controlled by control means com-
10 prising a driver 10 and an electronic gear 10. The motor 8 is connected with a position feed-back device and is thus in the embodiment shown activated and deactivated in response to signals from an encoder 11 detecting the movement of the arrangement along the
15 application path. The encoder 11 is rotatably mounted on an arm 12 connected with e.g. the housing of the pump 7.

In order to apply the joint 6 of the sealant material in the gap between the frame portion 1b and the
20 glazing element 2, the arrangement is advanced along the sides of the window. The encoder 11 transmits a signal to the control means 9, 10 which activates the motor 8 which in turn drives the gear pump 7. The pump 7 draws sealant from the container 3 on its
25 inlet side. In order to ease the operation of the pump and to prevent under-pressure in the container 3 a slight pressure such as 5 bars or lower may be applied to the container. When the advancement of the arrangement is stopped, e.g. for a change of direc-
30 tions at one of the corners of the window, the motor 8 is deactivated as a result of the concurrent stop of the movement of the encoder 11. This results in a simultaneous stop of operation of the pump 7, and the formation of bulges along the joint 6 is thus avoided
35 as the flow of sealant material is stopped almost instantly and/or simultaneously. Advantageously, the nozzle 4 is made from a stiff material in order to prevent the material collected in the nozzle to flow

out as a result of any relaxation of the nozzle material. It is furthermore possible to avoid such outflow of material by compensating for the relaxation and for the compressibility of the sealant material
5 itself by suitable programmable control means.

As an additional feature, the apparatus is provided with means for detecting the position of the surface of the applied joint and thus the width and/or thickness of the joint. In the embodiment
10 shown these means comprise a laser 13 for detecting the width of the joint 6, which is connected with the control means 9, 10 which in turn provides for an increase or a reduction of the flow of sealant discharged via the pump 7 in response to the signals
15 from the position detecting means.

The arrangement may be formed as a manually portable device. In order to obtain a compact design, the nozzle and the container may be mounted on a respective side of the housing of the pump. Such a device
20 may e.g. be designed for do-it-yourself purposes.

In the embodiment shown in Fig. 4, an arrangement is shown, in which elements having the same or analogous function as in the above embodiment carry the same reference numerals to which "100" has been
25 added.

In this arrangement, an assembly comprising the pump 107, the motor 108, nozzles 104a and 104b, and the control means illustrated by the encoder generally designated 111 is suspended on a supporting
30 structure 120, such that the movable assembly may be moved along the application path by e.g. pulling and pushing the supporting structure in a manner that will be described in further detail in the following.

The encoder 111 incorporating a rotatable encoder
35 wheel 111a, which during application is in contact with the frame 101, is connected with an intermediate element 114 by means of an arm 112. The arm 112 is connected with the intermediate element 114 in a

pivot joint 112a, which allows the arm 112 and consequently the encoder 111 to be rotated around the pivot joint 112a, partly in order to allow movement of the movable assembly without activating the motor
5 and thus the pump, partly in order to be able to allow the arrangement to be used in connection with elements having differing dimensions, in particular in the height direction.

At the under side of the intermediate element 114,
10 a rotatable disc 115 is provided. In the embodiment shown the disc 115 carries two nozzles 104a and 104b. The nozzles 104a, 104b may e.g. have different lengths and opening areas in order to provide a possibility of adjusting the flow of sealant without
15 having to adjust e.g. the rotational speed of the motor 108.

The supporting structure 120 comprises a linkage mechanism including a number of arms 122, 123 and 124 that are connected with each other in joints 122a and
20 122b. The upper arm 124 is connected with a supporting element 125 by means of a joint 122c. Advantageously, the joints 122a, 122b, 122c allow mutual movement of the arms 122, 123 and 124 in three dimensions such that the entire movable assembly may be
25 lifted and lowered, and moved along an arbitrary application path.

The supporting element 125 may e.g. be connected with a wall or the ceiling (not shown), or form part of a transportable unit that may be wheeled or other-
30 wise transported from one place to another.

The lower arm 122 is connected with an element 121 which in turn is connected with e.g. the housing of the motor 108, or with any other part of the movable assembly by means of fixation member 126. The sealant
35 container in the form of a hose 103 is connected with a connecting element 121a on the element 121 and is in a not-shown manner guided in or along the arms to a supply source (not shown). The hose 103 is con-

nected with the inlet side of the pump 107.

The movable assembly may be moved into the appropriate position and along the desired application path by means of a handle 127.

5 The arrangement described in connection with Fig. 4 may as is the case in the above embodiment be provided with means for detecting the position of the surface of the applied joint and thus the width and/or thickness of the joint, e.g. comprising a la-
10 ser for detecting the width and/or thickness of the applied joint 6.

The invention should not be regarded as being limited to the embodiment described in the above but various modifications and combinations may be carried
15 out without departing from the scope of the appended claims.

C L A I M S

1. A method for applying a viscous material, in particular a sealant such as silicone, along an application path, in which at least said nozzle is
5 moved along said application path in relation to individual elements, the viscous material is transferred from a container accommodating the material to a nozzle and the viscous material is discharged from said nozzle in a longitudinally extending joint along
10 the application path by means of a pressure acting on said viscous material, said pressure being relieved in order to reduce the discharge of viscous material from the nozzle, said pressure being applied by and said transfer between the container and the nozzle
15 performed by a pumping means having an inlet side and an outlet side, the inlet side being connected with said container, the viscous material being supplied directly from the outlet side of the pumping means to said nozzle, said pumping means being driven by a mo-
20 tor which is controlled by control means, c h a r - a c t e r i z e d in that the movement along the application path is performed manually, and that said control means activate and deactivate said motor in response to signals from at least one encoder which
25 detects the movement of at least the nozzle along the application path thereby causing automatic interruption of the pumping means.

2. A method as claimed in claim 1, in which detecting means are provided for detecting the thick-
30 ness and/or width of the applied joint.

3. A method as claimed in claim 2, in which the discharged amount is decreased or increased in response to signals from said detecting means.

4. A method as claimed in any of the preceding
35 claims, in which the container is subjected to a slight pressure.

5. An arrangement for applying a viscous material, in particular a sealant such as silicone, along

an application path, comprising a container for accommodating said viscous material, a nozzle through which the viscous material is discharged to provide a longitudinally extending joint along the application path, pressure providing means acting on said material, means for reducing the pressure on said material, a pump having an inlet side connected with said container and an outlet side which is directly connected with said nozzle, said pump being connected with a motor which is controlled by control means, characterized in that said arrangement comprises an assembly that may be moved manually, and that said control means are connected with at least one encoder for activating and deactivating said motor in response to signals from said at least one encoder.

6. An arrangement as claimed in claim 5, in which said pump is a displacement pump.

7. An arrangement as claimed in claim 6, in which said pump is a gear pump, a screw pump or an impeller or vane pump.

8. An arrangement as claimed in any of claims 5 to 7, in which said nozzle is manufactured of a substantially non-yielding material.

9. An arrangement as claimed in any of claims 5 to 8, in which said at least one encoder is rotationally connected with an arm mounted on said movable assembly.

10. An arrangement as claimed in any of claims 5 to 9, in which the arrangement comprises detecting means for detecting the width and/or thickness of the joint.

11. An arrangement as claimed in claim 10, in which said detecting means comprise a laser connected with the control means for decreasing or increasing the discharge of the viscous material.

12. An arrangement as claimed in any of claims 5 to 11, in which said container is subjected to a

slight pressure.

13. An arrangement as claimed in any of claims 5 to 12, in which the nozzle and the container are mounted on a respective side of the housing of the pump to form a portable assembly.

14. An arrangement as claimed in any of claims 5 to 12, in which at least the movable assembly is suspended on a supporting structure.

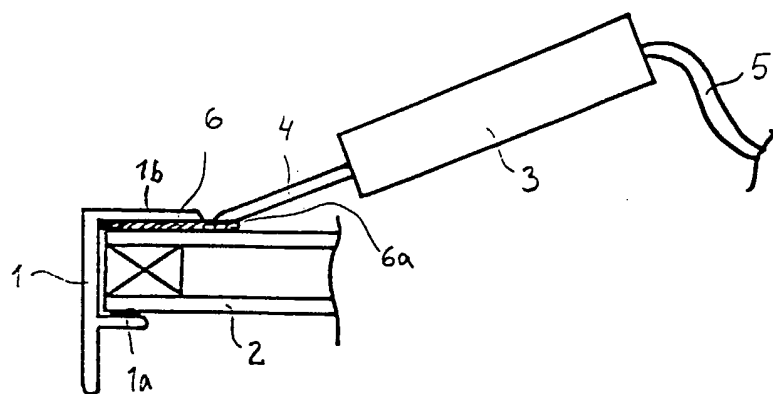
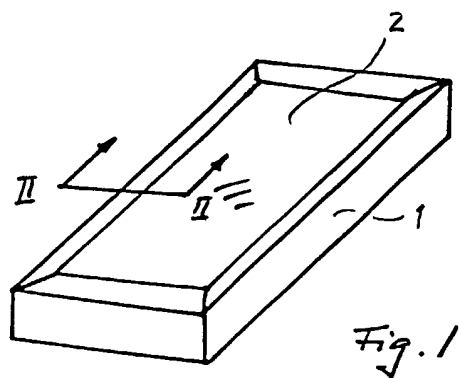


Fig. 2

PRIOR ART

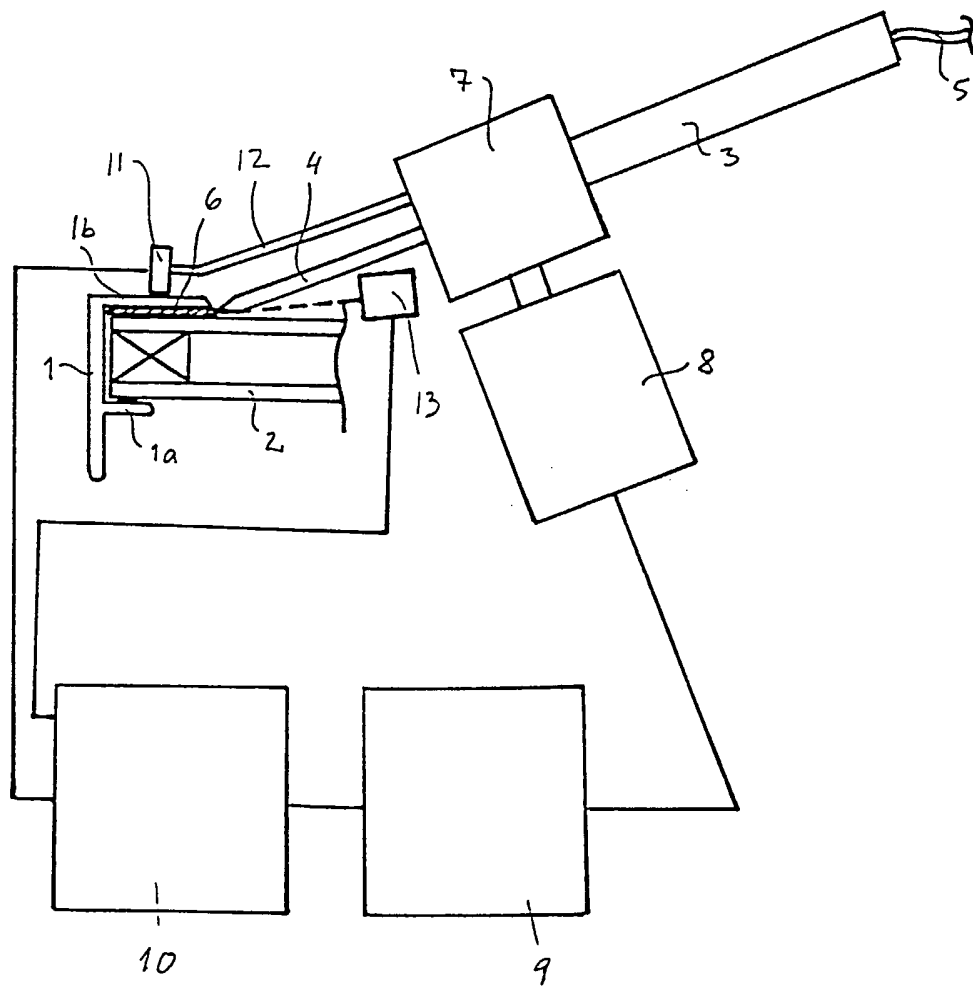


Fig. 3

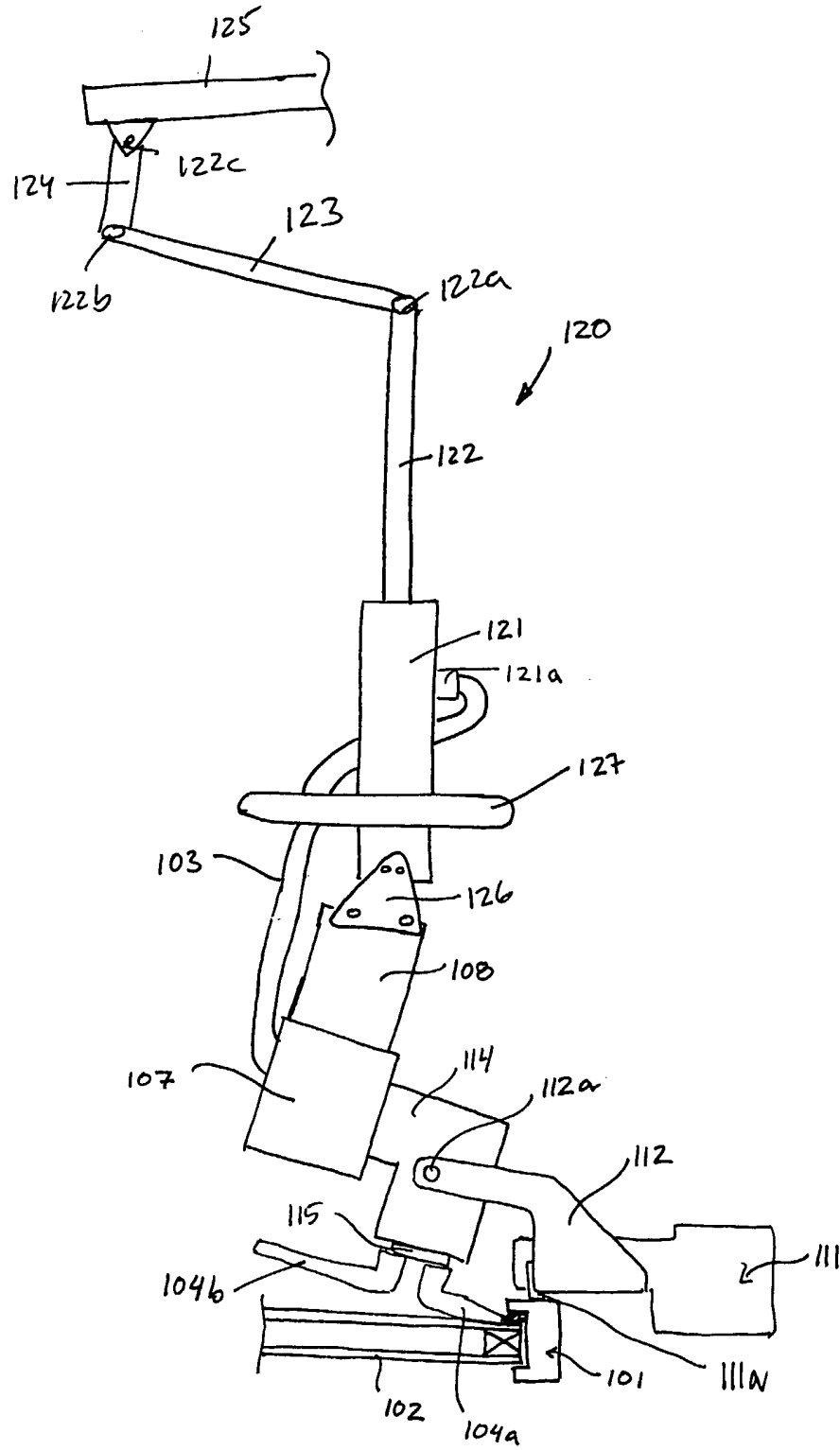


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 02/00495

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B05C 11/10, B05C 5/02, E04F 21/165

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B05C, E04F, G01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ


C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	EP 0757232 A2 (NORDSON CORPORATION), 5 February 1997 (05.02.97), page 4, line 48 - line 51, figures 1-3, abstract	2,3,10,11
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 Further documents are listed in the continuation of Box C.
 See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search	Date of mailing of the international search report
21 October 2002	04 11 2002

Name and mailing address of the International Searching Authority	Authorized officer
 European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Asa Lööf/MP Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 02/00495

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

International application No.
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