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(71) Applicant: **V.I.V. International S.p.A.**  
**37030 Cazzano Di Tramigna VR (IT)**

(72) Inventor: **Fenzi, Giancarlo**  
**37031 Illasi (Verona) (IT)**

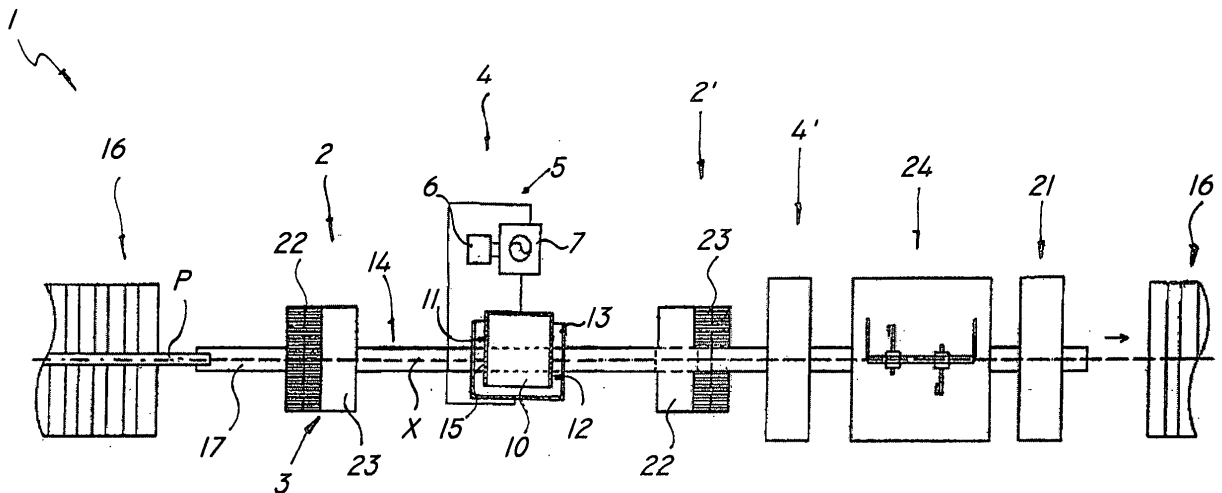
(74) Representative: **Maroscia, Antonio**  
**Abaty & Neumann SRL**  
**Via Tre Settembre, 99**  
**SM-47891 Dogana (SM)**

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(54) **System and method for painting and drying elongated items**

(57) A line for painting items, such as profiles and similar items, comprising at least one distributing station (2) for distributing one or more layers of a paint or dye comprising a liquid phase on at least part of the outer surface (S) of an item (P) to be painted, at least one drying station (4) for drying the paint or dye layers to at least partially remove the liquid phase. The drying station (4) comprises an irradiation device (5)

for irradiating at least part of the outer surface (S) of the item (P) with a beam of electromagnetic waves whose frequency falls in the range of radio-frequencies. The irradiation device (5) comprises an electromagnetic wave generator (6) for generating electromagnetic waves in the range of radio-frequencies and an applicator (7) with at least one pair of electrodes (8, 9) designed to generate an electromagnetic field in which the item (P) is immersed. A method of painting elongate items.



**FIG. 2**

## Description

### Field of the invention

**[0001]** The present invention generally finds application in the field of surface treatments, and particularly relates to a line and a method for painting objects, such as profiles, plates, sheets, made of polymeric, metal, wooden or anyway rigid materials.

### Background art

**[0002]** Lines for surface treatment of objects, particularly elongate objects such as profiles and the like, made of various materials, are known to comprise a plurality of workstations aligned along a manufacturing path.

**[0003]** For instance, lines for painting profiles typically include one or more stations for surface distribution of one or more products, such as paints, inks or other pigmented or clear liquids, for protecting the items or imparting a surface color or decoration thereto.

**[0004]** Such lines may also include stations for applying other products, such as primers, glues or adhesives in general to the surface of the items, for improving firm adhesion of the paint or decoration layers.

**[0005]** The products to be applied are generally in liquid or powder form and may be water- or solvent-based, with solvents being of either one- or two-component type.

**[0006]** Surface distribution thereof may be obtained using various operating techniques, such as spraying, roller coating, dipping, cataphoresis.

**[0007]** Furthermore, after each application of a product layer, the semifinished or finished profile may be conveyed to a drying station.

**[0008]** The drying techniques are selected as a function of the products being used and the times of permanence of the profile in the drying station.

**[0009]** In one of the most common techniques, the items are led into a heated fan oven, in which they stay for a predetermined time or slide at a speed selected according to the products to be applied and to the desired final moisture degree.

**[0010]** In these cases, a preliminary drying step may be provided with air at ambient temperature, possibly under forced ventilation.

**[0011]** Systems are further known for treatment and decoration of profiles designed to form door and window frames and casings, which alternatively include an infrared, microwave or ultrasound drying station.

**[0012]** Italian patent M02005A000167 discloses a profile decoration line including surface application of UV inks, i.e. inks with added photoinitiators, which may be cured by exposing the treated surface to a UV radiation source.

**[0013]** A drawback common to all the above technologies is their high energy consumption, which causes a considerable increase of overall process costs.

**[0014]** Furthermore, prior art solutions, which use

forced-air or infrared ovens are affected by the drawbacks of a large size and too long drying time, not always compatible with industrial manufacturing.

**[0015]** Also, these known drying techniques cause heating of the treated items, with heat propagating from the surface inwards. Therefore, such fast heating might cause quick curing of the outermost layers, with moisture being trapped in the inner layers, thereby forming bubbles or cracks and providing a technically unacceptable final product.

**[0016]** In addition to high manufacturing and handling costs, microwave drying stations have very high energy absorption which affects their cost effectiveness.

**[0017]** Therefore, such stations are often used for partially drying the profiles, the latter reaching the final drying degree at a later time, by heating in air furnaces.

**[0018]** Microwave systems also have a high inherent hazard degree, and require the intervention of highly qualified personnel, as well as effective system shielding.

**[0019]** Furthermore, idle operation should be also prevented, to avoid the generation of electric discharges in the oven.

**[0020]** Finally, the action of microwaves may be affected by the particular dye to be distributed over the profile, therefore the drying system may be required to be set each time that the color to be obtained is changed.

### Disclosure of the invention

**[0021]** The object of the present invention is to overcome the above drawbacks, by providing a method and a line for painting items, such as profiles and other items of various shapes, that is highly efficient and relatively cost-effective.

**[0022]** A particular object is to provide a line for painting items, that affords considerable energy savings.

**[0023]** Yet another object of the present invention is to provide a line for painting items, that has a considerably smaller size than traditional lines.

**[0024]** These and other objects, as better explained hereafter, are fulfilled by a line for painting items as defined in claim 1, which comprises at least one distributing station for surface distribution of at least one layer of a paint or dye comprising a liquid phase on at least a part of an item to be painted, at least one drying station for drying said layer to at least partially remove the liquid phase of the product that has been applied.

**[0025]** The drying station also comprises at least one device for generating a beam of electromagnetic waves whose frequency is selected in the range of radio-frequencies and for irradiating the item therewith.

**[0026]** The line is **characterized in that** the irradiating device (5) comprises an electromagnetic waves generator whose frequency falls in the range of radio-frequencies and an applicator with at least one pair of electrodes designed to generate an electromagnetic field in which the item (P) to be painted is immersed.

**[0027]** This will involve very low energy requirements,

thereby limiting energy absorption and obtaining a gradual, complete drying, with the utmost safety for the whole personnel.

**[0028]** In a further aspect, the invention relates to a method of surface treatment of items as defined in claim 12.

#### Brief description of the drawings.

**[0029]** Further features and advantages of the invention will become more apparent upon reading the following detailed description of a few preferred non exclusive embodiments of a line of the present invention, which are described by way of a non limiting example with the help of the accompanying drawings in which:

FIG. 1 is a cross sectional view of certain items adapted to be processed by a line of the invention; FIG. 2 is a schematic top view of a line of the invention in a first embodiment;

FIG. 3 is a perspective view of a detail of a drying device that is part of the line of Fig. 2, in a first preferred configuration;

FIG. 4 is a perspective view of a detail of the device of Fig. 2, in a second preferred configuration;

FIG. 5 is a schematic top view of a line of the invention in a second embodiment;

FIG. 6 is a cross sectional front view of an item during a distribution step, in a line of the invention.

#### Detailed description of a preferred embodiment

**[0030]** Referring to the above figures, a line according to the invention, generally designated by numeral 1, may be used in the whole process of painting items P, such as profiles, plates or sheets designed for assembly of door and window frames. Particularly, the line 1 may be used for painting construction elements in general, not necessarily rigid and of any shape whatever. More particularly, the line 1 may be used for painting elongate items.

**[0031]** The items P may be made, for instance, of a polymeric material, such as PVC or the like, or a metal material, such as copper and aluminum, wood or similar materials, any material having a non-magnetic behavior being generally usable, to avoid any interference with the electromagnetic field being generated.

**[0032]** The term painting process shall be intended to designate the whole process of treating the item P, which may include steps of surface treatment of the item P and steps of intermediate and final conditioning thereof, including decoration steps, if any.

**[0033]** These accessory steps will not be described in detail hereinafter, and those of ordinary skill in the art will understand that they may be carried out in several different manners, as is known in the art, without any limitation to the scope of the present invention.

**[0034]** The items P may have an outer surface S with

a plurality of adjacent faces defining respective extension planes and may either have, for instance, a L or T shape, or other complex geometries, or be substantially laminar. Fig. 1 shows a few exemplary, non limiting sections of treatable items P.

**[0035]** As shown in Fig. 2, the line 1 of the invention essentially comprises at least one distributing station 2, which may be equipped with means 3 for applying at least one layer L of a product, particularly a paint or ink containing a liquid phase, on at least one part of the item P to be treated.

**[0036]** The part of the item P to be treated may coincide with a portion of its surface S or with inner portions thereof.

**[0037]** As used hereinafter, the term "product" will designate a colored or clear paint, or any other water- or solvent-based dye or pigment, with solvents being of either one- or two-component type, that will be distributed over the item to be painted.

**[0038]** The product may be distributed on a single face F, as shown in Fig. 6, or on multiple faces, not necessarily coplanar or parallel.

**[0039]** The liquid phase of the product may be water, like in the case in which the product to be applied is a water-based paint, or a solvent.

**[0040]** The line further comprises at least one drying station 4 for drying the layer L of product to at least partially remove the liquid phase from the product.

**[0041]** In accordance with a peculiar feature of the invention, the drying station 4 comprises an irradiation device 5 for irradiating the item P, e.g. the whole surface S or the only face F on which the product has been distributed, with a beam of electromagnetic waves whose frequency is selected within the field of radio-frequencies.

**[0042]** Advantageously, the irradiation device 5 may be designed to irradiate electromagnetic waves having a frequency ranging from 6 MHz to 500 MHz, preferably from 20 MHz to 50 MHz.

**[0043]** Particularly, suitable frequencies may be selected within frequency ranges admitted by international standards for civil or industrial uses, whose central values are 6,78 - 13,56 - 27,12 - 40,68 - 433,92MHz.

**[0044]** The irradiation device 5 was experimentally found to exhibit optimized operation at low frequency values, e.g. about 27,12 MHz or 40,68 MHz.

**[0045]** As schematically shown in Fig. 2, the irradiation device 5 comprises a wave generator 6 with an applicator 7 and at least one pair of electrodes 8, 9, as shown in Figs. 3 and 4, for generating and directing radio-frequency waves to a predetermined working area, as well as a voltage generator, not shown, with electrodes 8, 9 connected to its poles.

**[0046]** The electrodes 8, 9 will obviously be made of a conducting material, such as copper, aluminum or the like.

**[0047]** The drying station 5 may also comprise a working chamber 10 with an inlet 11 and an outlet 12 for the item P to be treated, which may also be coincident.

**[0048]** The working chamber 10 may have a substantially elongate, tunnel-like configuration, with a predetermined longitudinal direction of extension X, that may be either horizontal or vertical.

**[0049]** The working chamber 10 may also have support means 13 for supporting the item P, which may also have either a horizontal or a vertical extension.

**[0050]** For instance, in case of horizontal processing, the support means 13 may essentially consist of a substantially horizontal support surface for the item P.

**[0051]** The longitudinal extension of the working chamber 10 may be selected according to the length of the items P to be treated but may also be shorter than it, if dynamic drying is used. This will provide a drying station 5 with a small surface extension, whose maximum size may be also smaller than the maximum size of the treatable items P.

**[0052]** The working chamber 10 may also include forwarding means 14 and/or rotary means, the latter not shown, for forwarding and/or rotating the item P in the chamber 10 in the longitudinal direction X.

**[0053]** The forwarding means 14 may include a motorized conveyor 15, i.e. a belt or roller conveyor, preferably made of a dielectric material to prevent interference with the electromagnetic field, for feeding the item P from the inlet 11 to the outlet 12 of the chamber 10. The top surface of the conveyor 15 will also define a support surface 13 for the item P.

**[0054]** The item P may be advanced continuously, at a predetermined speed, or with a step-by-step motion, with predetermined stop times, also selected according to the relative throughput of the distribution station 2 and/or the capacity of any intermediate storage stations, not shown.

**[0055]** The rotary means may promote controlled rotation of the item P being processed about a longitudinal axis for optimal drying of the product layer L when the latter is distributed over two or more non coplanar faces, e.g. over the whole side surface S of a profile P for door and window frames.

**[0056]** The electrodes 8, 9 located in the chamber 10, may either be stationary or, in an alternative configuration, not shown, be associated with moving means which are adapted to move them in the longitudinal direction X with a predetermined translation speed.

**[0057]** The electrodes 8, 9 of the pair may be configured to orient the electromagnetic field at a limited predetermined area of the chamber 10, which corresponds to the area designed for the passage of the surface S covered with the product layer L.

**[0058]** For instance, the electrodes 8, 9 may be located in parallel arrangement on a common horizontal plane n which is located above the support surface 13 that supports the profile P to concentrate the field into a predetermined space, and is delimited at the bottom by the support surface 13.

**[0059]** This configuration, as schematically shown in Fig. 3, is preferable when drying a profile P, possibly a

sheet, which has been submitted to surface treatment on a single substantially horizontal face F.

**[0060]** In an alternative embodiment, as schematically shown in Fig. 4, the electrodes may be located in such arrangement as to generate a substantially uniform electromagnetic field in the chamber 10.

**[0061]** For instance, the electrodes 8, 9 may substantially have a plate-like shape and be arranged on respective parallel planes n', n'', with either horizontal or vertical orientation, i.e. either parallel or transverse to the support plane 13.

**[0062]** The plate-like electrodes 8, 9 may be located at a predetermined fixed or adjustable transverse distance d, selected according to the shape of the item P to be treated.

**[0063]** The possibility of adjusting the distance d between the electrodes 8, 9 will provide the apparent advantage of changing the strength of the field as a function of the particular extension plane of the faces having the product to be dried thereon.

**[0064]** This will prevent overheating of those areas of the side surface S of the profile P that are located in stronger field regions, thereby ensuring proper drying of the whole product layer L.

**[0065]** Nevertheless, further embodiments may be provided for the electrodes 8, 9, not shown, which may also be annular or semiannular, and arranged in accordance with the teachings of the Italian application VI2005A000179, if the item P to be dried is treated with the product on two or more non coplanar sides, or may be suitably shaped to model the field by concentrating into one or more predetermined areas.

**[0066]** There may be also multiple pairs of electrodes 8, 9, with one or more of such pairs having an electrode in common.

**[0067]** In operation, the profile P being processed, which comes from the distribution station 2, directly or through an additional processing step, will move through the working chamber 10 where it will undergo a controlled heating step, for facilitating total or partial evaporation of the liquid phase of the distributed product.

**[0068]** The heating step will be caused by oscillation of the molecules of the product liquid phase, either water or solvent, about their equilibrium points. Such oscillation will be induced by the electromagnetic field that develops between the electrodes 8, 9, through which the product P passes, during operation, i.e. when the irradiation device 5 generates an electric voltage.

**[0069]** Each electrode 8, 9 generates an electromagnetic field around it which, when properly directed, is applied to the layer L of the processed product to heat it.

**[0070]** Furthermore, radio waves will not interact with the material of the item P, which is dielectric or non magnetic and thus will be subjected to less or no heating, caused by conduction only, preventing any possible deformation.

**[0071]** The line 1 may also comprise transfer means 16 for transferring the item P under treatment along a

predetermined path, suitable to move it from the distribution station 2 to the drying station 4.

**[0072]** If the item P has to be treated on part of its surface S only, it may be disposed horizontally and the transfer means 16 may include a belt, roller or the like conveyor 17, which may be also connected to or coincide at least partially with the conveyor 15 of the working chamber 10.

**[0073]** If the item P is to be vertically oriented, because the surface S to be treated extends over more than 180°, the transfer means 16 may include a guide 18, for example and without limitation a guide rail or a chain conveyor, defining at least part of the path, as shown in Fig. 5.

**[0074]** The guide 18 will move along the path at a first speed that may be constant or variable according to the particular processing or path section in which the item P is located during treatment.

**[0075]** The support means 13 for the item P may include a plurality of gripping members, not shown, adapted for coupling with an end of respective items P, such as by engagement in a hole formed in such end.

**[0076]** The gripping members may be configured as hooks, clips or have any other configuration adapted to hold the item P as it is fed along the path.

**[0077]** The transfer path, as shown by broken lines in Fig. 5, may have a first section T', located upstream from the distribution station 2, which lifts up through progressively increasing levels to gradually move the item P from a horizontal position to a vertical position, and a second section T'', passing across the distribution station 2 and the drying station 4 at a fixed level, in which the item P is held in a substantially vertical position.

**[0078]** The transfer path may end with a further third section T''' which gradually lowers through progressively decreasing levels to move the item P back to a horizontal position, or anyway at a level low enough for an operator to pick it up.

**[0079]** The transfer path may extend from a station 19 designed for initial storage of untreated items P to a station 20 for final storage of treated items P and may also be closed.

**[0080]** Further workstations may be also provided along the path, such as a pre-treatment station, not shown and known per se, for cleaning the surface S of the item P and preparing it for the next surface distribution step, and one or more additional drying stations of known type, schematically shown and designated by numeral 21 in Fig. 2.

**[0081]** Even with the vertical arrangement, rotary means may be provided, in association with the transfer means 16.

**[0082]** In a preferred configuration, the transfer means 16 will include a plurality of pinions or toothed wheels, not shown, which are designed to slide on the guide 18 and will have corresponding gripping members associated therewith.

**[0083]** The rotary means will in turn include a closed loop chain designed to rotate about a first vertical axis,

at a second predetermined speed. Alternatively, a rack or other similar driving member adapted to engage the toothed wheel to define a meshing gear.

**[0084]** The chain or rack will be disposed on a horizontal plane adjoined to a portion of the second section T'' of the path located in the distribution station 2. Particularly, the operating section of the chain will be substantially parallel to this portion of the second section T''.

**[0085]** The chain or equivalent member will be designed to selectively engage the toothed wheel to rotate it about a second vertical axis at a third predetermined speed.

**[0086]** Advantageously, the line will also include means for controlling and synchronizing the first and second predetermined speeds of the guide 18 and chain respectively.

**[0087]** These further means will be adapted to mutually synchronize the first and second speeds, i.e. to define a predetermined ratio therebetween to accordingly adjust the third rotation speed of the toothed wheel and hence the item P.

**[0088]** Thus, the item P to be painted may be either rotated or not and if it rotates, it may be rotated continuously or discontinuously.

**[0089]** In short, if the item P is to be fed without being rotated, for instance because one part only of the surface S has to be painted, the operating section of the chain and the guide 18 will be displaced at the same speed. However, by setting different values for the first and second speeds, different rotation speeds may be obtained for the toothed wheel and thus for the item P. Also, the first and second speeds may be adjusted for continuous or discontinuous rotation of the toothed wheel and hence the corresponding item P being painted.

**[0090]** The means 3 for applying the product in the distribution station 2 may operate by spraying, roller coating, dipping, cataphoresis or the like, for surface distribution of the product.

**[0091]** If roller coating means 3 are used, a product spreading roller 22 may be provided, possibly associated with a product collecting roller 23 for collecting the liquid phase product from a tank, which is adapted to contact one or more adjacent faces F of the item P for painting them.

**[0092]** Two or more offset and sequential painting stations 2, 2' are provided in the path along which the item P is transferred, which have corresponding distribution and collection rollers 22, 23 if non adjacent faces are to be painted.,

**[0093]** Each painting station 2, 2' may be followed by a corresponding drying station 4, 4', one of which may also not include the radio-frequency irradiation device 5.

**[0094]** For spray painting, not shown, one or more distribution nozzles may be provided, in aligned arrangement along the transfer path and possibly susceptible of oscillating in space and/or translating towards/away from the surface S of the item P.

**[0095]** The line 1 may also include further distribution

stations 24 for distributing products such as glues, adhesives or protective varnishes required for finishing the item P.

**[0096]** A decoration station 25 for decorating the surface S of the item P, e.g. as disclosed in Italian Application M02003A00022 or in Italian Application M02005A000167, may be located downstream from the drying station 4 or any other station of the line 1.

**[0097]** Furthermore, even if a single distribution or painting station 2 is provided, one or more different conventional drying stations may be provided along the path of the items P, i.e. not using waves, such as hot air drying stations.

**[0098]** These further stations may be also in fluid connection to each other for heat recovery from one of them and transfer of preheated air to the others, thereby achieving considerable power savings.

**[0099]** Nevertheless, it shall be understood that the painting line 1 may be designed according to any prior art mode, and may include some of the stations described herein or additional processing stations not described herein, without limitation to the scope of the present invention.

**[0100]** In a further aspect, the invention provides a method for painting elongate items, comprising the provision of an item P having a side surface S, and positioning thereof in a predetermined feeding plane for exposing at least part of the outer surface S.

**[0101]** Then, a step is provided for surface distribution of a liquid phase-containing product over at least part of the exposed surface S to apply one product layer L thereon.

**[0102]** The treated item P may thus be moved along a predetermined feeding path and then subjected to a drying step to at least partially remove the liquid phase of the distributed product.

**[0103]** According to a peculiar feature of the invention, the drying step is carried out by irradiating the surface S over which the product is distributed with a beam of electromagnetic waves whose frequency is selected from the range of radio-frequencies.

**[0104]** The irradiation frequencies may be selected from the values required by international standards for civil and industrial uses, as mentioned above.

**[0105]** The irradiation drying step includes a first step in which a radio wave beam is generated and a later step in which the beam is directed to a predetermined working area.

**[0106]** During the drying step, the item P may be fed through the irradiated working area at a predetermined feeding speed.

**[0107]** Alternatively, the drying step may be carried out with the item P placed on a stationary support surface 13 in a substantially horizontal position for a predetermined drying time, which is determined as a function of the particular shape of the item P and/or the strength of the electromagnetic field.

**[0108]** The drying step may be carried out with the item

P in a substantially vertical position, and lifted from the ground, with the item P either still or moving continuous or discontinuously.

**[0109]** In a possible alternative embodiment, the drying step may include forwarding of the electromagnetic field in a direction substantially parallel to the support surface 13.

**[0110]** The electromagnetic field may be forwarded by moving the electrodes 8, 9 in the feeding direction.

**[0111]** The distribution step may consist in uniform coating of a layer L of paint or another dye or transparent material over one or more faces F of the item P.

**[0112]** The product will be preferably distributed in one or more layers L of uniform micrometric thickness, e.g. ranging from 50 to 200 micron, preferably about 150 micron.

**[0113]** The above disclosure clearly shows that the invention fulfills the intended objects and particularly meets the requirement of providing a line and a method for painting elongate items, characterized by very low energy absorption, short drying times and high safety.

**[0114]** The use of radio-frequency waves will afford very short drying times, of the order of a few minutes, unlike the traditional techniques that require one hour or even more.

**[0115]** Very low energy absorptions will be required, possibly a few Amperes, which decrease as the amount of residual liquid phase in the product layer decreases, to substantially a zero value when drying is completed.

**[0116]** The use of radio waves with the above frequency values will avoid the need for particular shielding arrangements, while ensuring safety of the system even when no liquid phase remains in the product to be dried.

**[0117]** The behavior of radio waves, unlike microwaves, is also unaffected by the particular product in use, and will only be affected by its liquid phase content.

**[0118]** Finally, the heating effect caused by radio-frequency waves will propagate from the innermost layers outwards, and prevent the outer layers from hardening before evaporation of the liquid phase of the innermost layers.

**[0119]** The line and method of the invention are susceptible to a number of changes and variants, within the inventive concept disclosed in the annexed claims. All the details thereof may be replaced by other technically equivalent parts, and the materials may vary depending on different needs, without departure from the scope of the invention.

**[0120]** While the line and method have been described with particular reference to the accompanying figures, the numerals referred to in the disclosure and claims are only used for the sake of a better intelligibility of the invention and shall not be intended to limit the claimed scope in any manner.

## Claims

1. A line for painting items, such as profilates or similar items, comprising:
- at least one distributing station (2) for distributing one or more layers (L) of a paint comprising a liquid phase on at least part of the item (P) to be painted;
  - at least one drying station (4) for drying said one or more product layers (L) for at least partially eliminating the liquid phase, said drying station (4) comprising an irradiating device (5) for irradiating at least part of the item (P) to be painted with a beam of electromagnetic waves having predetermined frequency;
- characterized in that** said irradiating device (5) comprises an electromagnetic waves generator (6) for generating electromagnetic waves having frequency comprised in the field of the radiofrequencies and an applicator (7) with at least one pair of electrodes (8, 9) designed to generate an electromagnetic field wherein the item (P) to be painted is immersed.
2. Line as claimed in claim 1, **characterized in that** said drying station (4) comprises a chamber (10) with an inlet and an outlet for the treated item (P), said at least one pair of electrodes (8, 9) being placed into said chamber (10).
3. Line as claimed in claim 2, **characterized in that** the electrodes (8, 9) of said at least one pair are shaped for orientating said electromagnetic field toward a predetermined limited area of said chamber (10) designed for the passage of the part of the item (P) where the product is distributed on.
4. Line as claimed in claim 2 or 3, **characterized in that** said at least one pair of electrodes (8, 9) is shaped for generating a substantially uniform electromagnetic field into said chamber (10).
5. Line as claimed in any preceding claims, **characterized in that** said drying station (4) comprises forwarding means (14) and/or rotating means of the items (P) to be dried into said chamber (10).
6. Line as claimed in any preceding claims, **characterized by** comprising means (16) for transferring the item (P) to be painted along a predetermined feeding path through said distributing station (2) and said drying station (4).
7. Line as claimed in claim 6, **characterized in that** said transferring means (16) comprise a guide (18) defining at least partially said feeding path and at least one clamping member slidable along said guide (18) with a first predetermined velocity for gradually carrying an item (P) from a horizontal position to a vertical position.
8. Line as claimed in claim 7, **characterized in that** said transferring means (16) comprise at least one toothed wheel slidable along said guide (18) and associable to said at least one clamping member, said rotation means comprising a transmission member movable with a second predetermined velocity along a predetermined direction at least partially parallel to said feeding path and designed to selectively engage said at least one toothed wheel to bring it in rotation about a rotation axis with a third predetermined velocity.
9. Line as claimed in claim 8, **characterized by** comprising means for controlling and synchronizing said first velocity and said second velocity designed to mutually synchronize said velocities and regulate said third velocity.
10. Line as claimed in any of the preceding claims, **characterized by** comprising moving means for moving forward said pair of electrodes (8, 9) along a working direction with a predetermined forward speed.
11. Line as claimed in any of the preceding claims, **characterized in that** said generator (6) is configured for generating electromagnetic waves having frequency comprised between 6MHz and 500MHz and preferably between 20MHz and 50MHz.
12. A method for painting items, such as profilated or similar items, comprising the following steps:
- a) providing an item (P) to be painted in such a way to expose at least one part thereof;
  - b) distributing a paint or pigment having a liquid phase on said at least one exposed part of the item (P) to be painted;
  - c) drying the liquid phase of said paint or pigment distributed on the item (P);
- characterized in that** said drying step is carried out by irradiating said at least one part of the item (P) to be painted with a beam of electromagnetic waves having frequency comprised in the field of the radiofrequencies.
13. Method as claimed in claim 12, **characterized in that** said drying step comprises a step of forwarding the item (P) through said beam with a predetermined forwarding speed.
14. Method as claimed in claim 12 or 13, **characterized in that** said drying step is carried out with said item

(P) placed on a movable or stationary supporting plane (13) in a substantially horizontal position.

15. Method as claimed in any of the preceding claims, **characterized in that** said drying step is carried out with said item (P) in a substantially vertical position raised on the ground.

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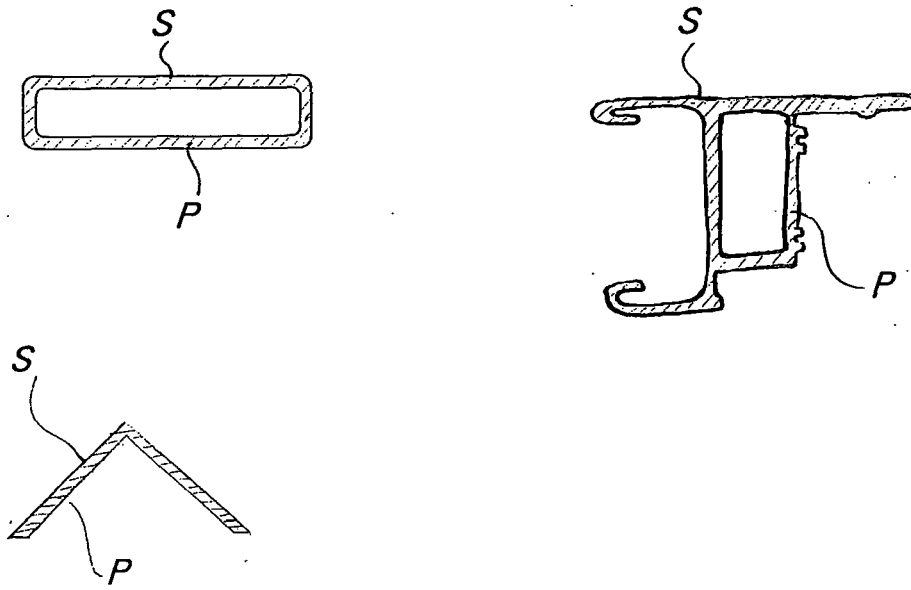


FIG. 1

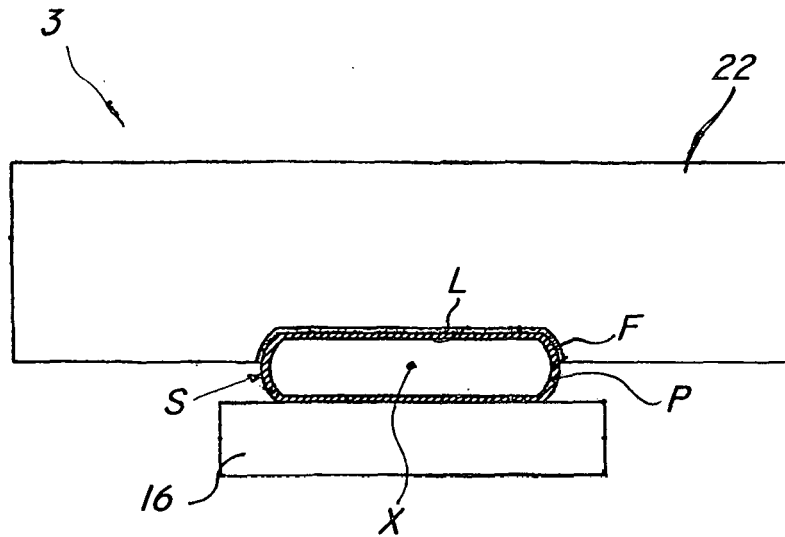


FIG. 6

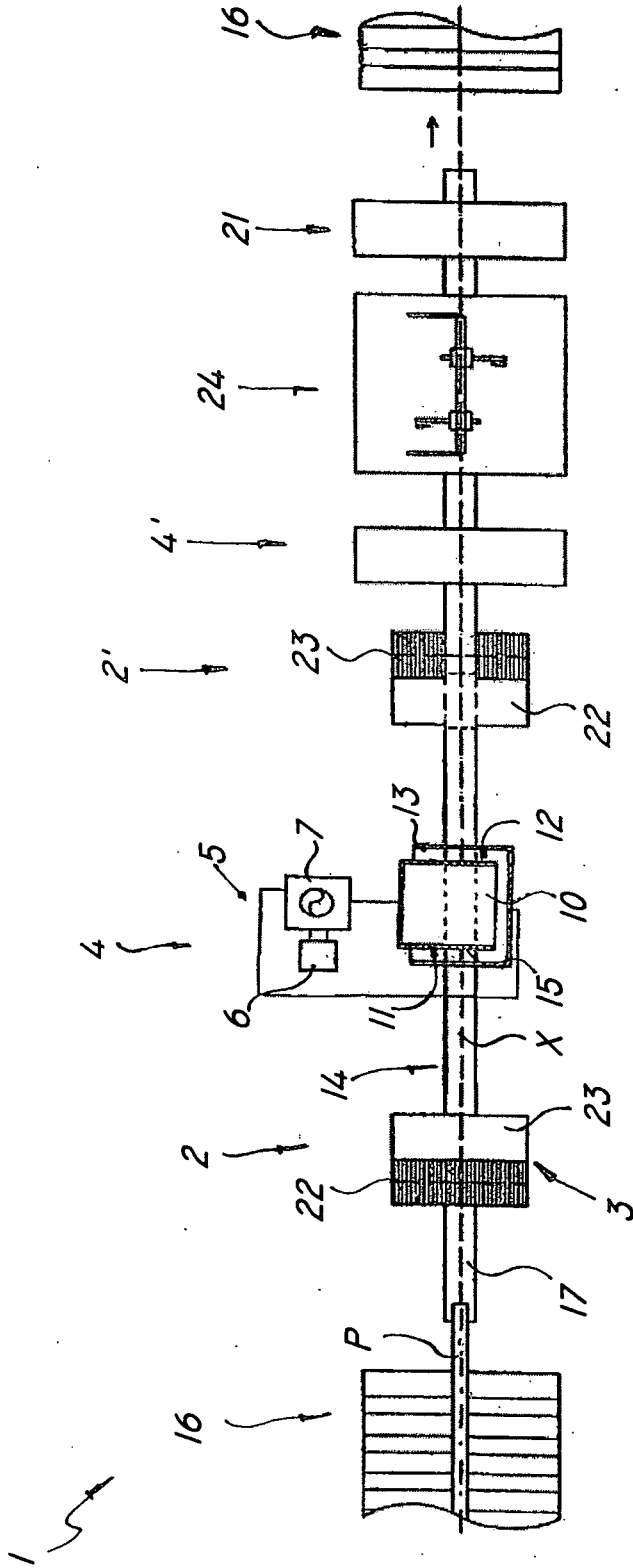


FIG. 2

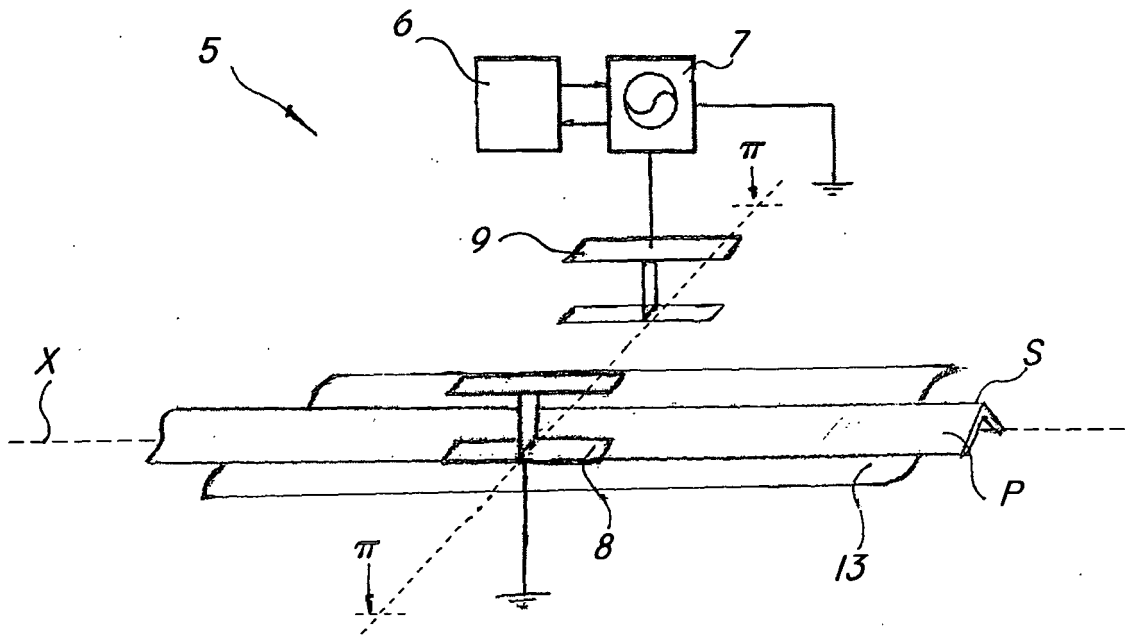


FIG. 3

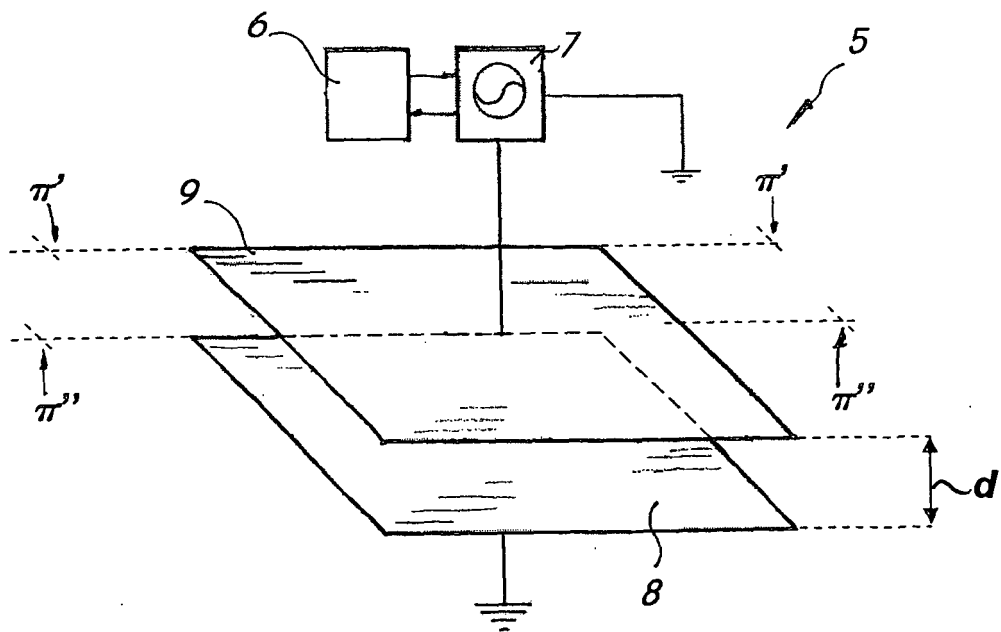


FIG. 4

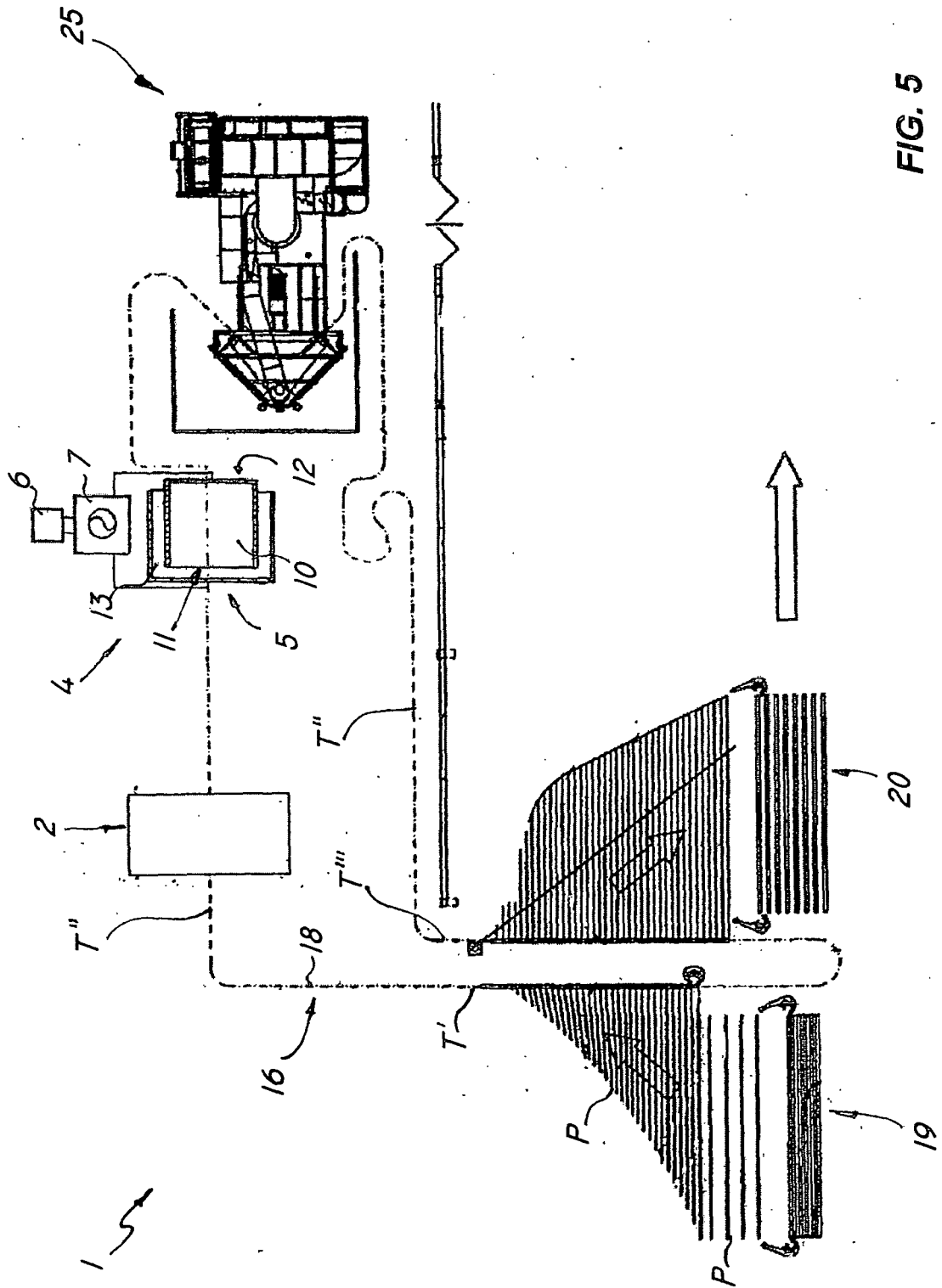


FIG. 5



EUROPEAN SEARCH REPORT

Application Number  
EP 10 00 1393

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 196 20 730 A1 (GUITIS MIKHAIL PROF DR DR [DE]; GRZESKOWIAK RITA [DE]; RUPP KARL HEINZ) 27 November 1997 (1997-11-27)	12	INV. F26B3/347 F26B15/12
Y	* Title * * column 1, line 6 - line 10 * * column 1, line 42 - line 45 * * column 1, line 54 - line 61 * -----	1-7,11	
Y	DE 38 20 265 A1 (SIEMENS AG [DE]) 21 December 1989 (1989-12-21) * figure 1 * * column 1, line 3 - line 5 * * column 1, line 20 - line 24 * * column 1, line 55 - column 2, line 7 * -----	1-7,11, 13,14	
Y	US 4 490 922 A (GORODETSKY ALEXANDR A [SU] ET AL) 1 January 1985 (1985-01-01) * figures 1-4 * * column 1, line 7 - line 11 * * column 2, line 43 - column 3, line 50 * * column 5, line 1 - line 58 * * column 9, line 8 - line 37 * * column 14, line 50 - column 15, line 21 * * * column 15, line 44 - line 51 * -----	7,15	
X	WO 2008/055926 A (AKZO NOBEL COATINGS INT BV [NL]; KITTLE KEVIN JEFFREY [GB]; SHEWRING N) 15 May 2008 (2008-05-15)	12	TECHNICAL FIELDS SEARCHED (IPC)  F26B B05D
Y	* page 1, line 7 - line 14 * * page 3, line 26 - page 4, line 1 * * page 4, line 13 - line 20 * * page 5, line 30 - page 6, line 4 * * page 8, line 29 - page 9, line 10 * * page 11, lines 26,27 * * page 14, line 13 - line 17 * ----- -/--	13-15	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 June 2010	Examiner Hauck, Gunther
CATEGORY OF CITED DOCUMENTS 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		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 ..... & : member of the same patent family, corresponding document	

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EPO FORM 1503 03/02 (P04C01)



EUROPEAN SEARCH REPORT

Application Number  
EP 10 00 1393

DOCUMENTS CONSIDERED TO BE RELEVANT				
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)	
A	US 4 050 888 A (PFISTER LEWIS ET AL) 27 September 1977 (1977-09-27) * figures 1,2,4 * * column 1, line 6 - line 11 * * column 2, line 48 - column 3, line 15 * * column 3, line 41 - column 4, line 31 * * column 4, line 56 - column 6, line 5 * -----	8,9		
A	EP 1 867 941 A (B LUX IMPIANTI ELETTRICI SNC [IT]) 19 December 2007 (2007-12-19) * figure 2 * * paragraphs [0001], [0002], [0008] - [0013], [0017], [0023] * -----	10		
A	US 5 323 544 A (OSGOOD JOHN H [US]) 28 June 1994 (1994-06-28) * figures 1,2,4 * * column 1, lines 6,7 * * column 3, line 13 - line 20 * * column 3, line 53 - line 62 * * column 4, line 7 - line 26 * * column 5, line 44 - line 50 * * column 6, line 6 - line 9 * * column 6, line 50 - line 53 * * column 6, line 62 - column 7, line 11 * -----	1		TECHNICAL FIELDS SEARCHED (IPC)
A	WO 02/05597 A (HEATWAVE DRYING SYSTEMS LTD [CA]) 17 January 2002 (2002-01-17) * page 1, line 3 - line 5 * * page 3, line 5 - line 6 * * page 8, line 3 - line 12 * * figure 1 * -----	4		
A	DE 20 2007 007421 U1 (GRZESKOWIAK HANS [DE]; GRZESKOWIAK PHILIP [DE]; GRZESKOWIAK ALEXANDER) 2 August 2007 (2007-08-02) * the whole document * -----	13,14		
		-/--		
The present search report has been drawn up for all claims				
Place of search <b>The Hague</b>		Date of completion of the search <b>7 June 2010</b>	Examiner <b>Hauck, Gunther</b>	
CATEGORY OF CITED DOCUMENTS 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		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 ..... & : member of the same patent family, corresponding document		

EPO FORM 1503 03.02 (P04C01)



EUROPEAN SEARCH REPORT

Application Number  
EP 10 00 1393

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 92/19082 A (IMATRAN VOIMA OY [FI]) 29 October 1992 (1992-10-29) * page 1, line 5 - line 17 * * page 2, line 21 - line 23 * * page 5, line 21 - page 7, line 15 * * figure 1 *	1	
A	----- US 3 935 647 A (ASCHBERGER ANTON A) 3 February 1976 (1976-02-03) * the whole document * -----	8,9	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		7 June 2010	Hauck, Gunther
CATEGORY OF CITED DOCUMENTS 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 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 & : member of the same patent family, corresponding document			

2  
EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

EP 10 00 1393

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  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

07-06-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19620730 A1	27-11-1997	NONE	
DE 3820265 A1	21-12-1989	NONE	
US 4490922 A	01-01-1985	NONE	
WO 2008055926 A	15-05-2008	NONE	
US 4050888 A	27-09-1977	NONE	
EP 1867941 A	19-12-2007	NONE	
US 5323544 A	28-06-1994	AU 6088694 A WO 9417351 A1	15-08-1994 04-08-1994
WO 0205597 A	17-01-2002	AU 7038901 A BR 0112249 A CA 2414253 A1 CN 1452852 A EP 1302093 A1 JP 2004502292 T MX PA03000085 A NO 20030053 A NZ 523467 A US 2002003141 A1 US 2003006867 A1 ZA 200300102 A	21-01-2002 07-10-2003 17-01-2002 29-10-2003 16-04-2003 22-01-2004 13-09-2004 07-02-2003 30-07-2004 10-01-2002 09-01-2003 08-10-2003
DE 202007007421 U1	02-08-2007	NONE	
WO 9219082 A	29-10-1992	AT 119733 T CA 2085227 A1 DE 69201617 D1 DE 69201617 T2 EP 0533889 A1 FI 911816 A JP 5508052 T US 5300749 A	15-03-1995 16-10-1992 13-04-1995 26-10-1995 31-03-1993 14-08-1992 11-11-1993 05-04-1994
US 3935647 A	03-02-1976	BR 7500535 A CA 1045813 A1 GB 1496950 A JP 1033521 C JP 51012456 A JP 55021955 B	06-07-1976 09-01-1979 05-01-1978 20-02-1981 31-01-1976 13-06-1980

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- IT M02005000167 A [0012]
- IT VI20050179 A [0065]
- IT M0200300022 A [0096]
- IT M020050167 A [0096]