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(54) **Electronically controlled system, with low energetic impact, for the contemporaneous drying and modelling of the hair, and related scheme for the construction, and ways of use**

Elektronisch gesteuertes System mit geringer energetischer Wirkung für das gleichzeitige Trocknen und Formen des Haars und dazugehöriges Bauschema und Benutzungsarten

Système commandé électroniquement, à faible impact énergétique, pour le séchage contemporain et le modelage des cheveux, et plan en relation avec la construction, et moyens d'utilisation

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(56) References cited:
DE-A1- 3 319 403 FR-A- 2 215 183
GB-A- 2 082 058 US-A- 3 057 364
US-A- 3 698 402 US-A- 4 376 441
US-A- 4 676 260 US-A- 5 640 781
US-A- 6 052 915 US-A1- 2003 234 100

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Description

1- DESCRIPTION OF THE STATE OF THE ART

[0001] 1.1- FOREGROUND- The present invention, developed in cooperation and following the suggestions of expert hair fashion stylists, is related to a system for the production of air, necessary for the contemporaneous operation of drying and modelling of the hair. Precisely, the invention here described is not only referred to a single device, but also to a complete system arranged in a way to allow the application, the modular extension and the arrangement, to the various professional and non-professional necessities.

1.2- THE EXISTING PRODUCTS- At the state of the art, some kinds of devices and plants have been known for a long time, and the most known are inspired to the traditional hair-dryer conception 1 (fig. 1), based on the generation of blown air with an electric motor 2 (fig. 1) and a fan 3 (fig. 1); blown air that is then heated by means of an electric heater 4 (fig. 1), and directed in proximity of the hair 5 (fig. 1) at a certain distance from them, through a duct 6 (fig. 1). A point to take note of: the principle and the devices for drying hair for domestic and for professional use are substantially the same.

1.3- THE TREND OF THE TRADITIONAL MARKET- A great improvement of the performances of hairdryers has been reached thanks to the technological development, and thanks to the introduction of electronics; at the same time, a very high level of installed power has been reached (some versions reach 1500 W), and consequently the use of these devices at home or in professional sites, without specific power supply contract, became impossible, especially if contemporaneous with other traditional electrical tools. Moreover, a not completely logic path has been followed during the past technological development; in fact, the technological evolution has attempted a problematical equilibrium among the quantity of hot air, the dimensions, the lightness and the noise emissions of the hairdryers. Moreover, what came out during the development of this project, was the fact that the suggestions coming from the professional area were not seriously taken into account, and not inserted into the products. Probably for these reasons, this kind of development has now reached the top of its maturity.

1.4- NEGATIVE POINTS OF THE EXISTING PRODUCTS- The following human and technological negative points, typical of the mass market products, are generated:

1.4.1- FORMS OF POLLUTION AND PROFESSIONAL DISEASES- Powerful and heavy motors have been installed inside the most powerful hairdryers; consequently, an increase of fatigue for the professional operator has been generated, and professional diseases in the long time have appeared (i.e.: in order of importance, arthritic shoulder diseases, sinew diseases, wrist diseases). At the same time, attention about the general human impact of the new technologies has grown up for social reasons among professionals and customers; and consequently, the attention for their negative aspects (i.e.: the acoustic and electromagnetic pollutions) that in the case of the hairdryers could reach dangerous values, has grown up too. In fact, the noise generated by the electric motor and by the fan (that reach the 20000 - 30000 rpm), make it difficult for a customer to communicate with people around; this because the noise tends to isolate the persons, and reduces possibility of dialogue. At the same time, as it happened for example in the case of the first generation of portable phones, cases of diseases related with the high electromagnetic emissions appeared.

1.4.2- POOR LIFETIME OF THE COMPONENTS- For economic reason, the kind of electric motors used in the traditional hair dryers, belongs to the "with-brushes" technology 7 (fig. 1); moreover, due to the required high performances, problems of rapid consumption of these components frequently appear. Consequently, the average lifetime of a traditional professional hairdryer (costs: from 35 to 80 euros) is reduced to 6 /12 months.

1.4.3- DAMAGES TO THE STRUCTURE OF THE HAIR- In a traditional hairdryer, the movement of an important quantity of air (higher than 100 litres per min), with exit temperature higher than 100 °C (very close to the human acceptable limit) is created in consequence of the high level of electric power installed; these values, that does not seem suitable for the treatment of such delicate part of the body close to the brain, create heavy heat dissipation on the human body, and represent a waste of power. Moreover, the fact that the hair drying and modelling operation, at the moment, only depends on the professional skills of the hairdresser must be considered; and this consequently means that important damages, might be easily produced by an inexperienced hairdresser, as consequence of the excess of installed power mentioned above.

1.4.4- "COLD JET" TREATMENT- From the technical and professional point of view we have to take into account that the products on the market, at the moment do not have a good and efficient "Cold jet" device; this device, that is of secondary importance for the non-professional use, becomes very important in case of professional destination. In fact, also in the professional devices, at the moment the "Cold jet" is simply obtained by the switching-off of the electric heater 4 (fig. 1). Unfortunately, that solution does not seem efficient both under the technological and under the hair treatment points of view; in fact, the "Cold jet" should guarantee the long duration of the shape of the hair heated and modelled with brushes and combs. Practically, the "Cold jet", in the same way has happens with treatment technology of metals, would give a final "temper effect" to the hair, following an adequate "curve of temper treatment"

8 (fig. 2); treatment that obviously increases its effect, if rapidly completed in few seconds after the end of the heating operation. Consequently, the traditional hairdryers cannot give this result, because a too slow decrease of the air temperature inside the hair dryer duct is performed with this kind of operation. In fact, a longer time is required to slow down the air flowing through the hot electric heater 4 (fig. 1) from the 100 °C to the ambient temperature. Moreover, the ideal "Cold jet" air temperature to perform the "temper" of hair correctly should be lower compared to the ambient temperature, and this has been achieved and demonstrated with tests. Again the traditional technology, cannot give this kind of results for the reasons mentioned above.

1.5- TENDENCIES OF THE INNOVATION: CENTRALIZED PLANTS- In order to solve those cited problems, some proposals have been presented; but at the moment, probably for reasons of market resistance, or for economic reasons, or for reliability reasons, or for reasons connected with the difficulties of installation in the shops, these proposals have not seriously reached the goal. In the so called "Centralized hair dryer plants", the air generator is installed out of the hairdressers' shops (for example in a room aside), both for the noise and for dimensional reasons, and is connected with the hairdresser's shop with specific pipelines. In this case the final part 9 (fig. 3) of the duct, only contains the electric heater 4 (fig. 3) and the operating switches for the adjustment of speed and air temperature; the mechanical noise in the shop, generated by the electric motor 2 (fig. 3) and by the fan 3 (fig. 3), are in this way definitely suppressed.

1.5.1- THE AIRPLUS - ATOTEC SYSTEM- This system is proposed in two main versions; the first one produced by Atotec (Turin), 10 (fig. 3) - (Turin 1995, patent application no. TO 1995A000919, ref. 5 of the list). In this version (selling price: about 5000 euros), the air generator has an important size (installed power: around 10 kW - dimensions: about 0,5 cubic metres), and it is composed by one motor and one fan (placed inside a silenced box for air cooling recirculation), and can serve up to 7 different job positions.

1.5.2- THE HAIR-TECH SYSTEM- In the case of the system produced by Hair-tech s.r.l. - Trevignano (TV), 11 (fig. 4) - (patent application no. TV 2002U000007, ref. 12 of the list, that only protects the swivel joint for the air distribution into the final part of the piping), the selling price is around 700 euros, and one single motor and one single fan serve the correspondent job position; moreover, the power (600 W) adsorbed by each electrical heaters 4 (fig. 4) must be added. Consequently, the power adsorbed by each job position varies from 1800 W to 2000 W; this means that the whole system requires a total power requirement of 8 kW for a traditional hairdresser's shop with 4 job positions, which is very high. Moreover, other investments for the installation of the piping inside the building must be added.

1.5.3- DIFFICULTIES IN MANAGING THE VARIATION OF THE AIRFLOW AND OF THE AIR PRESSURE- The system described above gives the advantage of not stopping the whole activity of the entire hairdresser's shop in case of failures; at the same time, simplicity and equilibrium are the result under the point of view of the electronic management of the parameters by the system control. And this because the airflow and the air pressure sent toward each job position, are not influenced by the switching on or off of the other job positions. What follows is that the insertion into the system of complicated software and hardware electronic controls for the continuous corrections of the motor speed are not required. In any case, possible corrections would not arrive to the job position with the needed precision, due to the length of the piping and to the variability of the volume of the hot air, and would create delays, confusions and rejection of the new technologies.

1.5.5- DIFFICULTIES OF INSTALLATION INSIDE THE HAIRDRESSERS' SHOPS- It's important to notice that, in most of the hairdressers' shops, room for a big air generator (or for 3 or 4 little groups) is not always easy to be found; moreover, residual noises (over 60 Db), and vibrations as a consequence of the high speed (more than 20000 rpm) are emitted by this kind of air generators. At the same time, room for an adequate air-cooling exchange must be guaranteed. Please note that the "Centralized power supply" concept, has a high innovative meaning if applied in the industrial field, but not necessarily if applied in the hairdressers' shops; and this because the hairdressers' shops are in general placed in traditional buildings, and in areas with high density of inhabitants. In these situations, aesthetic difficulties, or noises for the neighbours often appear; therefore, the collocation of a "centralized power supply" out of these buildings became almost impossible.

1.6- A NEW APPROACH: THE CONTEMPORANEOUS DRYING AND MODELLING OPERATION- With the aim to solve the problems connected with the weight of the hairdryers, and to reduce the waste of energy, a device 12 (fig. 5) with two innovative characteristics was invented in the sixties by an important Italian hairdresser, Simeone Filippi; as happens for the Atotec and for the Hair-tech versions, at present the motor 2 and the fan 3 (fig. 5) were placed far from the job position, and only the electric heater was installed in the diffuser 9 (fig. 5). The device was placed on a support 13 (fig. 5) near the job position, or hanged-up to the hairdresser's shoulder 14 (fig. 5), or hidden behind a wall. Moreover, series of interchangeable tools 16 (fig. 6) with inner air passages 17 (fig. 6) (brushes etc.) were arranged; in this way, it is possible to perform the modelling of the hair in a more precise way. In addition, thanks to the possibility of spreading the air close to the hair roots, air at low temperature, at low speed and in low quantity was required with reference to the invention. The device was well accepted by the hairdressers in those years, but, probably for the distance between

its innovative concept and the current technology, the invention did not reach the expected success.

1.7- ROWENTA, BABYLISS: RECOVERY OF THE TECHNOLOGY OF 40 YEARS AGO-The value of Mr. Simone Filippi ideas, i.e.: the production of interchangeable tools 16 (fig. 6) with inner hot air passages 17 (fig. 6), has been indirectly and recently confirmed by some important producers, as BABYLISS and ROWENTA; in fact, 40 years later, by using the most recent miniaturization technologies, little devices with that characteristic (with micro-motor, micro-fan and micro-electric heater inside the handle) were produced. Devices in which special empty brushes 16 (fig. 7) with inner air ducts 17 (fig. 7) are connected to the end; in this way, the roots of hair are directly reached by hot air, with all the economic and handling advantages described above. Due to their tiny dimensions, these devices seems to have been created for finishing activities, because their appreciated performances look not appropriate for a continuous and professional use; at the same time, at the moment, an important diffusion on the market doesn't result.

1.8- THE EXISTING PATENTS- The patents and the patent applications found during the search activity of existing patents, are listed below with a synthetic comment:

REF.	PATENT APPLIC. NO	PATENT NO.	TITLE
1	MI 1989A019995	00221980	Suspended arm... Telescopic turning device...
2	MI 1989A020709	----	Hairdryer... A handle for air diffusion, with multiple exits...
3	BG 1993A000019	01268542	Electronic hairdryer... Automatic switch that recognizes the presence of the hand, switches for variation...
4	BG 1995A000033	01281485	Electronic hairdryer... Automatic switch that recognizes the presence of the hand, switches for variation...
5	TO 1995A000919	----	Centralized system... System for drying, with air generator connected to a plurality of job positions...
6	FG 1996A000015	----	Brushes for hair drying... Single heated brush, without fan, for refine operations...
7	MI 1999A000443	01308646	Ancillary equipment... Kind of diffuser to be installed on the terminal of the hair dryer
8	TV 1993A000120	0001266103	Structure for drying... Device for contemporaneous hair drying and water aspiration....
9	CO 1989A007216	---	Perfection apparatus... Scheme of various kind of innovative hair dryer
10	RE 1999U000050	0000248283	Device for hairdryer... Terminal of hair dryer air diffuser with sliding part....
11	TV 1992U000024	0000229235	Structure of device... Hairdryer with automatic switch-off in case of prolonged not use...
12	TV 2002U000007	----	Handle... Swivel joint for hairdryer air distribution in a centralized system....

No contrasts appear with reference to the idea here described and claimed; in fact, all of the existing patents are referred to centralized systems and ducts for air distribution (points 5, 12) already deeply examined, or to devices for suspension of hairdryers (point 1), or to different ways for closing and regulate the exit of the air, or to diffusers with double ducts, or to a little heated brush without fan, or to various schemes for the electronic control of the device.

1.9- CONCLUSIONS- The following conclusions can be resumed:

- Also in the hairdressing sector, as well as in many other sectors, both on the customer's and on the hairdresser's side, the attention for medical and aesthetic aspects are growing.
- At the same time, social attentions for other aspects like the hair health, the noise, the electromagnetic radiations, the radiation pollution due to ion, the professional diseases etc., are growing too.
- As a consequence of the negative points described, present in the traditional hairdryers, the operators in the field now require lightweight, silent, cheap hairdryers, easy to install in the shop, easy to use and easy to maintain (in the case of female hairdressers).

That said, the needs to solve or reduce the problems described, appear as outcome of the considerable evolution of the

hairdressing activity; moreover, thanks to the interesting possibilities offered by the new technologies, the designing of a system that represent a great improvement has been seriously considered. In particular, the designing of an easy-to-use system, with a high degree of automation, with, for example, a continuous control of some important physical parameters is becoming possible. Accordingly, the project and the drawings described below have been developed.

[0002] The problems described above are solved according to the present invention by a system having the features of claim 1. Furthermore detailed embodiments are described in the dependent claims.

[0003] Furthermore, various apparatuses have been proposed for drying and modelling the hair.

[0004] US-A-3 698 402 Hair curling device (ARNESEN BERNHARD A) 17 October 1972 (1972-10-17), discloses a hairdryer with a special tool with passages for air inside, for hair curling.

[0005] US-A-4 676 260 Total hair care pistol (PAULHUS DOROTHY A [US] ET AL) 30 June 1987 (1987-06-30), discloses a hairdryer shaped as a pistol, with comb and brushes with passages for air inside, with quick connection means to the hairdryer itself.

[0006] GB-A-2 082 058 Brushing and curling appar..., (SAHM JUERGEN) 3 March 1982 (1982-03-03), discloses a plurality of brushes for hair connected to a manifold, with passages for air inside and around the brushes themselves; moreover, is disclosed a swivel joint placed near the handle of said brushes.

[0007] US-A-6 052 915 Hands-free portable.. (TURNER CHERYL G [US]) 25 April 2000 (2000-04-25), discloses a wearable hairdryer cap, in which the cap itself is connected to the hairdryer by means of a hose.

[0008] DE 33 19 403 A1 Haarbehandlungsgerat... (POGETTI PIETRO) 29 November 1984 (1984-11 - 29), discloses a hairdryer and brush for hair with passages for air inside, connected with a hose, and also able to be connected with a vacuum device.

[0009] US-A-5 640 781 Apparatus for styling... (CARSON GARY PATRICK [US]) 24 June 1997 (1997-06-24), discloses a kind of adjustable support for hairdryer, to be installed on the wall, with a wireless control for the hairdryer itself.

[0010] FR-A-2 215 183 Appareil pour le sechage... (CAMMAN MICHEL [FR]) 23 August 1974 (1974-08-23), discloses a brush for hair with passages for air inside.

[0011] US-A-4 376 441 Hair treatment applicator... (DUNCAN THEODORE [US]) 15 March 1983 (1983-03-15), discloses a brush for hair with special teeth and passages for air inside.

[0012] US-A-3 057 364 Hair drying implement... (FREEDMAN LAWRENCE I ET AL) 9 October 1962 (1962-10-09), discloses a brush for hair with passages for air inside, which presents a cover in shape of a half cylinder installed on the top.

[0013] The above-mentioned documents refer to tools (brushes, combs, caps, curling devices), with passage of air inside, or to devices for suspension of hairdryers.

[0014] US 2003/234100 A1 Personal dryer (ROSS SHERRY [US]) 25 December 2003 (2003-12-25), the closest prior art, represents an evolute electronically controlled device, that performs the drying of the entire person; its important characteristic is represented by the distribution of air at different temperatures on the different parts of the body, comprising the head. Said different levels of temperature of the air sprayed at each exit port are controlled by sensors means; that means are thermocouples, are placed inside the housing of the device, and cooperate in feedback with the electronic control. Other sensors, specifically the pressure control valves and the air volume control valve, are also placed inside the housing to control the air volume and the pressure of the air, in feedback with said electronic means.

[0015] However, this document do not disclose features for the specific drying and the contemporaneous modelling of the hair; furthermore, this document discloses sensors or thermocouples that only measure the temperature of the air in the housing, and not other kind of physical - chemical values; particularly, these sensors do not measure the temperature, the humidity, the brightness directly on the hair, what should be needed to avoid damages on the hair.

[0016] It is to be noted that, in this document, the safety limits controlled by the said thermocouples, are only referred to the temperature of the air produced inside the housing and expelled by the exit ports, and controlled by said thermocouples sensors placed inside the housing.

[0017] This document discloses cold air generation system for the general use on the human body and not specific means including the use of cold air for the efficient fixing and improving of the modelling operation of the hair; moreover, the tools disclosed in this document are not able to turn around their own axis.

[0018] US 2003/234100 A1 discloses pre-set functions that enables the user to program and/or select a drying program; this drying program is not automatically chosen by the system, according with data automatically acquired on the hair.

Again, this document gives information about the dimension and the different possible installations of the system itself, and specifies only that "graphical user interface ... sits flush with the wall surface".

[0019] The present application differentiates from said prior art document, principally because includes sensors means that, in feedback with the own electronic control, read physical / chemical values (humidity, temperature and degree of reflection), directly on or near the hair. In this way, the quality of the air sprayed on the hair, is continuously monitored and adapted in feedback, to avoid damages to the hair themselves.

Fig. n.	2- DESCRIPTION OF THE DRAWINGS
1	Traditional hair dryer
2	Example of "Temper curve" for steel
3	Multi-users centralized system
4	Innovative system, version 1
5	Innovative system, version 2
6	Tools with inner air ducts
7	Rowenta and Babyliss innovative devices
8	Scheme of innovative system for contemporaneous hair drying and modelling
9	Functional scheme for system controlled by means of sensors
10	Thermograph of the hair and image of the head
11	Hair control with infrared and micro-waves sensors
12	Example of microprocessor (TAG Technology) integrated into the tools
13	"Tangential" and "Rotating cage" fans (top: view from I and from II in fig. 13)
14	Brushless motor scheme
15	Piping (bottom: section III of fig. 15 - details of the inner cables)
16	Main components of the diffuser (bottom: kind of handles)
17	Instructions for use of the diffuser (bottom: section IV of fig. 17, handling zone)
18	Series of tools in shape of brushes and combs
19	Waves modelling tool "ferro Marcel" style (bottom, section V of fig. 19)
20	Flat ironing tool (bottom: two views from VI of fig. 20, with and without rolls)
21	Spiral ironing tool
22	Curler installation tools for waves modelling
23	Cap for hair drying and modelling operation
24	Scheme of the quick-change tools connection on the diffuser
25	"Cold jet" device with cold compressed air duct inside the diffuser, with dedicated compressor and refrigerator
26	"Cold jet" device with cold compressed air duct outside the diffuser, with dedicated compressor and refrigerator
27	"Cold jet" device with cold ventilated air duct outside the diffuser, with air piping derived from the main air generator, with dedicated refrigerator
28	Multi-purpose tool, "Conca" style; bottom: section VII of fig. 28, and example of application on the hair
29	Functional scheme of "anti-stress" control principle
30	Scheme for mode of use
31	Scheme of the system in the "ceiling" version
32	Scheme of the system in the "wall" version
33	Scheme of the system in the "armchair" version
34	Scheme of the system in the "teaching fashion school" version
35	Scheme of the system in the "portable" version, for competitions and exhibitions
36	Block diagram of the Central Unit
37	Scheme of the dimensional and physical-chemical data acquisition from the hair
38	Scheme of preparation, delivery and diffusion of products on the hair
39	Scheme of work of an electronic controller (Hardware) - Example
40	Scheme of the flow chart of an electronic control program (Software) - Example
41	Possible recycling of the traditional hairdryers

3- DESCRIPTION OF THE INVENTION

[0020] 3.1- MAIN COMPONENTS OF THE SYSTEM- The application described here below only represents an example of the principles claimed in the patent application, and is referred to an innovative system that allows the contemporary drying and modelling of the hair; thanks to calculations, comparing actions, optimizations, iterative verifications and practical tests, the innovative characteristics described below have been obtained. Specifically, every choice has

been done with the aim to get the best equilibrium among efficacy, efficiency, simplicity and general economy of the system. The main components of the system are:

The central unit 19 (fig. 8), under the control of the operator, who manages all the functions of the system; this central unit is consequently linked with the sensors 20 (fig. 8), with the high efficiency motor 130 (fig. 8), with the low pressure fan 39 (fig. 8), with the piping 42 (fig. 8), with the diffuser 50 (fig. 8), with the electric heaters 4 (fig. 8), with the tools 52 (fig. 8), with the mini-compressor 21 (fig. 8), with the air refrigerator 22 (fig. 8) and with the "Cold jet" diffuser 23 (fig. 8). In a more completed version, the touch screen 24 (fig. 8) to give inputs and / or to check the functionality of the system is provided; moreover, some of these commands are repeated on the special keyboard placed on the diffuser 50 (fig. 8).

3.2- TECHNICAL CHARACTERISTICS OF THE SYSTEM- These are the technical characteristics of the system:

- Control of the degree of completion of the hair drying and modelling activity (i.e.: control of humidity, temperature, degree of reflection of the hair, etc.) performed by means of sensors.
- Quick-change tools and brushes with air ducts inside, to increase the quality and the efficiency of the hair treatment, and to reduce the consumption of energy.
- Air generators placed far from the operators.
- Special silent fan, designed for the production of low air pressure.
- High efficiency "Brushless" electric motor, typically used in the industrial automation field, with feedback for the speed control, electric maintenance free, silent and suitable for installation near the job positions.
- Special soft-touch ultra-light piping.
- Rotating ultra-light diffuser with electric heater inside and operation switches, easy to use, made with special fibres.
- Specific device for the efficient "Cold jet" production.
- Reduction of three times of energy consumption compared to the traditional plants.

3.3- FUNCTIONAL CHARACTERISTICS OF THE SYSTEM- These are the functional characteristics of the system:

- Full control of the air generator, of the electric heater and of the sensors, thanks to a microprocessor and other electronic means of memorization.
- Acquisition of the values that measure the degree of completion of the hair drying and modelling activity by means of sensors.
- Acoustic and / or visual and / or numerical signalling of the values that measure the degree of completion of the hair drying and modelling activity.
- Automatic memorisation of the parameters in use (speed, temperature, humidity...).
- Download, modification and execution of the memorised programs for drying, modelling and treating of the hair (time, speed, temperature and their profiles of variation).
- Easy modification of the programs for drying, modelling and treating of the hair, with switches set on the diffuser.
- Memorization of the programs for drying, modelling and treating of the hair "in progress" in a database, with the definition of identification fields such as "Customer", "Kind of hair", "Diameter of the hair", "Length of the hair", "Density of the hair" etc..
- Data sheet for the download and for the selection of the suitable program for drying, modelling and treating of a specific kind of hair, or for the selection of the most suitable treatment already in memory, or for a crossed selection by name and by kind of related memorised treatments, or for the download of video "demo" (i.e.: as instruction), to be selected according to kind of hair, or to the needed final shape of the hair.

3.4- MAIN VERSIONS- The following four main versions have been considered:

- For installation into the hairdressers' shops with balanced swivel arm (in the ceiling 116 (fig. 31) or in the wall 117 (fig. 32) version), and the armchair 118 (fig. 33) version.
- For installation in hairdressing schools 124 (fig. 34).
- Portable, for professional use in competitions and exhibitions 127 (fig. 35).
- For home usage, in a simplified version.

3.5- DIRECT AND INDIRECT ADVANTAGES- Direct and indirect advantages related to the general lowering of the operating temperature appear as a consequence of the characteristics listed above; in fact, the chemical characteristics and the efficacy of the products used for hair treatment, are highly influenced by the operating temperature itself. Generally, these products are divided in two categories: products for modelling, and potions for hair and roots care; both have organic principles inside, that transfer their efficacy only if applied at a compatible temperature. As confirmed by the laboratory tests, the efficacy of their molecules decreases, to disappear, when invested by high temperature. (i.e.: 100 °C); which often happens in a non-conscious way, with traditional hair drying systems (see point 1.4.3). That said,

the following advantage comes out with the new drying and modelling method that this kind of system allows:

- Low energetic impact.
- Rapidity and efficacy of the drying and modelling operation.
- General reduction of stress and noise.
- Increased efficacy of the products used for the hair treatment.

Now, the creation of a new line of products, calibrated for a correct absorption at low temperatures could be taken into account. With reference to this intention, is still remembered the case of products containing delicate organic elements sensitive to temperature (derived from the amino acid group), launched on the market few years ago; if the theoretical efficacy tested in laboratory was very high, it almost disappeared in the practical application. And this because the limit temperature of 55 °C, suggested by the producer, was often unintentionally overtaken because of the use of traditional hair dryers. After these facts, this kind of products was gradually removed from the market.

3.6- IMPLEMENTATION OF THE SENSOR TECHNOLOGY - The most innovative aspect of the present project is represented by the implementation of sensors; as there is a continuous growing of the interest for health and for aesthetic physical, new highly technological solutions to facilitate the hairdressing activity can be proposed and tested; and this because the evaluation and the control of the physical and chemical parameters that indicate the hair treatment situation, were left, in the past, uniquely in the hands of the hairdresser him/herself. Instead, from now on, with the present invention essential indications that reduce the degree of subjectivity, and guarantee a better "Customer Satisfaction" are offered to the operator.

At the same time, thanks to the impressive speed of growth, and quick speed of decrease of costs of the "Nanotechnologies", new use of micro-sensors and micro-actuators for the "Sensor Control" in the system here described will be possible; that said, the present description is related to a product immediately "Ready for the market", also if more futuristic aspects are already protected with the present patent.

NOTE: FOR SIMPLICITY REASONS, ALL THE LISTED SENSORS HAVE BEEN IDENTIFIED WITH THE SAME NUMBER; EVEN IF THEY HAVE DIFFERENT FUNCTIONS (HUMIDITY CONTROL, TEMPERATURE CONTROL, ETC.).

3.6.1- SENSORS FOR THE CONTROL OF THE HAIR, AND TECHNOLOGY APPLIED-

As consequence of the high-speed variability and of the high variance of the data to be controlled, crossed controls and redundancy techniques have been applied in the present project; sensors 20 (fig. 8) are in dialogue with the electronic central unit 19 (fig. 8) in three complementary hierarchic modes, activated by the operator. Contemporaneous measure of the same parameters in different areas of the hair has been planned, with the aim to give back to the operator himself, a complete overview of the quality of the drying and modelling activity.

MODE 1- Control performed by sensors placed inside the terminal part of tools 52 (fig. 8).

MODE 2- Control performed by sensors placed in the special tool 26 (fig. 8) for direct contact measures with the hair, during the combing activity.

MODE 3- Control performed by the sensors 27 (fig. 8) placed near the system, and oriented on the job area, for remote measures.

In each of these modes, an acoustic and / or a visual signal 28 (fig. 9) or other signals are emitted, and / or safety procedures are activated as soon as levels of attention 29 (fig. 9) is reached, which allows to the operator to identify the measurement system that originates the alarm, with the help of either of green, or yellow or red led, (30, 31, 32 fig. 9), which inform that the drying and modelling conditions are normal, near the limits, out of the normal established parameters. Moreover, inside the more evolved "Remote measure system" mode 3, the video-camera system 33 (fig. 10) for the detection of parameters like temperature, humidity etc. could be installed; for example, the company FLIR Systems produces control systems for thermo graphical infrared control, that can visualize the head image with its thermal map 34 (fig. 10) on the video 24 (fig. 8, 10). Moreover, in this way the link among different colours and different temperatures, and the monitor detection of the areas that need more or less treatment is facilitated. As to humidity, two methods for the remote control (infrared 35 (fig. 11) and microwaves 36 (fig. 11)) are known; in the first, which is even more economic, only the detection of the superficial humidity values is permitted, while in the second one the stratified detection 136 (fig. 11) of the humidity value is possible. Thanks to this second option, the continuous and stratified check of a high volume of hair can be easily performed. This system, developed for example by the company ALEPH - Modena and obviously considered safe, has been already used for the control of stratified humidity of cereals stocked in silos in great quantity.

3.6.2- SENSORS FOR THE SYSTEM CONTROL- Moreover, in combination with the sensors that control the hair, other sensors 20 (fig. 8) can be supplied for the control of the technical parameters of the entire system (temperature,

speed and pressure of the air generated by the fan 39 (fig. 8), air temperature after the electric heater 4 (fig. 8), "Cold jet" air temperature" 23 (fig. 8)).

3.6.3- SENSORS FOR THE AUTOMATIC SELECTION- At the same time, other innovative advantages, for example the automatic selection of specific software (without intervention of the operator), have been designed with the aim to get a complete use of the technology of sensors; each tool could have a specific element of identification 37 (fig. 12) inside (for example, a "tag", or intelligent labels with the RFID technology inside, a microprocessor etc.). That tool, when installed on the diffuser 50 (fig. 8, 12), establishes the contact with the receiver 38 (fig. 12), and informs the system about its presence. Consequently, on the bases of the characteristics of the recognised tool, the performances of the program chosen by the operator are automatically set up by the central unit 19 (fig. 8) (for example: small brush = low air volume, normal brush = high volume of air, comb = high temperature); moreover, on the bases of the operative necessities, little alterations of these parameters can be easily produced and memorized by the operator.

3.7- CHOICE OF THE CORRECT KIND OF FAN, WITH REFERENCE TO THE CHARACTERISTICS OF THE TOOLS USED FOR THE MODELLING OPERATION- As already supposed by the professional operators, a second important goal has been reached with the tests; in fact, it has been demonstrated that the use of a reduced air pressure to dry the hair is possible, as a consequence of the use of brushes with the inner air ducts 52 (fig. 8). Moreover, high air pressure would have created negative consequences for the correct hair modelling. Consequently, the result is that traditional fans 38 (fig. 13) (producers: AMETEK, FISE, and others), noisy and with a high dynamic response (speed: more than 25000 rpm), have been discarded; therefore, preference has been given to "cage" fans 39 (fig. 13) or similar ones (producers: ELICENT and others), silent and with low dynamic response (speed: around 2000 rpm). The same are used in air conditioning. We noticed that the present project has been extremely influenced in an important and positive way by that decision; after that, an intrinsically silent system with transitional characteristics, ready to be placed near the hairdresser has been developed, for reasons of size, of impact on the environment, of cost, of simplicity. Moreover, compared to the existing centralized system described at point 1.5, no silencing structures are needed.

3.8- MOTOR- An important technical choice has been decided about the motor, in order to gives the system the following characteristics:

- Possible performance of the new automation concepts listed before.
- Compatibility with the market requirements.
- High level of reliability.

The decision to increase the lifetime cycle of the motor itself has been taken, in order to allow the operators to install and then "forget" the motor under the technical point of view; and this with a view to avoid maintenance activities and / or substitution of spare parts by the operator (specifically Female operators). Consequently, the high efficiency brushless motor 130 (fig. 8), developed in cooperation with a leading motor producer described below, has been chosen; in this way, all the problems connected with noise and with brushes have been cancelled. In fact, this kind of motors is widely used in industrial automation, it has very compact size, high specific power, its electrical components are maintenance free, and its lifetime is only consequential to the life of their bearings (higher than 10000 hours of work); this means that at least 5 years of lifetime is guaranteed (hypothesis of intense use of the system for 8 hours per day x 250 days x 5 years = 10000 hours). A short description of the "brushless" motors has been arranged below, with the aim to give evidence of the peculiarity that characterises the innovation of the present system:

3.8.1- "BRUSHLESS" MOTOR FOR INDUSTRIAL AUTOMATION- This kind of motor, with magnetic components made with the named "Rare hearts", produced for example by Siemens, Bosch (SE 13030 series and similar), is silent and has high and sophisticated dynamic characteristics; for example, both the control of the speed and the motor shaft position are performed by the feedback system 40 (fig. 14) (which is essential for the control of any phase of industrial automation). For these reasons the cost is very high, and, at the moment, not acceptable for the kind of system here described.

3.8.2- VARIABLE RELUCTANCE "BRUSHLESS" MOTOR- This kind of motor is considered noisier than the previous ones, especially in the starting phase, but the cost is considerably lower.

3.8.3- SILENT AND CHEAP "BRUSHLESS" MOTOR, WITH INNOVATIVE ELECTRONIC AND DRIVING SYSTEM- this kind of motor has been developed by a leading motors producer; it has the same performances as a "Universal" hairdryer motor, and, moreover, offers the advantages of the two kind of "brushless" motors described above; in this case, the motor has been personalized in cooperation with the inventors of the present project, and represents the ideal motor for the system here described. In fact, it has been dimensioned in combination with the special fan that is silent and consequently ready for the installation close to the job positions in the hairdressers' shops.

3.9- ELECTRONIC MOTOR CONTROL- Thanks to the motor feedback system 40 (fig. 14), a quick and gradual adaptation of the airflow to the operator needs is achieved; thanks to the general electronic control 19 (fig. 8, 14), that includes the electronic motor control 41 (fig. 14) too, the full control of the system itself is achieved.

3.10- PIPING- The decision to install the air generator close to each job position, has been taken in order to get a quick mechanical response of the air generator to the needs of the operator; with the intention to improve the whole operative aspects, a compact easy-to-handle air duct 42 (fig. 8, 15) has been provided, with adequate diameter (about 30 mm) and good resistance to the low pressures, and lightness (weight: lower than 100 gr/metre). This kind of piping derives from the VENA types concept, distributed by the ANGST + PFISTER company, and is composed by the corrugated thin silicon sheet 43 (fig. 15), rolled on the plastic wire spiral 44 (fig. 15) (for electrical insulating reasons), and is also used for the passage of the electric cables 45 (fig. 15) of the electric heater 4 (fig. 8), for the signal cables 46 (fig. 8) of the sensors 20 (fig. 8, 15), for the cables 47 (fig. 8, 15) which connect the control switches 25 (fig. 8) placed on the diffuser 50 (fig. 8), and serves as passage for the "Cold jet" air duct 48 (fig. 15) described later; for obvious reasons of speed, a system of connections "quick-change" type 134 (fig. 15) has been used to allow the connection of the piping 42 (fig. 15) as well as of the cable terminals 45, 46, 47 (fig. 8, 15), easy-to-use for inexperienced people, and derived from similar devices already on the market.

3.11- THE ROTATING DIFFUSER AND THE OPERATING INSTRUCTIONS- Thanks to the adoption of innovative characteristics already included into the device invented in the 60ies by Mr. Simeone Filippi, (point 1.6), the diffuser 50 (fig. 16) has been re-designed in cooperation with the professional users, with an eye to the ergonomic criteria. It includes tools 52 (fig. 16) able to rotate 51 (fig. 16) around the axis 60 (fig. 16), by the action of the hand that holds the diffuser 50 (fig. 16) itself. It is built with ultra-light materials (carbon fibre, etc.), and contains the electric heater / heaters 4 (fig. 16) (with sensor for the temperature control and the automatic safety switch); it also contains the operation switches 25 (fig. 16) (ON / OFF), and the switches for temperature of the electric heater 4 (fig. 16) and for the adjustment of the air speed, together with the sensors 20 (fig. 16) for the control of the air temperature at the exit of the diffuser itself. With the aim of contrasting the rotation 51 (fig. 16) of the tools 52 (fig. 16) during the modelling, and counterbalancing the tilting momentum created by the piping 42 (fig. 16), the terminal side 54 (fig. 16) has been oriented of about 75 degrees. To facilitate the operator's personal response, series of curved pipes 55 (fig. 16) inclined in different ways (45°, 60°, 90°) to be chosen during the installation of the system has been provided; at the same time, the special deformable version 56 (fig. 16) that allows the desired inclination has been also supplied. The cross section of the first area 57 (fig. 17), has been modelled to the print 58 (fig. 17) of the hand naturally wrapped on it; in fact, that part of the diffuser is seized with the part of the palm of the hand 59 (fig. 17) placed near the root of the thumb, and held by pressure with the ring finger and the little finger 61 (fig. 17). Consequently, the rotation of tools 52 (fig. 16, 17) results from the combined movement of the thumb and of the ring finger 64 (fig. 17) on the rotating ring 62 (fig. 17). In order to avoid the described fatigue and torsion to the wrist, the rotating flanges 63 (fig. 16) are placed among the piping 42 (fig. 16) and the diffuser 50 (fig. 16); flanges have mechanical stops, to avoid absolute rotations over 330°, and to avoid dangerous torsions to the inner electric cables.

3.12- QUICK-CHANGE INTERCHANGEABLE TOOLS WITH INNER AIR DUCTS- To facilitate quick connection and removing of the tools, a special shape of the tip 65 (fig. 16) of the diffuser has been arranged; some of the tools here described, are already known on the market as tools for a single and independent use ("Marcel" tool, flat and spiral ironing tool). In this case, a specific electric heater, or the hot air coming from the traditional hairdryer is used to heat them; unfortunately, the defects already explained generally appear with this heating method. For these reasons, in the invention here described, the tools have been highly improved; for example, they now can turn and / or oscillate around the axis 60 (fig. 16, 18), and specific inner ducts 17 (fig. from 18 to 23) for the hot air passage have been designed. Therefore, a new and more efficient modelling method is now possible. And these tools are:

3.12.1- BRUSHES FOR MODELLING 67 (fig. 18) not according to the invention- Built in appropriate diameters and lengths calculated on the bases of the modelling operational requirements, with the inner airflow ducts 66 (fig. 18).

3.12.2- SPECIAL COMBS 68 (fig. 18) not according to the invention - With the inner airflow ducts 66 (fig. 18) for the diffusion of air during the combing operations.

3.12.3- TOOL FOR MODELLING OF WAVES, "FERRO MARCEL" STYLE 69 (fig. 19)-The lock of hair 72 (fig. 19) is trapped and pressed between the cylindrical portion 70 (fig. 19) and the semi-cylindrical portion 71 (fig. 19); in this way, thanks to the direct hot air 66 (fig. 19) blown among the hair through the inner ducts 17 (fig. 19), a high efficacy modelling operation is obtained. And this especially if compared with the traditional "Ferro Marcel" tool, heated by means of an electric heater and without air inside.

3.12.4- FLAT IRONING TOOL 73 (fig. 20)- The lock of hair 72 (fig. 20) is trapped and pressed between two plates 74 (fig. 20) with the inner ducts 17 (fig. 20) for hot air 66 (fig. 20); the lock of hair are aligned by the bristles 75 (fig. 20) and are pinched by the rollers 76 (fig. 20) to perform the flat ironing modelling operation.

3.12.5- SPIRAL IRONING TOOL 77 (fig. 21) not according to the invention - The lock of hair 72 (fig. 21) is wrapped around a helicoids profile 78 (fig. 21) with the inner ducts 17 (fig. 21); thanks to the airflow 66 (fig. 21), the modelling

operation is completed and fixed.

3.12.6- TOOL FOR THE INSTALLATION OF THE CURLER FOR WAVES MODELLING 79 (fig. 22) not according to the invention - Curler 81 (fig. 22) is placed and held by the retaining device 82 (fig. 22) on a cylindrical hollow profile 80 (fig. 22) with the inner ducts 17 (fig. 22); in this way, axial and rotational movements of the curler are avoided. At the end of the modelling operation, the button 83 (fig. 22) is pushed by the operator to disengage the diffuser 50 (fig. 22), which leaves the curler just arranged free on the head. With the aim of reducing the installation time, the tool with increased length 84 (fig. 22) for the contemporaneous installation of the series of curler 81 (fig. 22) has been designed; in this way, other curlers could be preinstalled and pre-heated on the tool by the airflow 66 (fig. 22), while the previous installation goes on.

3.12.7- CAP FOR DRYING AND MODELLING 85 (fig. 23) not according to the invention - The bag 86 (fig. 23), shaped to be dressed on the head and on the hair 5 (fig. 23) is connected to the diffuser 50 (fig. 23); this diffuser supplies the air 66 (fig. 23) for the drying and modelling operation.

3.12.8- QUICK-CHANGE TOOLS SYSTEM 87 (fig. 24) not according to the invention - The quick-change connection system is performed by the combination of the following two mechanisms:

- The male-female conic coupling system 88 (fig. 24) (special conic profile has been calculated with reference to the friction coefficient between the two parts in touch (preferably "Techno polymer" for medium temperatures)).
- The safety stud 89 (fig. 24) with release button 90 (fig. 24), for the correct coupling among the diffuser 50 (fig. 24) and the tools 52 (fig. 24).

Couplings have been studied to guarantee the correct equilibrium among:

- Robustness of manipulation during the modelling operations.
- Necessity to avoid wastes of air.
- Easy handling during installation of the tools and the removing operations.

If the detection sensors 20 (fig. 8, 24) are installed on such kind of devices, as planned at point 3.6, the necessary quick-change electric connection 91 (fig. 24) for the signal transmission at low voltage from the sensor, or from the sensors 20 (fig. 8, 24) to the central process unit 19 (fig. 8), will be set up consequently on board.

3.13- "COLD JET" TOOL AND ANCILLARY EQUIPMENTS- As detailed at point 1.4.4, due to the importance of this kind of tool, and to the different ways of use, three different solutions have been designed with a view to:

- The technologic quality degree.
- The cost.
- The frequency of use.
- The professional result.
- The kind of drying system used (see point 3.20 - versions).

3.13.1- VERSION 92 (fig. 25) WITH COMPRESSED COLD AIR PIPING PLACED INSIDE THE DIFFUSER, WITH SPECIFIC AIR COMPRESSOR- The components are:

The air compressor 21 (fig. 25), the optional air cooling system 22 (fig. 25) (liquid nitrogen tech., or electric refrigerator tech., etc.), the compressed air piping (diameter: 5 mm) 93 (fig. 25) placed inside or in parallel to the main piping 42 (fig. 15, 25), the on / off switch 94 (fig. 25) installed on the diffuser 50 (fig. 16, 25).

3.13.2- VERSION 95 (fig. 26) WITH COMPRESSED COLD AIR PIPING PLACED OUTSIDE THE DIFFUSER, WITH SPECIFIC AIR COMPRESSOR- The basic components are the same as for the previous version, with the addition of the specific diffuser 96 (fig. 26), that can be included inside the tool 26 (fig. 8, 26) already used for the measurement of humidity.

3.13.3- VERSION 97 (fig. 27) WITH VENTILATED COLD AIR PIPING PLACED OUTSIDE THE DIFFUSER, AND WITH DERIVATION OF THE AIR FROM THE MAIN GENERATOR OF AIR - The components are:

The system 98 (fig. 27) with piping (diameter: 20 mm) derived from the main ventilated air duct 99 (fig. 27), the optional air cooling system 22 (fig. 27) (liquid nitrogen technology, or electric refrigerator technology, etc.), the specific diffuser 96 (fig. 27) and the on / off switch 94 (fig. 27).

3.13.4- INTERCHANGEABLE QUICK-CHANGE AUXILIARY EQUIPMENT- As for the diffuser 50 (fig. 16), due to

the similarity of the job operations to be performed or supported, the integration of the "Cold jet" 96 (fig. 26, 27) into the tools 26 (fig. 8) could be arranged (i.e.: Rotating tools with the inner ducts 17 (fig. 28), similar to the ones used for the main diffuser may be provided); at the same time, the quick-change connection system 141 (fig. 28) similar to the described one 87 (fig. 24) could be designed. In case of use of compressed air, a quick-change connection system could be build, by means of the traditional connection systems for compressed air already on the market (produced by companies such as LEGRIS, FASTER etc.). In this case, the necessary quick-change electric connection 91 (fig. 28) for the transmission (at low voltage) of signals from the sensor, or from the sensors 20 (fig. 28) to the central process unit will be also mounted on board consequently.

3.13.5- MULTI PURPOSE MODELLING TOOL (NAMED "CONCA") 26 (fig. 28)- By means of the multi-purpose modelling tool named "conca" 26 (fig. 28), a complete and coordinated use of the whole system is achieved; this kind of tool, has been studied both to cover the brushes 67 (fig. 28) to avoid the spreading of hot air 66 (fig. 18) during the modelling operations, and to the contemporaneous measure of the humidity of the hair by means of the sensors 20 (fig. 28). This apparent technical redundancy, can be used in two cases:

- When the operator, because of the high variability of the parameters to be checked, and for the reasons explained at point 3.17 (choice between continuous or periodic check), does not prefer to use the other forecasted methods of measurement.
 - When the operator needs to acquire more data on a critical area of the hair.
- This important tool, also includes the other sensors 20 (fig. 28) on the upper side 100 (fig. 28), and is used on this side for instantaneous measurements, when the covering of the brushes 67 (fig. 28) is not required. With the aim of facilitating the operations, a series of teeth 101 (fig. 28) has been placed on the tool; as already said, the "Cold jet" system 93 (fig. 25, 28) can also be contained into the named "Conca" tool too.

3.14- SCHEME OF THE WORKING OF THE SYSTEM- In the new kind of system here described (that can also be considered safer and more efficient with respect to the traditional ones), the traditional concept of hair drying and modelling has been re-designed and turned upside-down; in fact, the control of the main parameters as humidity and temperature has been guaranteed. The same for other parameters, such as the light reflection of hair, measured with optical devices. Consequently, the care for the health of the hair has been privileged. Moreover, suggestions or variations about the functionality of the system, related to the quality of the drying and modelling operation, are automatically executed by the system. As already said, the automatic sensors 20 (fig. 8) govern the system for the acquisition of the parameters that indicate the degree of drying of the hair. In these situations there may often be typical mistakes and psychological rejection of automatic devices. In order to reduce this kind of reactions, special attention has been paid to the problem; for example, the full control of the system has been assigned to the operator, who can decide in any moment if, how and when to gradually use the potentiality offered by the system itself. In the phases of "learning and familiarizing" with the new performances offered by the system, the operator can decide (by means of simple selections on the touch-screen, or by means of selectors keys) how to use the system itself; for example, the operator can decide to use the system as a normal hairdryer, with all the technical consequential advantaged already described. After this first phase, the operator will gradually decide about the use of all the possibilities offered by the electronic automation, placed inside the new "friendly" and a "humanized" system.

3.15- HEALTH OF THE HAIR- The care of the health of the hair is guaranteed by the sensors 20 (fig. 8), that read the humidity values 102 (fig. 8), the temperature value 103 (fig. 8) etc., in the interested area of the hair 5 (fig. 8), and send them back to the central unit 19 (fig. 8). Those values are compared to one or more of the pre-alarm limits 29 (fig. 9), previously fixed on the panel on the bases of the physical data and professional experience; consequently, adequate electric parameters are sent to the motor 130 (fig. 8) or to the electric heaters 4 (fig. 8), with the aim to maintain the humidity degree 102 (fig. 8), the temperature degree 103 (fig. 8) etc., inside the said pre-alarm limits. If, despite the automatic corrections, this condition does not occur, some acoustic and / or visual signals 28 (fig. 9) are first of all launched to the operator; to avoid damages to the hair, the electricity that feeds the electric heater 4 (fig. 8) is cut off by the system within a calculated time, and the entire system is stopped if the alarm persists. Moreover, details about the reasons of that anomaly are finally launched on the video. If the humidity and / or the temperature of the hair etc., remain inside the pre-fixed limits, the drying operation goes on, till the correct humidity degree is reached; the acoustic and / or visual signals 28 (fig. 9) are launched to the operator, to inform about the end of the treatment.

3.16- INTEGRATED ANTI STRESS CONTROL- At the same time, a control is made about the speed of variation of the parameters monitored by the sensors 20 (fig. 8); in fact, physical - chemical reaction and micro-pathologic stress into the keratin contained in the hair could happen during a traditional activity of drying and modelling, as a result of the too rapid variation of temperature, humidity etc. (see the analogy with the technology of the steel treatment, point 1.4.4. - "Cold jet" treatment). In order to avoid this situation, the sensors 20 (fig. 8) perform a continuous sampling of the variation 142 (fig. 29) of humidity 102 (fig. 8, 29), of temperature 103 (fig. 8, 29) etc., in the unit of time, comparing the trend to the normal values 104, 105 (fig. 29) pre-set before and memorized in the central unit. Acoustic and / or visual

signals 28 (fig. 9) and / or invitations to modify the job rhythms and / or to modify the operative parameters are launched to the operator, if values 102, 103 etc. (fig. 29), result too high respect to the ones considered as normal.

3.17- CHOICE BETWEEN CONTINUOUS OR PERIODIC CONTROL- Three kinds of contemporaneous crossed controls (see point 3.6.1), are offered by the system of sensors 20 (fig. 8); in function of the presumed kind of needed help, the best combination among them can be chosen by the operator. This because the hairdressing activity is composed by a wide sequence of different operations, that are significantly influenced by the professional experience, by the intuition, by the speed of manipulation and by the acquired personal skills. Global and continued information on the trend of the temperature, of the humidity etc., referred to the extended area 5 (fig. 8) or to the whole head, are supplied by the remote control sensors 27 (fig. 8); at the same time, the data referred to a restricted job area, can be supplied by the sensors located inside the tools 52 (fig. 8) and 26 (fig. 8). Moreover, measurements not strictly connected with the progress of the modelling activity can be carried out with the sensors placed on the single tool "Conca", to be used with the second (free) hand. In order to decide how to go ahead, it might be useful to know immediately the drying degree of a zone not yet included into the current job area. At the same time, thanks to the high level of repetition of the modelling operations, an experienced operator can easily reach high personal capability of discrimination; in this sense, in order to avoid the repetition of useless and boring controls, such degree of flexibility has been implemented. For example, quick responses about the evolving of the operations can be read easily with a rapid touch of the "measuring comb" tool 26 (fig. 28), held by the second (free) hand.

3.18- "FUZZY LOGIC" AND AUTOMATIC SELF-LEARNING- The most recent criteria of development of software, and the peculiarity of the measurements to be executed, have required the application of the so called "Fuzzy" logic to develop the software (that includes flexibility and self adapting characteristics); and this because is necessary to take into account:

- The possibility, for the temperature and for the humidity parameters etc., to deeply influence each other.
- The different and specific style of manipulation of each operator.
- The high variability of the starting condition of each modelling cycle.
- The different response to the treatment, due to the different kinds of hair.

For these reasons, as specified later, the use of the self-learning function is considered, in parallel with the pre-defined "drying and modelling" software; and this with a view to memorize and use the specific ways of use invented time after time by each operator.

3.19- HOW TO USE THE SYSTEM- With a simple selection on the "non-contact" touch-screen 24 (fig. 8, 30) (similar to the ones used in the medical sector), or with a selector key 107 (fig. 30), the following pre-settled modes can be uploaded and sent to the system:

3.19.1- "MANUAL" MODE 108 (fig. 30)- The operator simply uses the system like a traditional hairdryer; in this way, adequate and safe values of temperature and humidity are guaranteed by the technology of the sensors. Acoustic and / or visual signals 28 (fig. 9) are launched to the operator when the right values of humidity are reached.

3.19.2- "MANUAL" MODE WITH SELF-LEARNING FUNCTION 109 (fig. 30)- The memorisation of technical data 110 (fig. 30) (time, air generator speed and acceleration profiles, electric and temperature data of the electric heaters, etc., performed during the job operations) is added to the functions listed in the previous point. With the intention to use them in the future as trace for similar jobs, we suggest the choice of this option for the memorization of peculiar kinds of hair modelling. A specific code 111 (fig. 30) ("Customer name", "Kind of hair", "Length of the hair", "Density of hair" etc.) can be assigned to the memorized programs.

3.19.3- "DRYING AND PRE-MODELLING" MODE 112 (fig. 30)- In this case, a program compatible with the limits of non-damaging of the hair, has been studied to privileges the sending of high volume of air at high temperature 113 (fig. 30); at the same time, the consequential optimum air generator speed profile and the optimum electric heater (or electric heaters) heating profile is applied. Furthermore, acoustic and / or visual signals 28 (fig. 9) are launched to the operator at the end the program, when the value of humidity compatible with the next modelling phase is reached.

3.19.4- "HAIR TREATMENT AND FINAL MODELLING" MODE 114 (fig. 30) - Again, a program compatible with the limits of non-damaging of the hair, but that privileges the sending of low volume of air at low temperature 115 (fig. 30) has been studied; contemporaneously, the consequential optimum speed profile of the air generator and the optimum heating profile of the electric heater (or electric heaters) is applied. At the same time, acoustic and / or visual signals 28 (fig. 9) are launched to the operator at the end of the program, when the pre-calculated ideal value of humidity is reached.

NOTE: Both the previous options, if necessary, can be previously modified by the selection of a more specific appropriate program memorized in advance; in this case, the temperature and the velocity of the air can be slightly modified by the operator, following the aspects listed below, and previously measured and / or memorised:

- The thickness of the hair.
- The chemical composition of the hair.
- The structure of the hair (hair with glass structure, porous structure or compact structure).
- The form of the hair (plain, rich, curled).

On the bases of these data, indications about the more appropriate lotions and treatments are suggested to the operator on the screen; if no alterations are signalled, for simplicity reasons the memorized standard program is carried out. In any case, if necessary, job parameters as the speed of the air generator and / or the temperature of the electric heater (or electric heaters) can be modified, memorized and re-numbered by the operator into the system. For what concern the selection and the diffusion of lotions and products for the care of the hair, the installation of an appropriate dispenser 147 (fig. 8, 38) of products 148 (fig. 38) has been provided; thanks to the data acquired on the hair, the preparation and the diffusion of the appropriate product can be done through a specific piping, possibly installed inside the air ducts of the diffusers 26, 50 (fig. 8).

3.19.4- "IDENTIKIT" MODE (fig. 37) - This option has been designed with the aim of inserting the technology derived from the "Identikit" methods into the system; the image of the face 185 (fig. 37) of the customer can be acquired by means of a camera or video camera 186 (fig. 8, 36, 37), and some new kind of shapes 184 (fig. 37) can be overlapped and proposed to the customer, with the intent to help the customer herself (or himself) to choose the more suitable one.

3.20- VERSIONS- The proposed versions are the following:

3.20.1- FOR HAIRDRESSERS' SHOPS not according to the invention - Three kind of sub-versions are available: THE CEILING STYLE 116 (fig. 31), THE WALL STYLE 117 (fig. 32), THE ARMCHAIR STYLE 118 (fig. 33); as shown in fig. 31, 32, 33, the standard component (this means: the same components but installed in different ways) of a hypothetical equipment version, are the motor air generator 119, the balanced swivel arm and support 120, the rigid piping 121, the flexible piping 42, the diffuser 50, the drying and modelling tools 52, the system of sensors 20 (fig. 8), the "Cold jet" system 23, the electronic control 19 (fig. 8), the screen and the operative terminal 24 (fig. 8). NOTE 1- For simplicity reasons, the "Cold jet" system is here represented in the version 95 (fig. 26), described at point 3.13.2.

NOTE 2- The armchair version 118 (fig. 33) has been worked out for the installation inside modern armchairs and very large armchairs; in this case the motor air generator 119 (fig. 33) is hidden inside the base of the armchair 122 (fig. 33) and the rigid piping components 121 are not required. Moreover, is required a wrapping device 123 (fig. 33) to collect the flexible piping.

3.20.2- TEACHING VERSION FOR FASHION SCHOOLS 124 (fig. 34) not according to the invention - This version has been studied for the rapid and efficient installation of modular and non-fixed plants, as the ones for use in teaching; a modular welded rigid structure 125 (fig. 34) with the preassembled connection for the energy supply 126 (fig. 34) has been designed as function of main support, as a substitute of the rigid piping 121.

3.20.3- PORTABLE VERSION FOR COMPETITIONS AND EXHIBITIONS 127 (fig. 35) not according to the invention -

This version is composed by a portable structure, and contains a modified selection of the main components already listed above; for example, for reasons of transportation, the screen 24 (fig. 8) for the management of the job programs has been changed with a hand-held terminal 128 (fig. 35), while the control with sensors is only performed by the manual tool named "conca" 26 (fig. 8, 28).

3.20.4- SIMPLIFIED DOMESTIC VERSION- This version derives directly from the "Version for hairdressers' shops", and can be worked out in different ways (with sensors for direct control, with a simplified electronic control for the remote control with sensors etc.), according to the professional degree required.

3.21- REDUCTION OF ENERGY CONSUMPTION- The consumption of energy of the present innovative drying system, compared to the other kind of drying technologies is listed in detail in the following data-sheet:

KIND OF HAIR DRYER OR KIND OF SYSTEM	POWER MOTOR	POWER ELECTRIC HEATER	TOTAL INSTALLED POWER	MINIMUM INSTALLED POWER
PROFESSIONAL HAIR DRYER	100 w	1800 w	1900 w	1900 w

(continued)

KIND OF HAIR DRYER OR KIND OF SYSTEM	POWER MOTOR	POWER ELECTRIC HEATER	TOTAL INSTALLED POWER	MINIMUM INSTALLED POWER
CENTRALIZED SYSTEM 7 PLACES "ATOTEC" STYLE	/	/	1500 w	10000 w
CENTRALIZED SYSTEM 1 PLACE "HAIR-TECH" STYLE	1300 w	600 w	1900 w	1900 w
PRESENT INNOVATIVE SYSTEM	200 w	400 w	600 w	600 w

From the energetic point of view, the best configuration is represented by the present patent application; the goal has been reached because, step after step, each aspect of the present project has been optimized, as resumed below, with an eye to these important aspects:

- The most modern and reliable typology of motor technologies has been used.
- The fan with the best degree of efficiency and efficacy has been tested and then chosen.
- The device for the final diffusion of the air has been strongly improved; hot air is now directly blown near the surface of the scalp. Consequently, wastes of hot air have been reduced.
- The control of the technical parameters of the system has been attributed to a system of sensors, and the human influence on their evaluation has been reduced.

For the development of the present innovation, the use of up to date, reliable, ready for the market and relatively cheap technologies has been taken into account since the beginning; for example, the apparent high cost of brushless motors is quickly compensated by:

- The general low consumption of energy (three times less that what is consumed in the standard hairdressing devices).
- The long motor lifetime (five times higher that the traditional non-brushless motors).
- The absence of electric servicing (no periodical changes of deteriorated brushes are required).

At the same time, high job uniformity and high operative safety for customer and operator come out as a consequence of the implementation of an efficient electronic supervisor system, and as a result of the implementation of the system of sensors too. At first sight this usage of technology may appear like a mere addition of costs; on the contrary, in the opinion of the inventors they represent a clever choice of long-term investment.

3.22- BLOCK DIAGRAM OF THE CENTRAL UNIT OF THE SYSTEM- A scheme of the main components of the system is listed below (fig. 36):

- Central unit for control and command 19 (fig. 8, 36).
- Devices for the acquisition of the data 106 (fig. 36).
- Instruments for the treatment and the memorizing of the data 131 (fig. 36).
- Software for the treatment of the data 132 (fig. 36).
- Internal data-sheets 133 (fig. 36).

The central unit 19 (fig. 8, 36) performs the following jobs:

- Governs the whole system 129 (fig. 8, 36) thanks to the means 106 and 131 (fig. 36).
- Acquires and / or memorizes the values read by means of the sensors 20 (fig. 8) and / or acquires and / or memorizes the data inserted by means of the operator etc..
- Makes use of these values, thanks to the means 132 (fig. 36).
- Compares these values with the internal data sheets 133 (fig. 36) etc..
- Maintains the general working conditions of the system inside the pre-settled limits of safety, thanks to the continuous

dialogue with the sensors 20 (fig. 8).

Moreover, data coherent with the input of the operator, and / or data coherent with the needed technical result of drying and / or modelling, are sent to the specific electronic controllers of each components (i.e.: the controller 151 (fig. 36) for the motor air generator 119 (fig. 36), the controller 152 (fig. 36) for the electric heater 4 (fig. 36), the controller 153 (fig. 36) for the compressor 21 (fig. 36), the controller 154 (fig. 36) for the refrigerator 22 (fig. 36) etc.)).

3.23- EXAMPLE OF AN ELECTRONIC CONTROLLER (HARDWARE) IN OPERATION- The electronic management of each component of the system is performed by each single controller 151, 152, 153, 154 (fig. 36, 39) etc.; the controller 151 (fig. 36, 39) here described as an example, governs the motor air generator 39 (fig. 39), etc.. Data are received by the sensors and by the other input units 20, 24, 107, 128 (fig. 36, 39) etc. by means of the interface device 155 (fig. 39). The generator of the motion profile 156 (fig. 39) placed inside the controller 151 (fig. 39) sends the data of the movement to the adding node 157 (fig. 39) for elaborations and comparisons. Then the elaborated data are sent to the P.I.D. filter 158 (fig. 39) (Proportional-Integral-Derivate), and consequently, the drive stage 160 (fig. 39) of the motor 39 (fig. 39) is informed through the digital / analogic converter 159 (fig. 39). At that moment, adequate values of electricity are sent to the motor 39 (fig. 39) by the drive stage 160 (fig. 39), to get the required profile of motion. Simultaneously, in real time, through the real speed / position processor 161 (fig. 39), the adding node 157 (fig. 39) is informed by the speed / position transducer 40 (fig. 39), about the speed of the motor 39 (fig. 39); in this way, the continuous control and, if necessary, the continuous variation of the motor speed profile is granted.

3.24- EXAMPLE OF FLOW CHART FOR THE ELECTRONIC PROGRAM (SOFTWARE)-The attached flow chart 187 (fig. 40), reports the logical procedure of the software that governs the system; during the phases 163, 164, 165, 166 etc. (fig. 40) the values of humidity, temperature 162 (fig. 40) etc., read by means of the sensors 20 (fig. 8, 40), are compared to the related reference values previously memorized.

For example, in case the values of humidity 102 (fig. 40) etc., come out from the data of reference, a second control 167 (fig. 40) during the phase 163 (fig. 40) is activated; if the data are high 168 (fig. 40), the lowering operation 170 (fig. 40) of the values of the electric current sent to the electric heater 4 (fig. 40) is carried out by the central unit 19 (fig. 8). On the contrary, the increasing operation 171 (fig. 40) of the values of the current sent to the electric heater 4 (fig. 40) is performed by the central unit 19 (fig. 8) in case of low data 169 (fig. 40).

Further and parallel controls: the values of air speed result different from the reference data during the phase 164 (fig. 40); in this case a second control 172 (fig. 40) is activated: when the data are high 173 (fig. 40), then the lowering operation 174 (fig. 40) of the values of the current sent to the motor 130 (fig. 40) is activated by the central unit 19 (fig. 8). On the contrary, the increasing operation 176 (fig. 40) of the values of the current sent to the motor 130 (fig. 40) is executed by the central unit 19 (fig. 8) if the data are low 175 (fig. 40).

One further example: during the phase 165 (fig. 40), the speed of variation 142 (fig. 29, 40) of the value of humidity 102 (fig. 29, 40), and / or of the value of temperature 103 (fig. 29) etc., is high 177 (fig. 40); then the data of reference are read, and the lowering operation 178 (fig. 40) of the values of the current sent to the electric heater 4 (fig. 40) is carried out by the central unit 19 (fig. 8). Each anomaly is signalled to the operator by means of acoustic and / or visual signals 28 (fig. 8, 40); moreover, according to its importance, yellow 182 (fig. 40) or red 183 (fig. 40) signals are lighted up. In case of coherent data 179 (fig. 40), the choice 180 (fig. 40) is made by the program, and the control procedure is repeated with a pre-defined sampling frequency (i.e.: 100 ms); in this case, the lighting up of a green signal 181 (fig. 40) informs about the correct evolution of the drying operation.

NOTE: The description reported above has been arranged with a view to correctly inform about the general application of the basic principle expressed with the present invention. More specific integrations can be arranged, following of the expansion of the experience in the technology concerning applications of sensors control.

3.25- RE-USE OF TRADITIONAL HAIR DRYERS (fig. 41) not according to the invention - Fig. 41 implies the realistic possibility of connecting the traditional hairdryer 1 (fig. 1, 41) to the piping 42 (fig. 8, 41), to the diffuser 50 (fig. 8, 41), to the tools 52 (fig. 8, 41); and that would make it possible to recycle a great number of existing hairdryers as portable air generators, or armchair installations (fig. 32, 33, 34, 35). In this case, the old electrical connection with the existing electric heater should be interrupted, in order to respect the existing laws about the products (CEI, IMQ etc..).

Claims

1. Electronically controlled system (129), with low energetic and environmental impact, for the drying and the contemporaneous modelling of the hair, comprising:

- at least a motor group (130), at least a fan (39), at least a device (4) for the heating of the air, at least an air diffuser (50) for the distribution of the air and/or at least one hair drying and modeling tool (52) with at least an inner duct (17) for the distribution of the air (66), at least a pipe (42) for the connection of the air diffuser and/or

the tool(s) to the motor group (130),

- sensor means (20) that measure the temperature values within the system,
- at least an electronic central unit that governs the whole system (129), including a central unit (19) and software means for data elaboration (132) that acquire and / or memorise the temperature values read by the sensors (20) and / or temperature values inserted by an operator, that compares these data;

characterised by the fact that comprises

- first sensor means (20) placed inside of the at least one hair drying and modeling tool (52) for direct contact measures with the hair, during the combing activity and/or
- second sensor means (20) placed in at least a special hair modelling tool (26) for direct contact measures with the hair, during the combing activity and/or
- third sensor means (20) placed near (27) the system and oriented on the job area for remote measures,

and further comprises

- said central unit (19) that includes electronic means (106) for data acquisition, electronic means for data treatment and memorization (131), and software means which elaborate (132) and acquire and / or memorise the values read by the said first sensor means and/or second sensor means and/or third sensor means (20), and / or the values inserted by the operator, elaborate these data and consequently sends operative signals to electronic central unit that governs the whole system (129) in order to control the said at least a motor group (130), at least a fan (39), at least a device (4) for the heating of the air, avoiding the overtaking of the pre-established safety limits, protecting in this way the health .of the hair and / or the health of the scalp, and permitting the right treatment of the same, that are very sensible to the micro-climatic conditions, while an alarm signal (28) is emitted, and / or safety procedures are activated as soon as levels of attention (29) are reached, which alert the operator.

2. Electronically controlled system (129), according to claim 1, **characterised by** the fact that the said first sensor means and/or second sensor means and/or third sensor means (20) include at least a sensor for the detection of parameters of temperature and/or humidity and/or degree of reflection of the hair.
3. Electronically controlled system (129), according to claims 1 and/or 2, **characterised by** the fact that the said first sensor means (20) are included in at least a tool (52) and comprise at least a sensor for the detection of parameters of temperature and/or humidity and/or degree of reflection of the hair.
4. Electronically controlled system (129), according to any or more of the claims 1 to 3 **characterised by** the fact that the said second sensor means (20) are included in at least a special tool (26) and comprises at least a sensor for the detection of parameters of temperature and/or humidity and/or degree of reflection of the hair.
5. Electronically controlled system (129), according to any or more of the claims 1 to 4, **characterised by** the fact that the said third sensor means (20) includes at least a vided-camera (33) and at least a screen (24) for the thermal map (34), connected with the said central unit (19), and that the said third sensor means (20) captures and represents imagines of the hair without contact with the same in a predetermined area (27) and detects the surface values of humidity and / or temperature, and / or the value of humidity and / or temperature in a deepest area (136) inside particularly voluminous hair, to give the thermal map of the hair on the said screen (24).
6. Electronically controlled system (129), according to the claim 3, **characterised by** the fact that the said first sensor means (20) included in the said drying and modelling tools (52) comprises at least an electronic identification means (37) that, when the tool (52) is installed on the said air diffuser (50), through a receiver (38) informs the system about presence of the said tool and the performances of the program chosen by the operator are automatically set up by the central unit (19).
7. Electronically controlled system (129) according to any or more of the claims 1 to 6, **characterized by** the fact that comprises a multi - purpose tool (26), which does not cooperate with the air diffuser (50), and includes an semi - cylindrical portion (100), that covers brushes (67) during the modelling operation to avoid wastes of hot air, that the said multi - purpose tool (26) has at least one side shaped as a comb (101), and that the said multi - purpose tool (26) is provided with sensor means (20) for the measurement of physical - chemical values of the hair.

8. Electronically controlled system (129) according to the preceding claim, **characterized by** the fact that includes:

- a device for the diffusion of a cold air jet (96) and a switch-key (94),
- a quick-change connection (141),
- a compressed air piping (93) inside the special tool (26), and
- at least an air duct (17) for the diffusion of the air,

which empower the results of the modelling operation.

9. Electronically controlled system (129), according to the claim 7 and / or 8, **characterised by** the fact that comprises at least a device (92, 95, 97) for direct production and distribution of cold air which is connected to the said special tool (26), and includes a mini compressor (21) and air cooling means (22), functionally independent from the drying and modelling airflow and which allow the immediate and optimal fixing of the hair (5).

10. Electronically controlled system (129) according to any or more of the claims 7 to 9, **characterized by** the fact that includes at least an air duct (42), that comprises a corrugated thin silicon sheet (43), a spiral structure with electrical insulator means, a quick connection and quick disconnection means (134), means for the passing of:

- electric cables (45) of the electric heater (4),
- signal cables (46) of the sensor means (20),
- cables (47) for the connection of control switches (25) on the diffuser (50),

and for the passing of an air duct (48) for the multi - purpose tool (26).

11. Electronically controlled system (129) according to any or more of the claims 1 to 10, **characterized by** the fact that said at least a diffuser (50) of air is made of ultra light aramidyic fibres and / or carbon fibres, to reduce loads on the wrists of the operator.

12. Electronically controlled system (129) according to any or more of the claims 1 to 11, **characterized by** the fact that comprises an ironing tool (73) including two opposed plates (74) covered by a layer of bristles (75) for the alignment of the hair, that the said plates have opposed ironing rollers (76), said plates and said rollers being moved back and forth by means of an handle (139), and that the said ironing tool (73) has air ducts (17) for the diffusion of the air (66), empowering of the results of the modelling operation.

13. Electronically controlled system (129) according to any or more of the claims 1 to 12, **characterized by** the fact that the handling portion (57) of the diffuser (50) has an ergonomic shape (58) assimilated to the print of the hand naturally wrapped on it, when said portion (57) is seized with the part of the palm of the hand (59) near the root of the thumb, and held by pressure with the ring finger and with the little finger (61), to empower the handling of the diffuser (50), and to reduce loads on the wrist of the operator.

14. Electronically controlled system (129) according to the preceding claim, **characterized by** the fact that a portion (62) of the tool (52) is free to rotate or to oscillate around an axis (60), is placed in an area (146) between the diffuser (50) and the tool (52) itself, and has an ergonomic shape, which allows the firm hold of the diffuser (50) and the efficient rotation of tools (52) only with one hand, being said portion (62) connected to tool (52) itself.

15. Electronically controlled system (129) according to the claim 1, **characterized by** the fact that includes devices (143) for the acquisition of dimensional and / or physical and / or chemical data of the hair, by means of tool (144) measuring the thickness of the hair, and / or by means of kit for rapid analysis (145) to acquiring the mineral composition and / or the PH degree of the hair, and / or data about the kind of hair, devices (143) that, through an electronic program and through the central unit (19), automatically set-up the performances of the system (129) itself, and / or display information to the operator through screen means (24).

16. Electronically controlled system (129) according to the claim 1, **characterized by** the fact that the software means include an electronic program that, through the central unit (19), performs the set-up of the system itself in the following modes of use:

- manual mode (108),
- manual mode with self-learning function (109)

- drying and pre-modelling mode (112)
- hair treatment and final modelling mode (114)
- identikit mode

- 5 17. Electronically controlled system (129) according to the claim 16, **characterized by** the fact that the software means include an electronic program for the manual mode of use (108), in which, through the central unit (19), the system (129) itself is used as a traditional hairdryer, and in which said central unit (19) informs the operator about the reaching of the pre-set values of temperature, and / or brightness, and / or humidity (29) of the hair, by means of acoustic and / or visual signals (28).
- 10 18. Electronically controlled system (129) according to the claim 16, **characterized by** the fact that the software means include an electronic program for the manual mode of use with self learning function (109), in which, through the central unit (19), the following technical data (110) in use are stored and codified (111):
- 15 - times,
 - profiles of speed and acceleration of the motor-fan,
 - electric power and temperature data of the electric heater(s),
 - duration of job phases,
- 20 19. Electronically controlled system (129) according to the claim 16, **characterized by** the fact that the software means include an electronic program for the drying and pre-modelling mode of use (112) in which, through the central unit (19), the system arranges the profiles for the air generator speed and for the electric heater(s), to privilege the sending of high volume of air at high temperature (113), and in which the system ends the program with the emission of acoustic and / or visual signals (28), when the value of humidity of the hair, compatible with the next modelling phase, is reached.
- 25 20. Electronically controlled system (129) according to the claim 16, **characterized by** the fact that the software means include an electronic program for the way of use hair treatment and final modelling mode (114) in which, through the central unit (19), the system arranges the profiles for the air generator speed and for the electric heater(s), to privilege the sending of low volume of air at low temperature (115), and in which the system ends the program with the emission of acoustic and / or visual signals (28), when the pre-calculated value of humidity of the hair is reached.
- 30 21. Electronically controlled system (129) according to the claim 16, **characterized by** the fact that the software means include an electronic program for the identikit mode (fig. 37), in which, through the central unit (19), and through the technology based on the methods of Identikit, the image of the face (185) of the customer is achieved by means of a device (186), and some new kind of modelling of the hair (184) are proposed to the customer to choose on a screen means (24) the more suitable one.
- 35 22. Electronically controlled system (129) according to the claim 1, **characterized by** the fact that the software means include an electronic program that, through the central unit (19), controls the speed of variation (142) of the humidity (102) and / or of the temperature (103), and that automatically informs the operator with acoustic and visual signals and corrects the anomalies, avoiding physical -chemical stresses to the hair.
- 40 23. Electronically controlled system (129) according to any or more of the claims 16 to 22, **characterized by** the fact that the software means include an electronic program that, through the central unit (19), on the bases of the data acquired through the devices (143) for the acquisition of data from the hair, selects suitable products (148) in a dispenser (147), and delivers the right products to the operator, or spreads the right products on the hair, through specific piping (149) inside the air duct of the diffuser (50), and / or inside the air duct of the multi-purpose tool (26).
- 45 24. Electronically controlled system (129) according to any or more of the claims 16 to 23, **characterized by** the fact that the software means include the electronic program (187) that, through the central unit (19), read the data:
- 50 - humidity of the hair (102), and / or
 - temperature of the hair (103),
 - the speed of variation (142) of the humidity of the hair (102), and / or
 - the speed of variation (142) of the temperature of the hair (103),
- 55

acquired by the sensor means (20), and compares them to the preset data and consequently, according with them,

performs the variations of the electric current value supplied to the electric heater(s) (4), and / or supplied to the motor (130), till to automatically recovery the preset conditions of equilibrium.

25. Electronically controlled system (129) according to the preceding claim, **characterized by** the fact that the electronic program (187), through the central unit (19), informs about any anomaly with acoustic and / or visual signals (28), lighting-up yellow (182) or red (183) signals according to the importance of the detected anomaly, and, in case of detection of coherent values (179), executes the readdressing (180) and performs the repetition of the control procedure following a pre-defined sampling frequency, and informs continuously and automatically the operator about the correct evolution of the drying operation, with the lighting of a green signal (181).

Patentansprüche

1. Elektronisch gesteuertes System (129), mit niedrigen Energieverbrauch und geringen Auswirkungen auf die Umwelt für das Trocknen und die gleichzeitige Formgebung des Haares, bestehend aus:

- Mindestens einer Motor-Gruppe (130), mindestens einem Gebläse (39), mindestens einer Vorrichtung (4) für die Erwärmung der Luft, zumindest einer Luftstromrichtdüse (50) für die Verteilung der Luft und / oder mindestens einem Haartrocken- und Formgebungswerkzeug (52) mit mindestens einer integrierten Düse (17) für die Verteilung der Luft (66), mindestens einem Schlauch (42) für den Anschluss der Luftstromrichtdüse und / oder eines oder mehrerer Zusatzgeräte an die Motor-Gruppe (130),
- Messmitteln (20), die die Temperatur-Werte innerhalb des Systems messen,
- Mindestens einer elektronischen Zentraleinheit, die das gesamte System (129) steuert, einschließlich einer Zentraleinheit (19) und Software für die Datenverarbeitung (132), die die von den Messmitteln (20) erfassten oder vom Benutzer eingegebenen Temperaturwerte einliest und / oder speichert und die diese Daten vergleicht;

Dadurch gekennzeichnet, dass sie mit Folgendem ausgestattet ist:

- Erste Messmittel (20) im Inneren mindestens eines Haartrocken- und Formgebungswerkzeuges (52) für direkte Kontaktmessungen des Haars während des Kämmens und / oder
- Zweite Messmittel (20) im Inneren mindestens eines speziellen Formgebungswerkzeuges (26) für direkte Kontaktmessungen des Haars während des Kämmens und / oder
- Dritte Messmittel (20), die sich in der Nähe (27) des Systems befinden und für Fernmessungen auf den Arbeitsbereich gerichtet sind,

und ferner Folgendes umfasst -

- die erwähnte Zentraleinheit (19) bestehend aus elektronischen Mitteln (106) für die Datenerfassung, elektronischen Mitteln zur Datenverarbeitung und Speicherung (131), und einer Software, die die Werte verarbeitet (132) und / oder erfasst, die von den erwähnten ersten Messmitteln und / oder zweiten Messmitteln und / oder dritten Messmitteln (20) gemessen und / oder vom Benutzer eingegeben werden, die diese Daten verarbeitet und dementsprechende Betriebssignale an die elektronische Zentraleinheit, die das gesamte System steuert (129), sendet, um **dadurch** mindestens eine der erwähnten Motor-Gruppen (130), mindestens ein Gebläse (39), mindestens eine Vorrichtung (4) für die Erwärmung der Luft überwacht, um das Überschreiten der im Voraus festgelegten Sicherheits-Grenzwerte zu vermeiden und so die Gesundheit der Haare und / oder die Gesundheit der Kopfhaut schützt und deren die richtige Behandlung ermöglicht, und die sehr sensibel auf die mikroklimatischen Bedingungen reagiert und ein Alarmsignal (28) und / oder Sicherheitsverfahren auslöst, welche den Benutzer warnen, sobald die Überwachungs-Grenzwerte (29) erreicht werden.

2. Elektronisch gesteuertes System (129), nach Anspruch 1, **dadurch gekennzeichnet, dass** die erwähnten ersten Messmittel und / oder zweiten Messmittel und / oder dritten Messmittel zumindest mit einem Messfühler für die Erfassung der Werte der Temperatur und / oder der Feuchtigkeit und / oder des Reflexionsgrades des Haares ausgestattet sind.
3. Elektronisch gesteuertes System (129), nach den Ansprüchen 1 und / oder 2, **dadurch gekennzeichnet, dass** die ersten Messmittel (20) in zumindest einem Zusatzgerät (52) integriert sind und mit mindestens einem Messfühler für die Erfassung der Werte der Temperatur und / oder der Feuchtigkeit und / oder des Reflexionsgrades des Haares ausgestattet sind.

4. Elektronisch gesteuertes System (129), nach den Ansprüchen 1 bis 3, **dadurch gekennzeichnet, dass** die ersten Messmittel (20) in zumindest einem speziellen Zusatzgerät (26) integriert sind und mit mindestens einem Messfühler für die Erfassung der Werte der Temperatur und / oder der Feuchtigkeit und / oder des Reflexionsgrades des Haares ausgestattet sind.

5. Elektronisch gesteuertes System (129), nach einem oder mehreren der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** die erwähnten dritten Messmittel (20) mit mindestens einer Videokamera (33) und mindestens einem Bildschirm (24) für das Wärmebild (34) ausgestattet und an die erwähnte Zentraleinheit (19) angeschlossen sind und dass diese dritten Messmittel (20) Abbilder der Haare in einem vorgegebenen Bereich (27) ohne mit diesen in Berührung zu kommen, erfassen und wiedergeben und die Werte der Luftfeuchtigkeit und / oder der Temperatur an der Oberfläche der Haare und / oder die Werte der Luftfeuchtigkeit und / oder der Temperatur des tiefsten Bereichs (136) besonders voluminösen Haares erfasst und ein Wärmebild des Haares auf dem erwähnten Bildschirm (24) darstellt.

6. Elektronisch gesteuertes System (129) nach dem Anspruch 3, **dadurch gekennzeichnet, dass** die ersten Messmittel (20), die in das erwähnte Haartrocken- und Formgebungswerkzeug (52) integriert sind, mindestens ein elektronisches Erkennungssystem (37) umfassen, das wenn das Werkzeug (52) mit der erwähnten Luftstromrichtdüse (50) verbunden wird, mittels eines Anwesenheitsmelders (38) das System über die Anwesenheit des erwähnten Werkzeuges informiert und dass die vom Benutzer eingegebenen Leistungsmerkmale automatisch von der Zentraleinheit (19) eingestellt werden.

7. Elektronisch gesteuertes System (129) nach einem oder mehreren der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** es mit einem Mehrzweckwerkzeug (26) ausgestattet ist, welches nicht mit der Luftstromrichtdüse (50) zusammenwirkt, und ein als Halbrohr (100) ausgeführtes Teil beinhaltet, das die Bürsten (67) während der Formgebung bedeckt, um Verluste heißer Luft zu vermeiden, dass das erwähnte Mehrzweckwerkzeug (26) mindestens eine kammförmige Seite aufweist, dass das erwähnte Mehrzweckwerkzeug (26) mit Messmitteln (20) für die Messung von physikalisch-chemischen Werten der Haare ausgestattet ist.

8. Elektronisch gesteuertes System (129) nach dem vorhergehenden Anspruch, **dadurch gekennzeichnet, dass** es folgende Teile enthält:

- Ein Gerät für die Diffusion eines kalten Luftstroms (96) und einen Taster (94),
- Eine Schnellwechsel-Verbindung (141),
- Einen Druckluftschlauch (93) im Inneren des Spezialwerkzeugs (26), und
- Mindestens einen Luftkanal (17) für die Diffusion der Luft,

welcher das Ergebnis der Formgebung verbessert.

9. Elektronisch gesteuertes System (129) nach dem Anspruch 7 und / oder 8, **dadurch gekennzeichnet, dass** es mindestens ein Gerät (92, 95, 97) für die direkte Erzeugung und Verteilung von kalter Luft umfasst, welches mit dem erwähnten Spezialwerkzeug (26) verbunden ist, und dass es mit mindestens einem Kleinst-Kompressor (21) und einem Mittel zur Luftkühlung (22) ausgestattet ist, deren Betrieb unabhängig vom Trocken- und Formgebungs-Luftstrom ist und das sofortige und optimale Fixieren der Haare (5) ermöglicht.

10. Elektronisch gesteuertes System (129) nach einem oder mehreren der Ansprüche 7 bis 9, **dadurch gekennzeichnet, dass** es mindestens einen Luftschlauch (42) besitzt, der eine gewellte dünne Silizium-Platte (43), eine spiralförmig Struktur mit elektrischer Isolierung, einen Schnellwechsel-Anschluss (für das Verbinden und das Trennen) (134), umfasst, sowie die Möglichkeit bietet, Folgendes aufzunehmen:

- Elektrische Leitungen (45) der elektrischen Heizvorrichtung (4),
- Signalleitungen (46) der Messmittel (20),
- Kabel (47) für den Anschluss von Steuerschaltern (25) auf der Luftstromrichtdüse (50) und einen Luftschlauch (49) für das Mehrzweckwerkzeug (26).

11. Elektronisch gesteuertes System (129) nach einem oder mehreren der Ansprüche 1 bis 10, **dadurch gekennzeichnet, dass** mindestens eine der erwähnten Luftstromrichtdüsen (50) aus ultraleichten Aramidfasern und / oder Kohlenstofffasern hergestellt ist, um die Belastung der Handgelenke des Benutzers zu reduzieren.

12. Elektronisch gesteuertes System (129) nach einem oder mehreren der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** es ein Glätteisen (73) mit zwei gegenüberliegenden Platten (74), die mit einer Schicht von Borsten (75) zum Ordnen der Haare bedeckt sind, umfasst, dass die erwähnten Platten gegenüberliegende Glättrollen (76) besitzen, dass die erwähnten Platten und Rollen mithilfe eines Handgriffs (139) hin und her bewegt werden, und dass das erwähnte Glätteisen (73) Luftkanäle (17) für die Verteilung der Luft (66) besitzt, welche das Ergebnis der Formgebung verbessern.
13. Elektronisch gesteuertes System (129) nach einem oder mehreren der Ansprüche 1 bis 12, **dadurch gekennzeichnet, dass** der Griff (57) der Luftstromrichtdüse (50) eine ergonomische Form (58) besitzt, die der ihn umgreifenden Hand entspricht, wenn der erwähnte Griff (57) mit dem, dem Daumen zugewandten Teil der Handfläche (59) umschlossen wird und durch den Druck des Ringfingers und des kleinen Fingers (61) gehalten wird, um die Handhabung der Luftstromrichtdüse (50) zu verbessern und die Belastung des Handgelenks des Benutzers zu reduzieren.
14. Elektronisch gesteuertes System (129) nach dem vorhergehenden Anspruch, **dadurch gekennzeichnet, dass** ein Teil (62) des Werkzeugs (52) frei drehend oder um eine Achse (60) schwingend ist, sich in einem Gebiet (146) zwischen der Luftstromrichtdüse (50) und des Werkzeugs (52) selbst befindet und eine ergonomische Form besitzt, die den festen Halt der Luftstromrichtdüse (50) und die wirksame Drehung der Werkzeuge (52) mit nur mit einer Hand erlaubt, das erwähnte Teil (62) ist mit dem Werkzeug (52) selbst verbunden.
15. Elektronisch gesteuertes System (129) nach dem Anspruch 1, **dadurch gekennzeichnet, dass** es Geräte (143) für die Erfassung von Ausmaßen und / oder physikalischen und / oder chemischen Werten der Haare mittels des Werkzeugs (144) zur Dickenmessung der Haare und / oder mithilfe eines Sets für die Schnellanalyse (145) zur Erfassung der mineralischen Zusammensetzung und / oder des pH-Wertes der Haare und / oder der Daten über den Haartyp umfasst, dass diese Geräte (143) mittels einer Software und der Zentraleinheit (19) automatisch die Leistung des Systems (129) einstellen und / oder dem Benutzer über den Bildschirm (24) Informationen anzeigen.
16. Elektronisch gesteuertes System (129) nach dem Anspruch 1, **dadurch gekennzeichnet, dass** die Software ein Programm beinhaltet, das über die Zentraleinheit (19) das System in folgenden Betriebszuständen selbst einstellt:
- Manueller Betrieb (108),
 - Manueller Betrieb mit Selbstlern-Funktion (109),
 - Trocknen und erste Formgebung (112),
 - Haarbehandlung und Endformgebung (114),
 - Phantombild-Modus.
17. Elektronisch gesteuertes System (129) nach dem Anspruch 16, **dadurch gekennzeichnet, dass** die Software ein Programm für den manuellen Betrieb (108) beinhaltet, in diesem manuellen Betrieb (108) kann, mithilfe der Zentraleinheit (19) das System (129) selbst wie ein traditioneller Haartrockner verwendet werden, dass die erwähnte Zentraleinheit (19) den Benutzer über das Erreichen der voreingestellten Werte von Temperatur und / oder Glanz und / oder Feuchte (29) der Haare durch akustische und / oder visuelle Signale (28) informiert.
18. Elektronisch gesteuertes System (129) nach dem Anspruch 16, **dadurch gekennzeichnet, dass** die Software ein Programm beinhaltet, das bei manuellem Betrieb gestattet, die Selbstlern-Funktion (109) zu verwenden, welche mithilfe der Zentraleinheit (19) die folgenden, vom System benutzten technischen Daten (110) speichert und kodiert (111):
- Zeit und Dauer,
 - Profile der Geschwindigkeit und der Beschleunigung des Motors-Gebläses,
 - Strom- und Temperatur-Daten der elektrischen Heizvorrichtung (s),
 - Dauer der Arbeitsschritte,
19. Elektronisch gesteuertes System (129) nach dem Anspruch 16, **dadurch gekennzeichnet, dass** die Software über ein elektronisches Programm für den Trocknen- und Vor-Formgebungsmodus (112) verfügt, in dem mithilfe der Zentraleinheit (19) das System die Profile für die Luftgeschwindigkeit und die elektrische Heizvorrichtung (en) so einstellt, dass die Luft mit großem Volumenstrom und hohen Temperaturen (113) gefördert wird, das System beendet das Programm unter Auslösung von akustischen und / oder visuellen Signalen (28), wenn der Wert der Feuchtigkeit des Haares mit der nächsten Formgebungsphase kompatibel ist.

20. Elektronisch gesteuertes System (129) nach dem Anspruch 16, **dadurch gekennzeichnet, dass** die Software über ein elektronisches Programm for den Modus der Haarbehandlung und Endformgebung (114) verfügt, in dem mithilfe der Zentraleinheit (19) das System die Profile für die Luftgeschwindigkeit und die elektrische Heizvorrichtung (en) so einstellt, das die Luft mit geringem Volumenstrom und niedrigen Temperaturen (115) gefördert wird, das System beendet das Programm unter Auslösung von akustischen und / oder visuellen Signalen (28), wenn der Wert der Feuchtigkeit des Haares mit der nächsten Formgebungsphase kompatibel ist.
21. Elektronisch gesteuertes System (129) nach dem Anspruch 16, **dadurch gekennzeichnet, dass** die Software ein Programm beinhaltet, das im Phantombild-Modus (Abb. 37) verwendet werden kann, indem mithilfe der Zentraleinheit (19), unter Verwendung einer Technologie, die die Verfahren von Identikit benutzt, das Abbild des Gesichtes (185) des Kunden durch eine besondere Vorrichtung (186) gespeichert wird, und dass verschiedene neue Arten der Formgebung der Haare (184) dem Kunden vorgeschlagen werden, damit dieser die geeignetste auf einem Bildschirm (24) auswählen kann.
22. Elektronisch gesteuertes Systems (129) nach dem Anspruch 1, **dadurch gekennzeichnet, dass** die Software ein Programm beinhaltet, das über die Zentraleinheit (19) die Geschwindigkeit der Veränderung (142) der Feuchtigkeit (102) und / oder der Temperatur (103) überwacht und den Benutzer automatisch mithilfe akustischer und optischer Signale informiert und die Anomalien korrigiert, und so physikalisch-chemische Belastungen der Haare vermeidet.
23. Elektronisch gesteuertes System (129) nach einem oder mehreren der Ansprüche 16 bis 22, **dadurch gekennzeichnet, dass** die Software ein Programm beinhaltet, das über die Zentraleinheit (19) auf der Grundlage der durch die Geräte (143) für die Haar-Datenerfassung erfassten Werte die entsprechenden Produkte (148) in einem Spender (147) bereitstellt, und dem Benutzer die richtigen Produkte anbietet oder die richtigen Produkte auf dem Haar verteilt, dies mittels eines speziellen Schlauches (149) im Inneren des Luftschlauches der Luftstromrichtdüse (50) und / oder innerhalb des Luftschlauches des Mehrzweck-Werkzeugs (26).
24. Elektronisch gesteuertes System (129) nach einem oder mehreren der Ansprüche 16 bis 23, **dadurch gekennzeichnet, dass** die Software ein Programm (187) beinhaltet, das über die Zentraleinheit (19) folgende Daten einliest:
- Feuchtigkeit des Haares (102) und / oder
 - Temperatur des Haares (103),
 - Die Geschwindigkeit der Veränderung (142) der Feuchtigkeit des Haares (102) und / oder
 - Die Geschwindigkeit der Veränderung (142) der Temperatur des Haares (103),
- die durch die Messmittel (20) erfasst werden, und dass es diese mit den vorgegebenen Werten vergleicht und entsprechende Veränderungen der Stromversorgung der elektrische Heizung (en) (4) und / oder des Motors (130) bis zur automatischen Wiederherstellung der vorgegebenen Gleichgewichtsbedingungen vornimmt.
25. Elektronisch gesteuertes System (129) nach dem vorhergehenden Anspruch, **dadurch gekennzeichnet, dass** das Programm (187), über die Zentraleinheit (19) bei Anomalien mit akustischen und / oder visuellen Signalen (28), gelb (182) oder rot (183) blinkenden Signalen, entsprechend der Schwere der festgestellten Anomalie warnt und das im Fall der Erfassung von ordnungsgemäßen Werten (179) das Zurücksetzen der Warnung (180) veranlasst und das Kontrollverfahren nach einer vordefinierter Frequenz wiederholt, und den Benutzer ununterbrochen und automatisch über den reibungslosen Ablauf der Haartrocknung durch Aufleuchten eines grünen Signals (181) informiert.

Revendications

1. Système commandé électroniquement (129), à faible impact énergétique et environnemental, pour le séchage contemporain et le modelage des cheveux, comprenant :
- au moins un groupe moteur (130), au moins un ventilateur (39), au moins un dispositif pour le chauffage de l'air, au moins un diffuseur d'air (50) pour la distribution de l'air et/ou au moins un outil pour le séchage et le modelage des cheveux (52) avec au moins un canal intérieur (17) pour la distribution de l'air (66), au moins un tuyau (42) pour le connexion du diffuseur d'air et/ou de l'/des outil/s avec le groupe moteur (130),
 - moyens capteurs (20) qui mesurent les valeurs de la température dans le système,
 - au moins une unité centrale électronique qui régit tout le système (129), y compris une unité centrale (19) et

logiciels pour l'élaboration des données (132) qui acquièrent et/ou mémorisent les valeurs de la température lues par les capteurs (20) et/ou les valeurs de la température insérées par un opérateur, qui compare ces données ;

5 **caractérisé en ce qu'il comprend**

- premiers moyens capteurs (20) placés à l'intérieur d'au moins un outil pour le séchage et le modelage des cheveux (52) pour mesures de contact direct avec les cheveux, pendant l'activité de peignage et/ou
- deuxièmes moyens capteurs (20) placés à l'intérieur d'au moins un spécial outil pour le modelage des cheveux (26) pour mesures de contact direct avec les cheveux, pendant l'activité de peignage et/ou
- troisièmes moyens capteurs (20) placés proche (27) du système et orienté vers le domaine de travail pour mesures à distance,

15 **et en outre il comprend**

- ladite unité centrale (19) qui inclut moyens électroniques (106) pour l'acquisition des données, moyens électroniques pour le traitement et mémorisation des données (131), et logiciels qui élaborent (132) et acquièrent et/ou mémorisent les valeurs lues par lesdits premiers moyens capteurs et/ou deuxièmes moyens capteurs et/ou troisièmes moyens capteurs (20), et/ou les valeurs insérées par l'opérateur, élaborent ces données et par conséquence envoient signaux opérationnels vers l'unité centrale électronique qui régit tout le système (129) afin de contrôler ledit au moins un groupe moteur (130), au moins un ventilateur (39), au moins un dispositif (4) pour le chauffage de l'air, en évitant le dépassement des limites de sécurité préétablies, en protégeant de cette façon la santé des cheveux et/ou la santé du cuir chevelu, et en permettant leur bon traitement, qui sont beaucoup sensibles aux conditions microclimatiques, tandis que un signal d'alarme (28) est émis, et/ou procédures de sécurité sont activées dès que les niveaux d'attention (29) sont atteints, qui alertent l'opérateur.

2. Système commandé électroniquement (129), selon la revendication 1, **caractérisé en ce que** lesdits premiers moyens capteurs et/ou deuxièmes moyens capteurs et/ou troisièmes moyens capteurs (29) incluent au moins un capteur pour la détection des paramètres de température et/ou humidité et/ou degré de réflexion des cheveux.

3. Système commandé électroniquement (129), selon la revendication 1 ou 2, **caractérisé en ce que** lesdits premiers moyens capteurs (20) sont inclus dans au moins un outil (52) et comprennent au moins un capteur pour la détection des paramètres de température et/ou humidité et/ou degré de réflexion des cheveux.

4. Système commandé électroniquement (129), selon l'une des revendication 1 à 3, **caractérisé en ce que** lesdits deuxièmes moyens capteurs (20) sont inclus dans au moins un outil spécial (26) et comprennent au moins un capteur pour la détection des paramètres de température et/ou humidité et/ou degré de réflexion des cheveux.

5. Système commandé électroniquement (129), selon l'une des revendications 1 à 4, **caractérisé en ce que** lesdits troisièmes moyens capteurs (20) incluent au moins une caméra vidéo (33) et au moins un écran (24) pour la carte thermique (34), lié avec ladite unité centrale (19), et qui lesdits troisièmes moyens capteurs (20) captent et représentent images des cheveux sans entrer en contact avec eux dans un prédéterminé domaine (27) et détectent les valeurs de surface de l'humidité et/ou température, et/ou la valeur de l'humidité et/ou de la température dans un domaine le plus profond (136) à l'intérieur des cheveux particulièrement volumineux, pour donner la carte thermique des cheveux sur ledit écran (24).

6. Système commandé électroniquement (129), selon la revendication 3, **caractérisé en ce que** lesdits premiers moyens capteurs (20) inclus dans lesdites outils de séchage et modelage (52) comprend au moins un moyen d'identification électronique (37) qui, lorsque l'outil (52) est installé sur ledit diffuseur d'air (50), par un récepteur (38) informe le système sur la présence du dit outil et les performances du programme choisies par l'opérateur sont automatiquement configurées par l'unité centrale (19).

7. Système commandé électroniquement (129), selon l'une des revendications 1 à 6, **caractérisé en ce qu'il comprend** un outil polyvalent (26), qui ne coopère pas avec le diffuseur d'air (50), et inclut une portion semi-cylindrique (100), qui couvre brosses (67) pendant l'opération de modelage pour éviter pertes d'air chaude, qui ledit outil polyvalent (26) a au moins un coté en forme d'un peigne (101), et que ledit outil polyvalent (26) est pourvu de moyens capteurs (20) pour le mesurage des valeurs physiques - chimiques des cheveux.

8. Système commandé électroniquement (129), selon la revendication précédente, **caractérisé en ce qu'il** inclut :

- un dispositif pour la diffusion d'un jet d'air froide (96) et une clé de contact (94),
- une connexion de changement rapide (141),
- une tuyauterie d'air comprimé (93) dans l'intérieur de l'outil spécial (26), et
- au moins un tuyau d'air (17) pour la diffusion de l'air,

qui valorisent les résultats de l'opération de modelage.

9. Système commandé électroniquement (129), selon la revendication 7 et/ou 8, **caractérisé en ce qu'il** comprend au moins un dispositif (92, 95, 97) pour la production et la distribution directe de l'air froide qui est lié au dit outil spécial (26), et inclut un mini-compresseur (21) et moyens de refroidissement par air (22), fonctionnellement indépendants du flux d'air du séchage et modelage et qui permettent la fixation immédiate et optimale des cheveux (5).

10. Système commandé électroniquement (129), selon l'une des revendications 7 9, **caractérisé en ce qu'il** inclut au moins un tuyau d'air (42) qui comprend une plaque de silicium mince et ondulée (43), une structure en spirale avec moyens d'isolation électrique, un moyen de connexion et déconnexion rapide (134), moyens pour le passage de :

- câbles électriques (45) du radiateur électrique (4),
- câbles de signaux (46) du moyen capteur (20),
- câbles (47) pour la connexion des commutateurs de commande (25) sur le diffuseur (50),

et pour le passage d'un tuyau d'air (48) pour l'outil polyvalente (26).

11. Système commandé électroniquement (129), selon l'une des revendications 1 à 10, **caractérisé en ce que** ledit au moins un diffuseur (50) d'air est constitué par fibres aramides et/ou fibres de carbone ultra légères, pour réduire charges sur les poignets de l'opérateur.

12. Système commandé électroniquement (129), selon l'une des revendications 1 à 11, **caractérisé en ce qu'il** comprend un outil de repassage (73) incluant deux plaques opposées (74) couvertes par une couche de poils (75) pour l'alignement des cheveux, qui lesdites plaques ont rouleaux de repassage opposés (76), lesdites plaques et lesdits rouleaux se déplacent d'avant en arrière par une poignée (139), et qui ledit outil de repassage (73) a tuyaux d'air (17) pour la diffusion de l'air (66), en valorisant les résultats de l'opération de modelage.

13. Système commandé électroniquement (129), selon l'une des revendications 1 à 12, **caractérisé en ce que** la portion de manipulation (57) du diffuseur (50) a une forme ergonomique (58) assimilée à l'impression de la main naturellement enveloppée sur lui, lorsque ladite portion (57) est saisie avec la partie de la paume de la main (59) proche de la racine du pouce, et détenue par la pression de l'annulaire et du petit doigt (61), pour habiliter la prise du diffuseur (50), et pour réduire charges sur le poignet de l'opérateur.

14. Système commandé électroniquement (129), selon la revendication précédente, **caractérisé en ce qu'une** portion (62) de l'outil (52) est libre de tourner ou osciller autour d'un axe (60), est positionnée dans un domaine (146) entre le diffuseur (50) et l'outil (52) lui-même, et a une forme ergonomique, qui permet la prise ferme du diffuseur (50) et la rotation efficace des outils (52) seulement avec une main, étant ladite portion (62) liée à l'outil (52) lui-même.

15. Système commandé électroniquement (129), selon la revendication 1, **caractérisé en ce qu'il** inclut dispositifs (143) pour l'acquisition des données dimensionnelles et/ou physiques et/ou chimiques des cheveux, par l'outil (144) mesurant l'épaisseur des cheveux, et/ou par le kit pour l'analyse rapide (145) pour acquérir la composition minérale et/ou le degré de PH des cheveux, et/ou données sur le type des cheveux, dispositifs (143) qui, par un programme électronique et par une unité centrale (19), automatiquement configurent les performances du système (129) lui-même, et/ou visualisent informations à l'opérateur par l'écran (24).

16. Système commandé électroniquement (129), selon la revendication 1, **caractérisé en ce que** le logiciel inclut un programme électronique qui, par l'unité centrale (19), effectue la configuration du système lui-même dans les suivantes modes d'utilisation :

- mode manuel (108),
- mode manuel avec fonction d'auto-apprentissage (109),

- mode de séchage et pré-modelage (112)
- mode de traitement des cheveux et modelage final (114)
- mode d'identikit.

5 17. Système commandé électroniquement (129), selon la revendication 16, **caractérisé en ce que** le logiciel inclut un programme électronique pour le mode manuel d'utilisation (108), dans lequel, par l'unité centrale (19), le système (129) lui-même est utilisé comme un sèche-cheveux traditionnel, et dans lequel ladite unité centrale (19) informe l'opérateur sur l'achèvement des valeurs prédéterminées de température, et/ou luminosité, et/ou humidité (29) des cheveux, par signaux acoustiques et/ou visuels (28).

10 18. Système commandé électroniquement (129), selon la revendication 16, **caractérisé en ce que** le logiciel inclut un programme électronique pour le mode manuel d'utilisation avec fonction d'auto-apprentissage (109), dans lequel, par l'unité centrale (19), les suivantes données techniques en utilisation (110) sont mémorisées et codifiées (111):

- 15 - temps,
- profils de vitesse et accélération du ventilateur du moteur,
- données de l'énergie électrique et de la température du/des radiateur/s électrique/s,
- durée des phases de travail.

20 19. Système commandé électroniquement (129), selon la revendication 16, **caractérisé en ce que** le logiciel inclut un programme électronique pour le mode de séchage et pré-modelage (112) dans lequel, par l'unité centrale (19), le système organise les profils pour la vitesse du générateur d'air et pour le/s radiateur/s électrique/s, pour privilégier l'envoi d'un grand volume d'air à haute température (113), et dans lequel le système termine le programme avec l'émission de signaux acoustiques et/ou visuels (28), lorsque la valeur de l'humidité des cheveux, compatible avec
25 la suivante phase de modelage, est atteinte.

30 20. Système commandé électroniquement (129), selon la revendication 16, **caractérisé en ce que** le logiciel inclut un programme électronique pour le mode de traitement des cheveux et modelage final (114) dans lequel, par l'unité centrale (19), le système organise les profils pour la vitesse du générateur d'air et pour le/s radiateur/s pour privilégier l'envoi d'un faible volume d'air à basse température (115), et dans lequel le système termine le programme avec l'émission de signaux acoustiques et/ou visuels (28), lorsque la valeur pré-calculée de l'humidité des cheveux est atteinte.

35 21. Système commandé électroniquement (129), selon la revendication 16, **caractérisé en ce que** le logiciel inclut un programme électronique pour le mode d'identikit (fig. 37), dans lequel, par l'unité centrale (19), et par la technologie basée sur les méthodes d'identikit, l'image de la face (185) du client est obtenue par un dispositif (186), et quelques nouvelles sortes de modelage des cheveux (184) sont proposées au client pour choisir sur un écran (24) la plus appropriée.

40 22. Système commandé électroniquement (129), selon la revendication 1, **caractérisé en ce que** le logiciel inclut un programme électronique qui, par l'unité centrale (19), contrôle la vitesse de variation (142) de l'humidité (102) et/ou de la température (103) et qui automatiquement informe l'opérateur avec signaux acoustiques et visuels et corrige les anomalies, en évitant les tensions physiques-chimiques aux cheveux.

45 23. Système commandé électroniquement (129), selon l'une des revendications 16 à 22, **caractérisé en ce que** le logiciel inclut un programme électronique qui, par l'unité centrale (19), sur la base de données acquises par les dispositifs (143) pour l'acquisition des données de cheveux, sélectionne produits appropriées (148) dans un distributeur (147), et délivre les produits corrects à l'opérateur, ou propage les produits corrects sur les cheveux, par une canalisation spécifique (149) à l'intérieur du tuyau d'air du diffuseur (50), et/ou à l'intérieur du tuyau d'air de
50 l'outil polyvalent (26).

24. Système commandé électroniquement (129), selon l'une des revendications 16 à 23, **caractérisé en ce que** le logiciel inclut un programme électronique (187) qui, par l'unité centrale (19), lit les données :

- 55 - humidité des cheveux (102), et/ou
- température des cheveux (103),
- la vitesse de variation (142) de l'humidité des cheveux (102), et/ou
- la vitesse de variation (142) de la température des cheveux (103),

acquises par les moyens capteurs (20), et les compare avec les données préréglées et par conséquence, selon ces données, effectue les variations de la valeur du courant électrique délivré à/aux radiateur/s électrique/s (4), et/ou délivré au moteur (130), jusqu'à récupérer automatiquement les conditions préréglées d'équilibre.

- 5 **25.** Système commandé électroniquement (129), selon la revendication précédente, **caractérisé en ce que** le programme électronique (187), par l'unité centrale (19), informe sur toute anomalie avec signaux acoustiques et/ou visuels (28), signaux d'allumage jaunes (182) ou rouges (183) selon l'importance de l'anomalie détectée, et, en cas de détection de valeurs cohérentes (179), effectue la redirection (180) et effectue la répétition de la procédure de contrôle suivant une fréquence d'échantillonnage prédéfinie, et informe continuellement et automatiquement l'opérateur sur l'évolution correcte de l'opération de séchage, avec l'allumage d'un signal vert (181).

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Fig.1

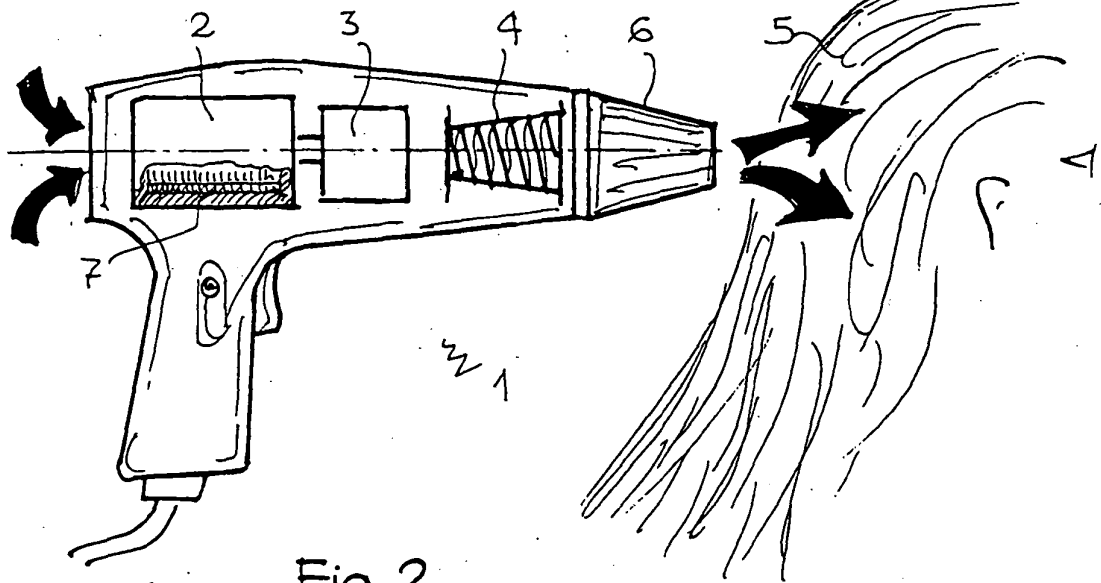


Fig.2

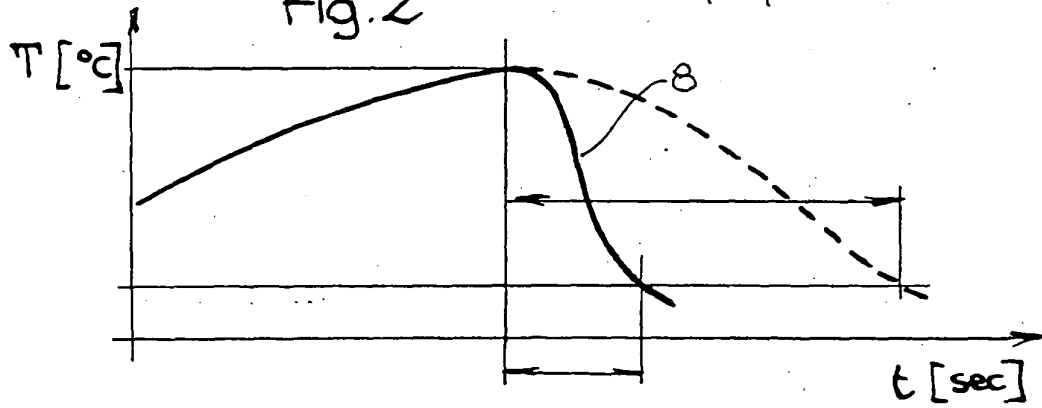
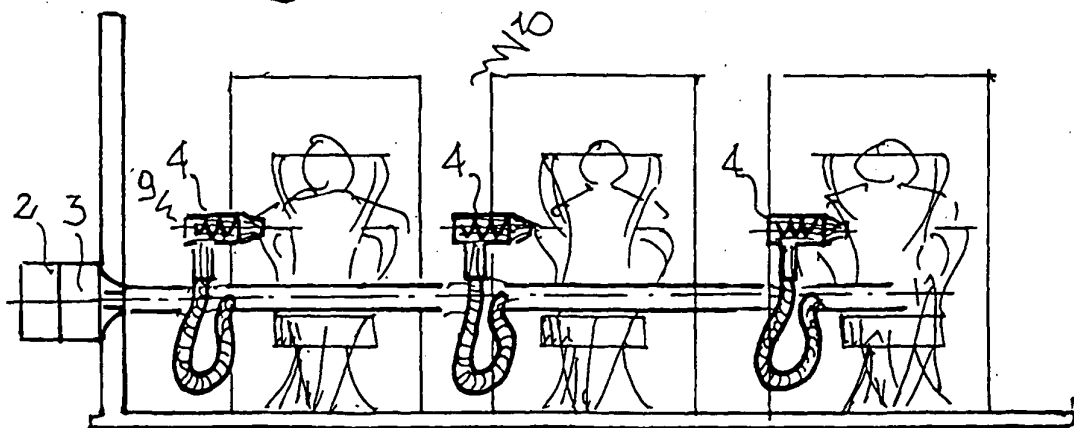
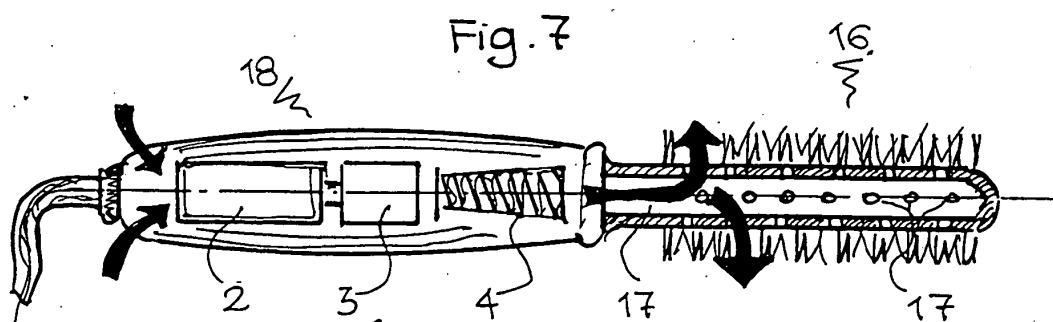
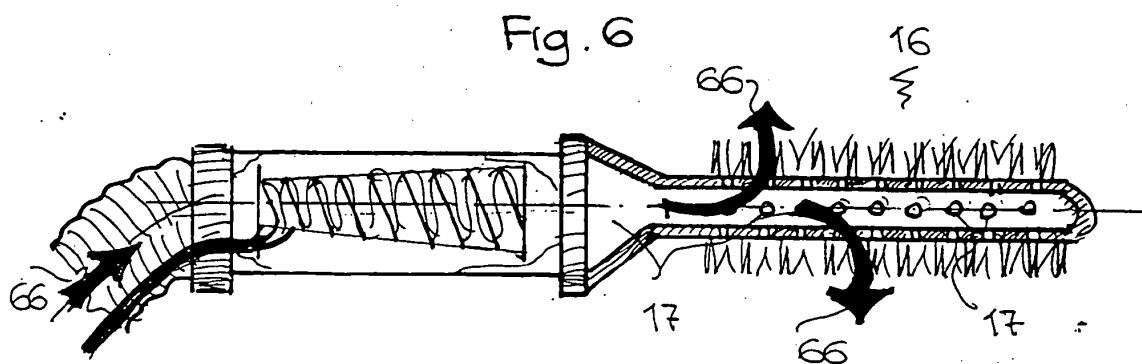
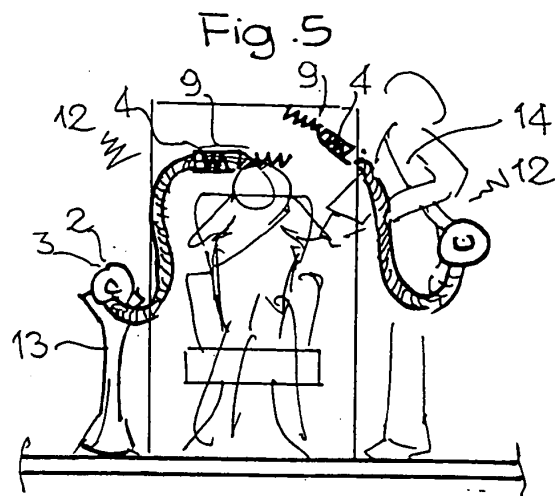
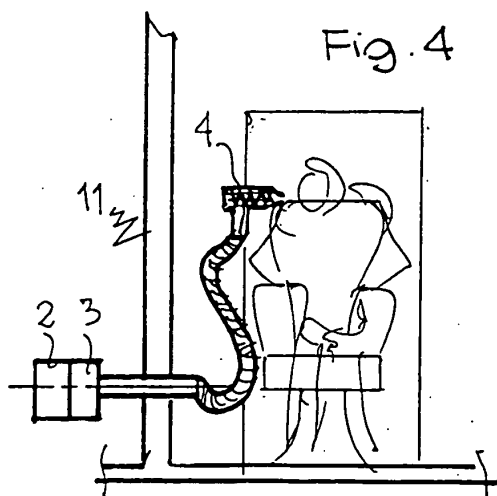
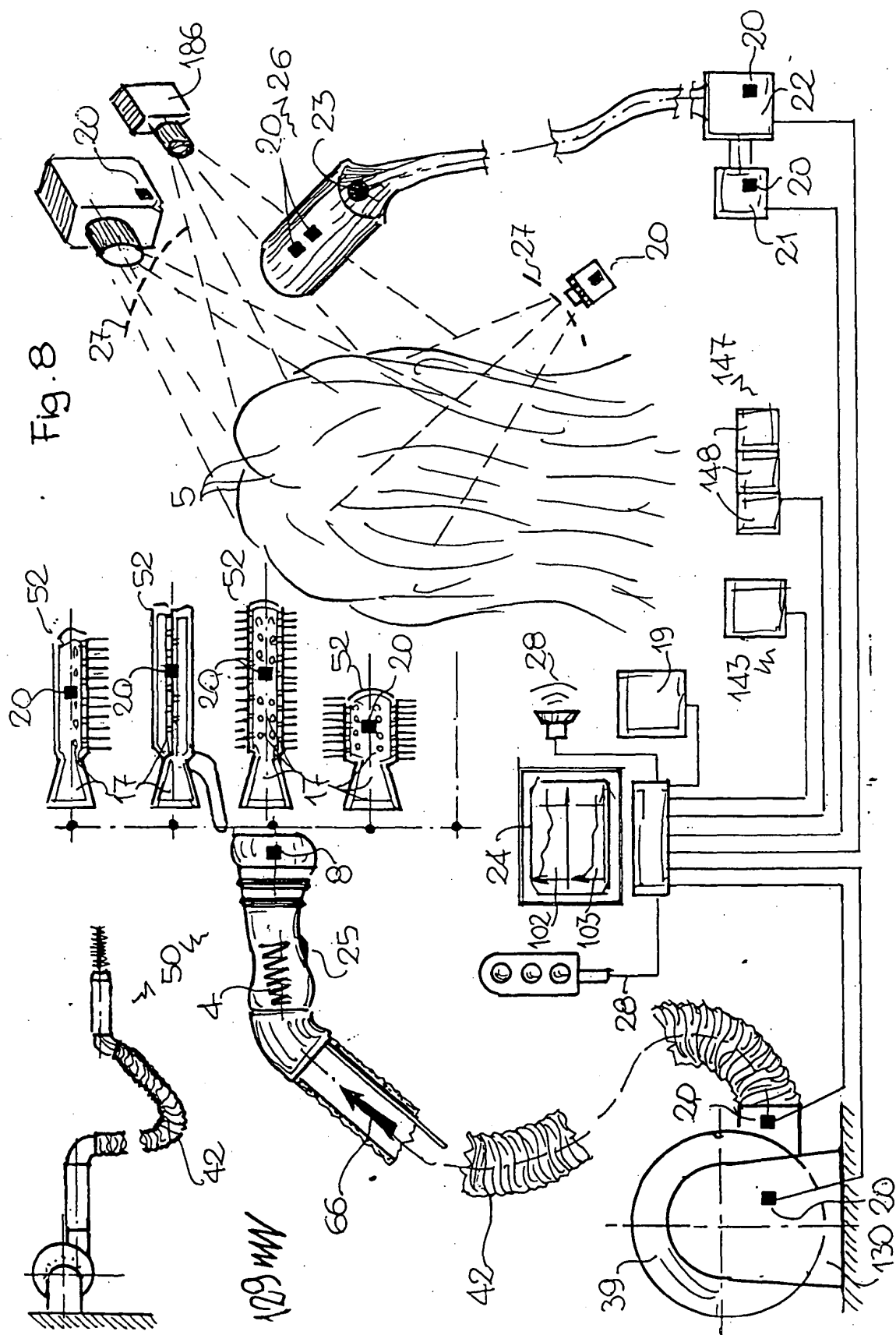
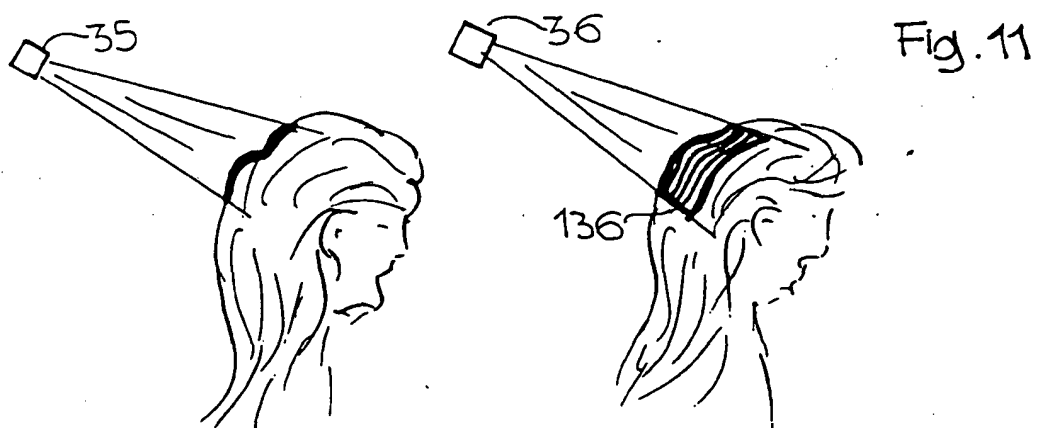
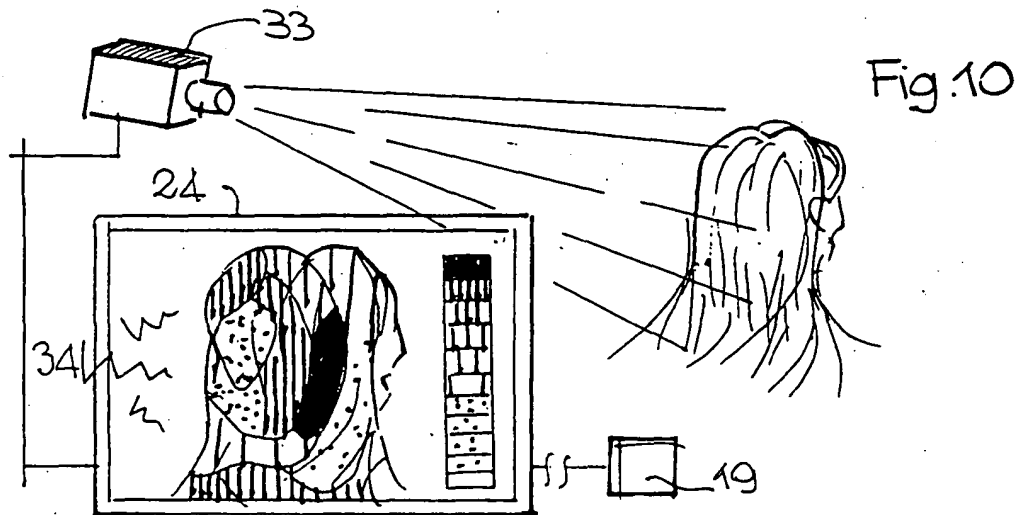
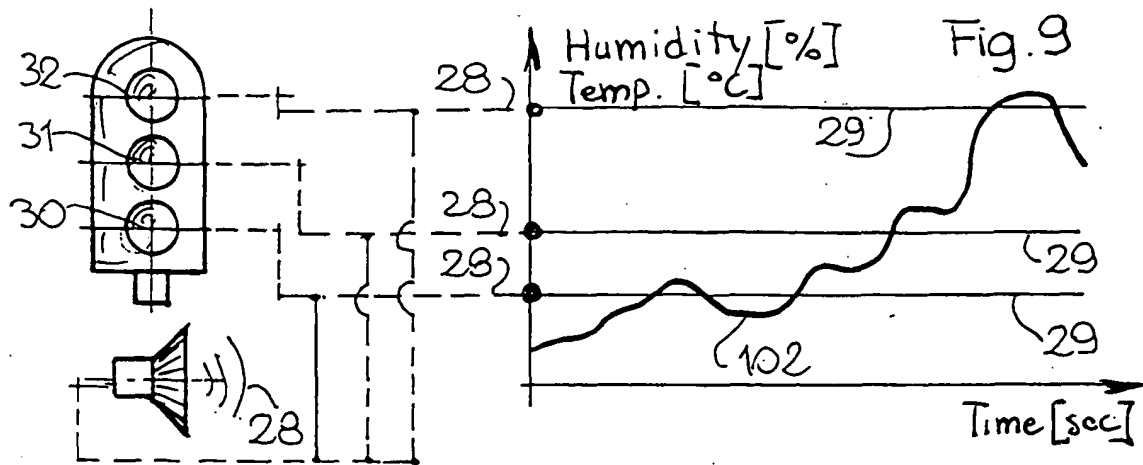


Fig.3









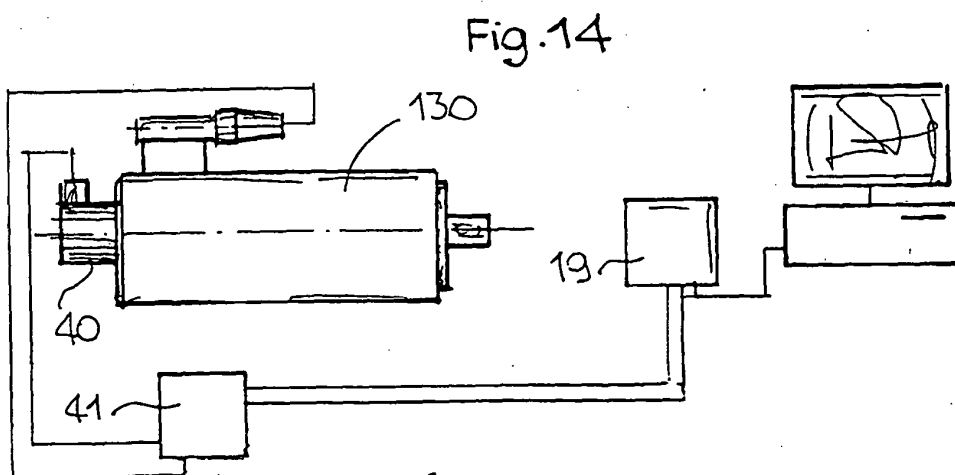
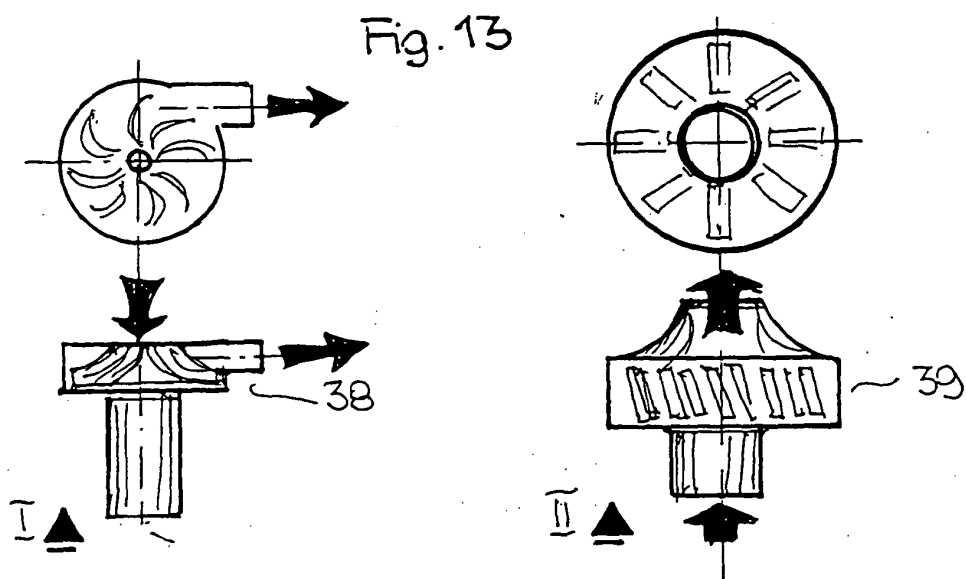
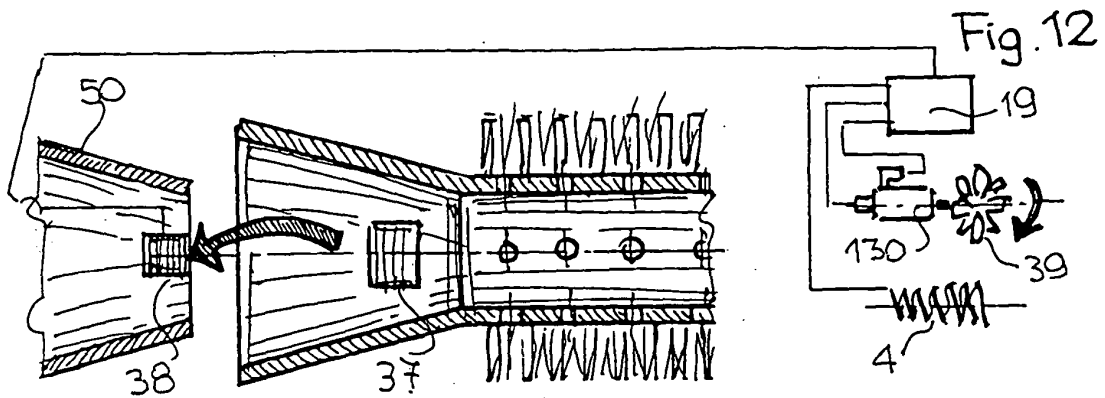
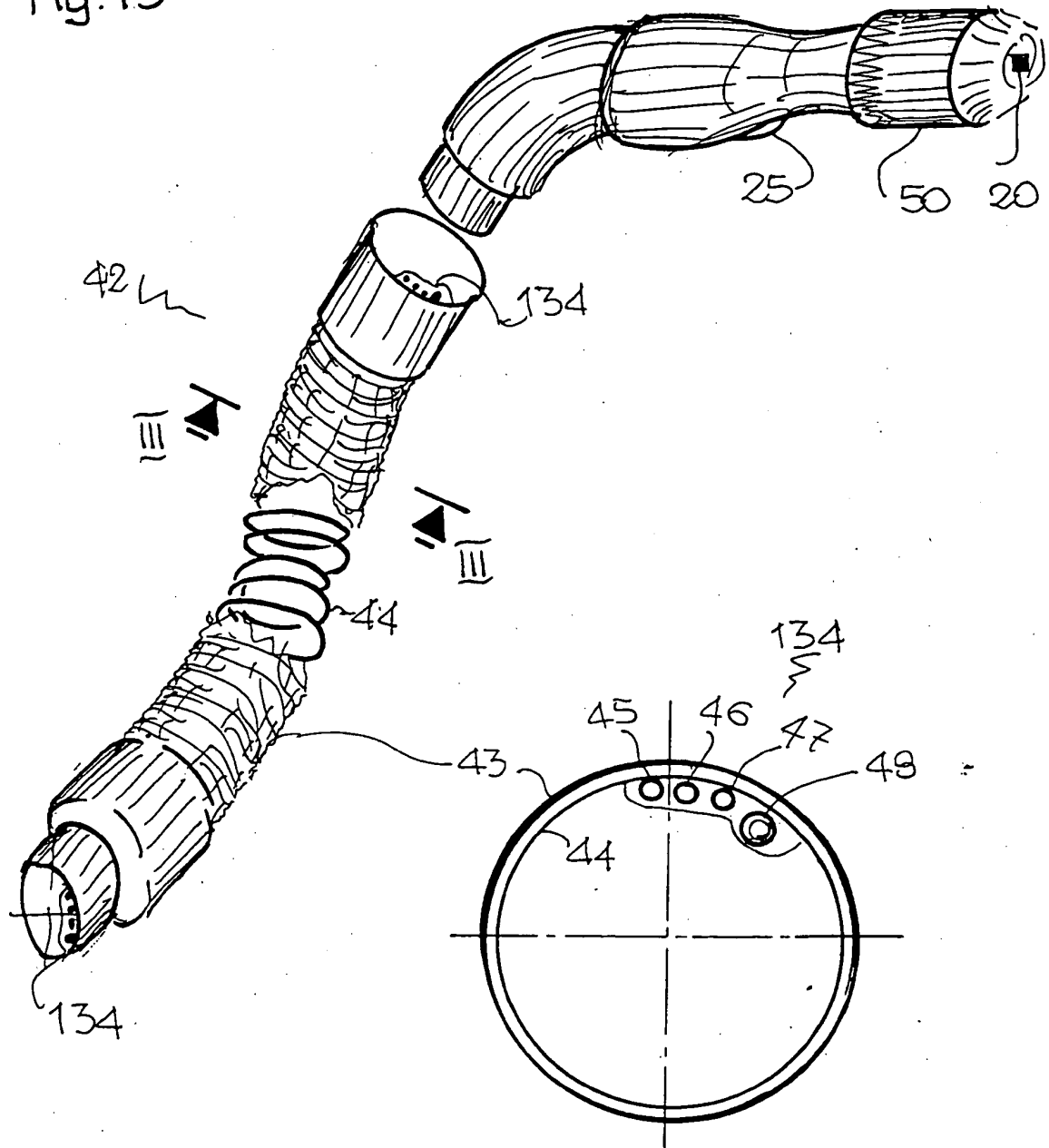
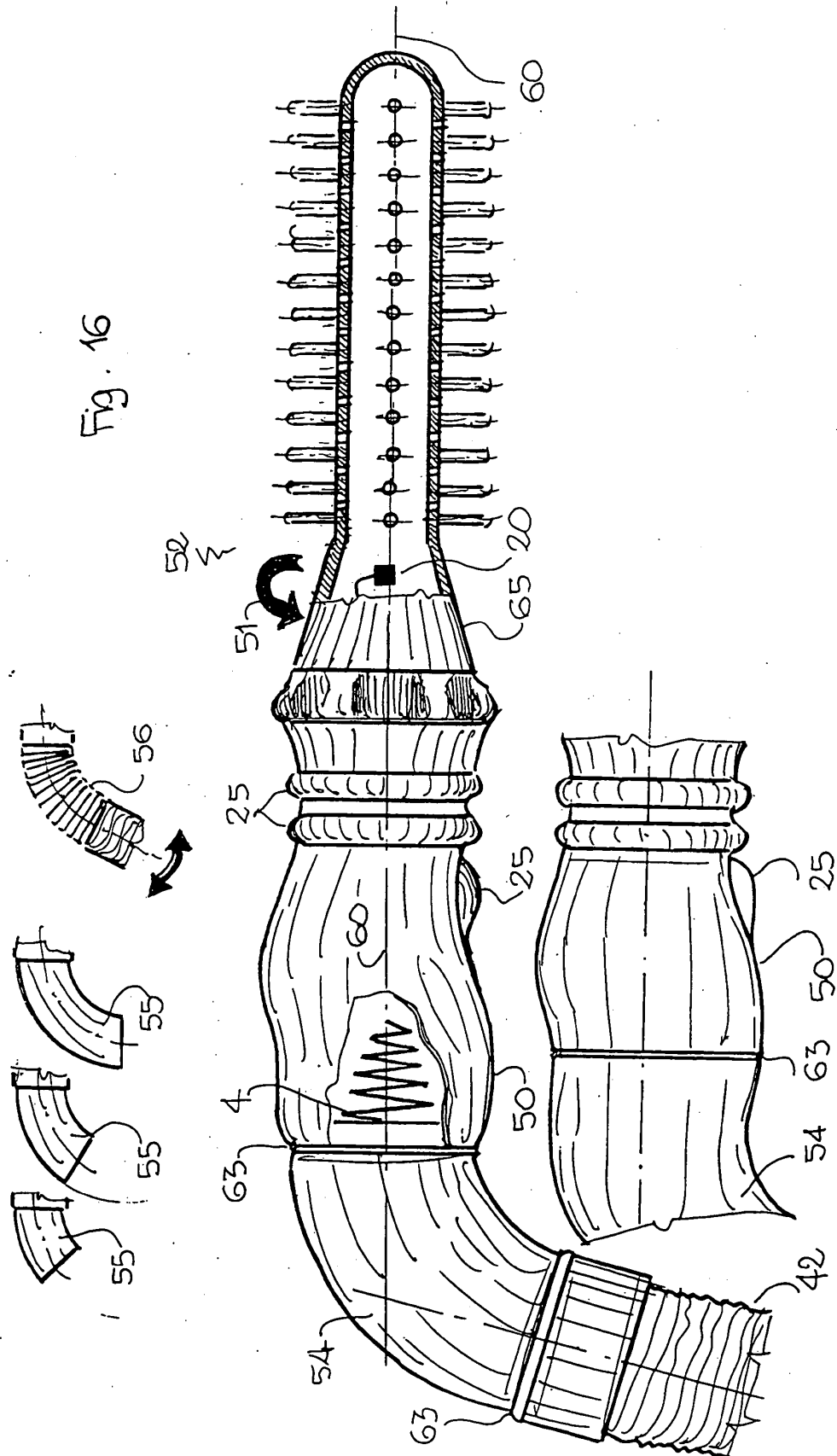


Fig.15





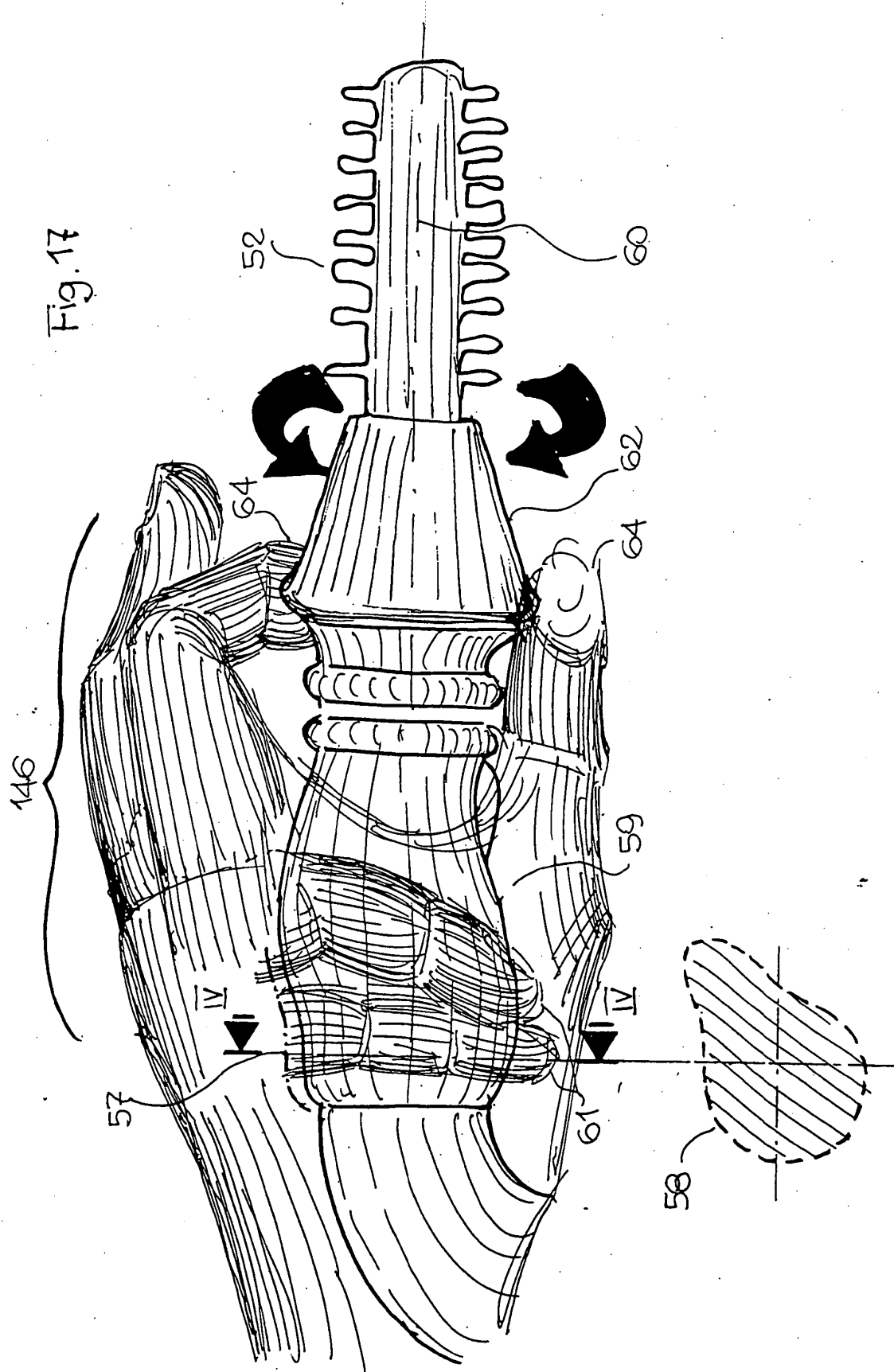


Fig.18

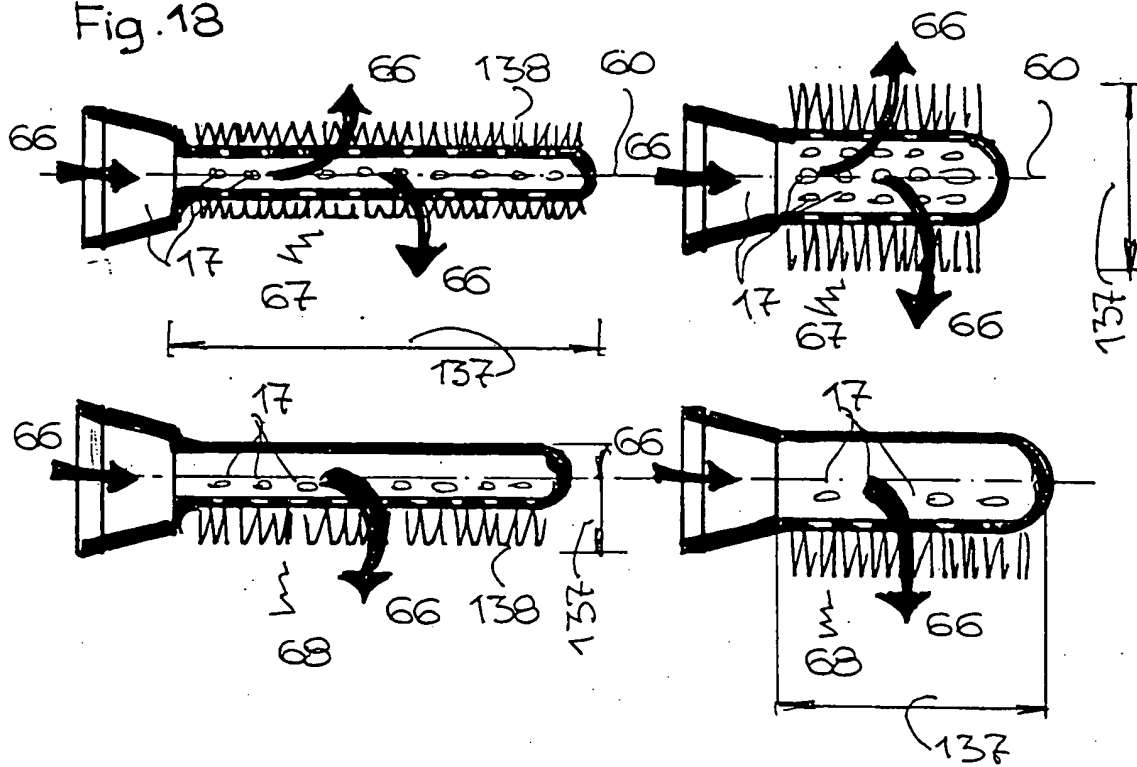
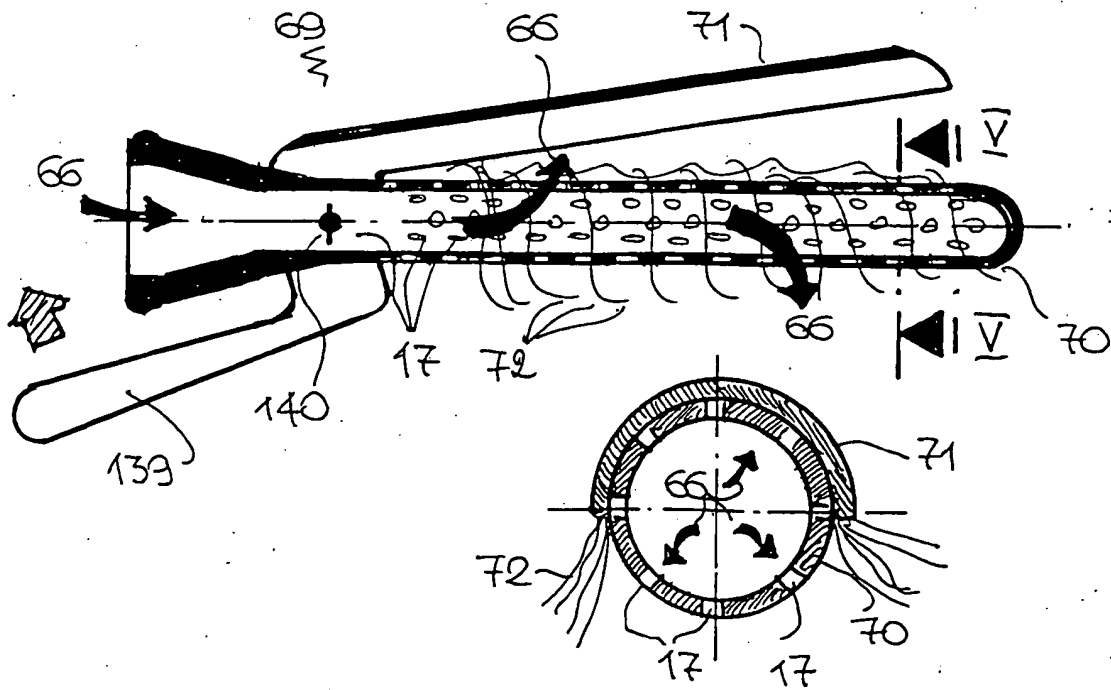


Fig.19



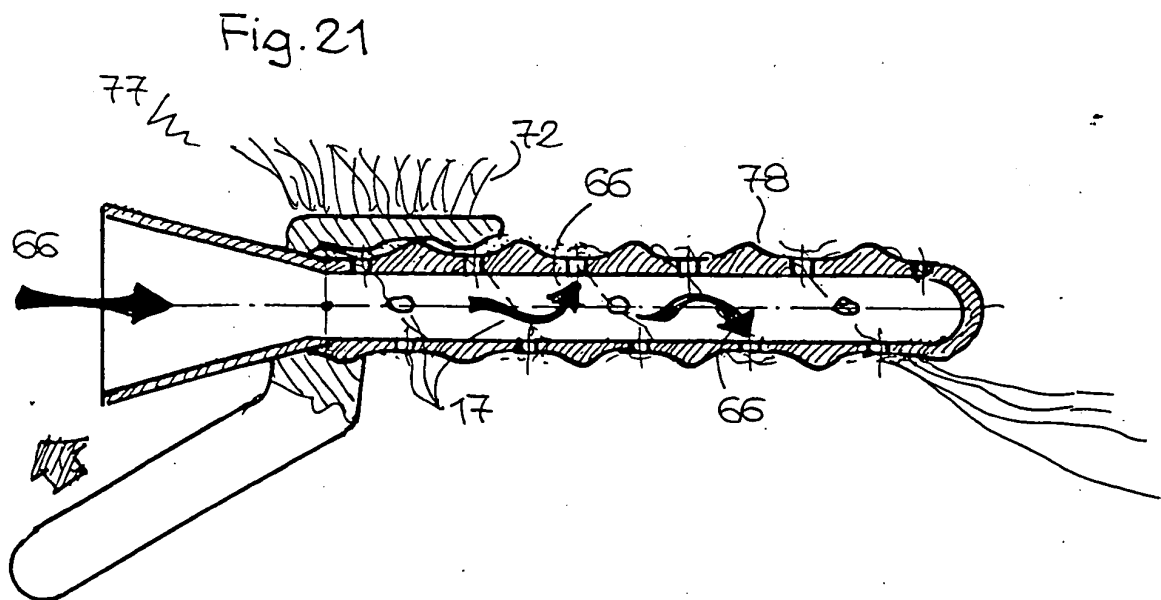
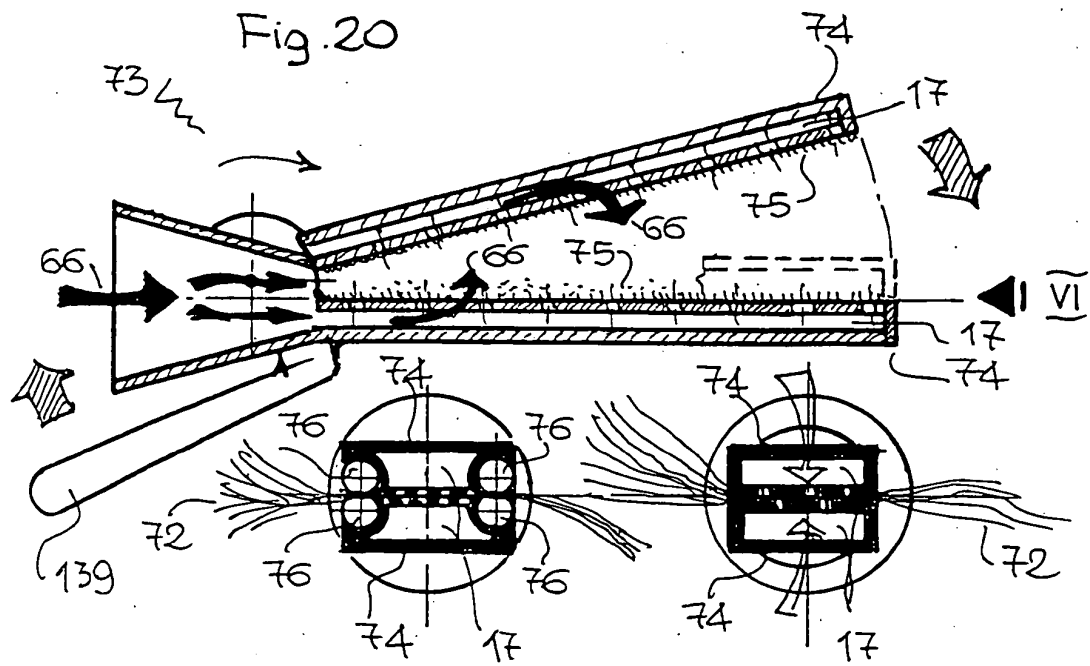


Fig. 22

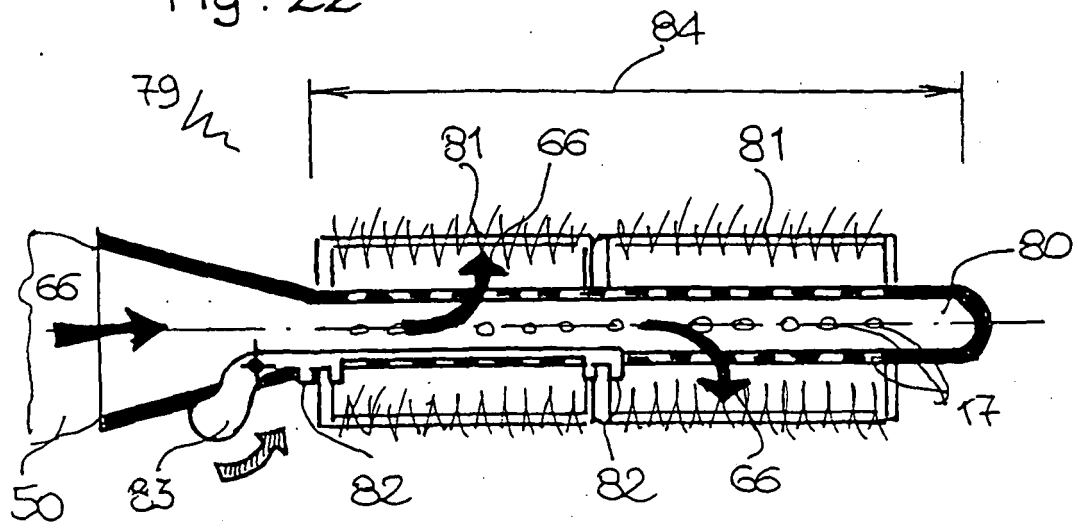


Fig. 23

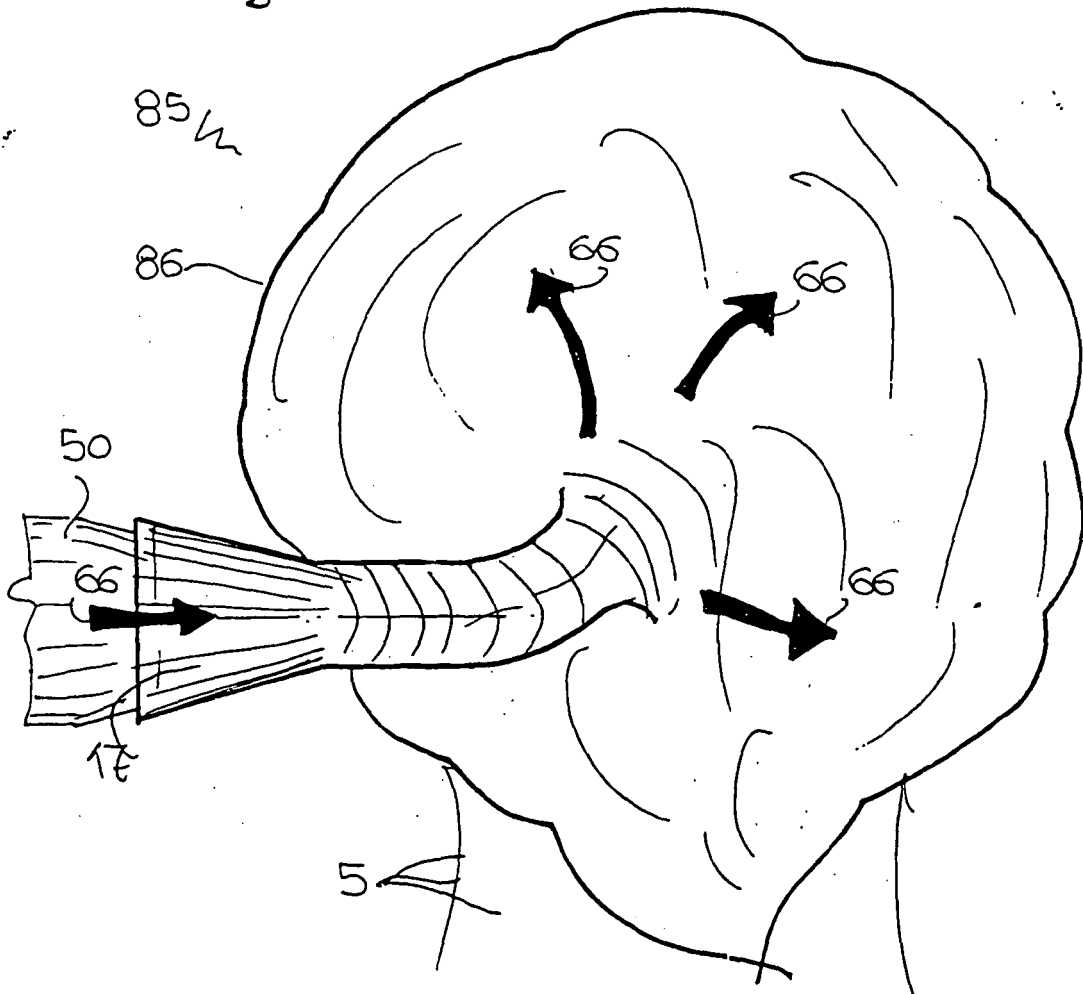
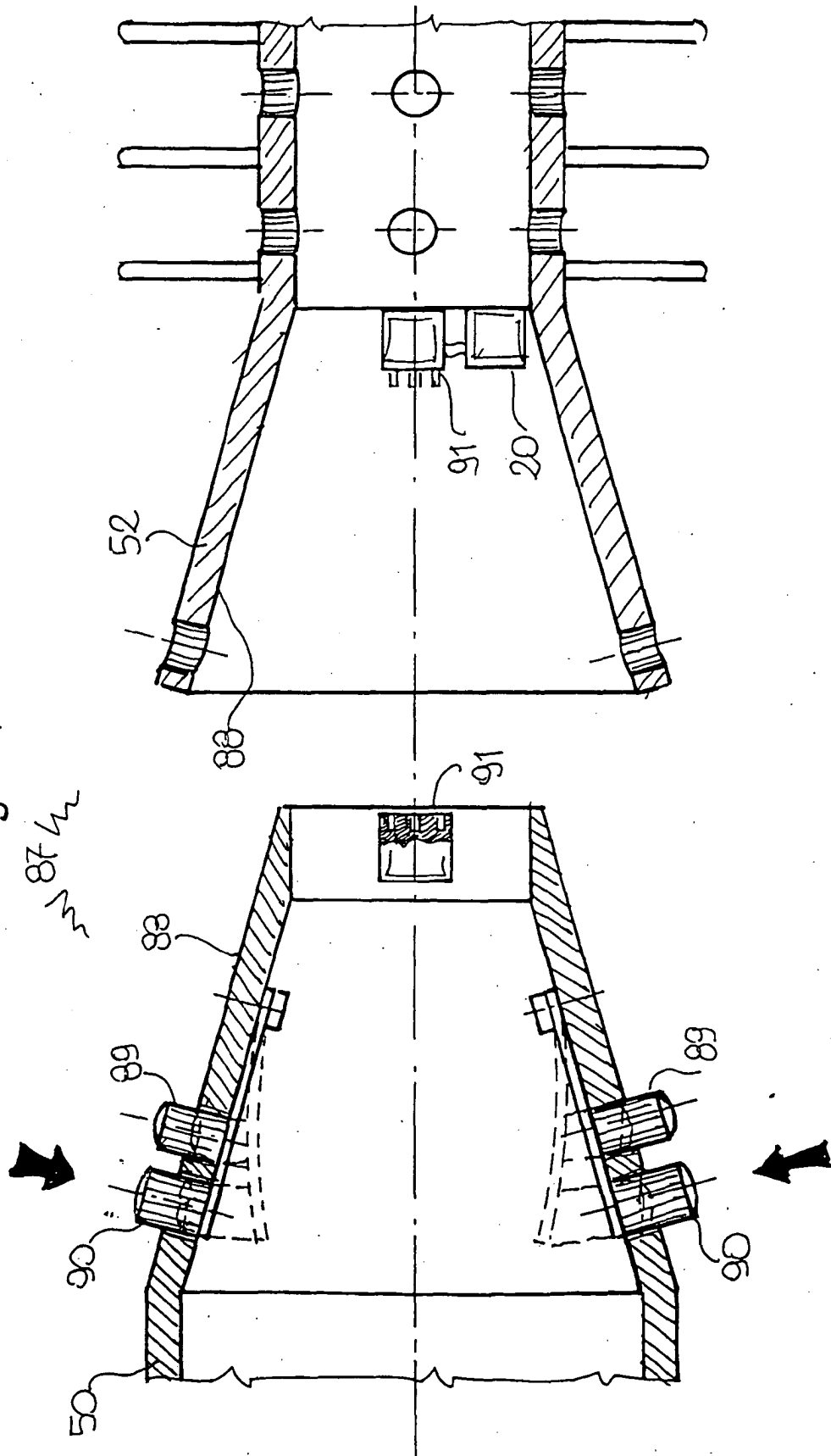


Fig. 24



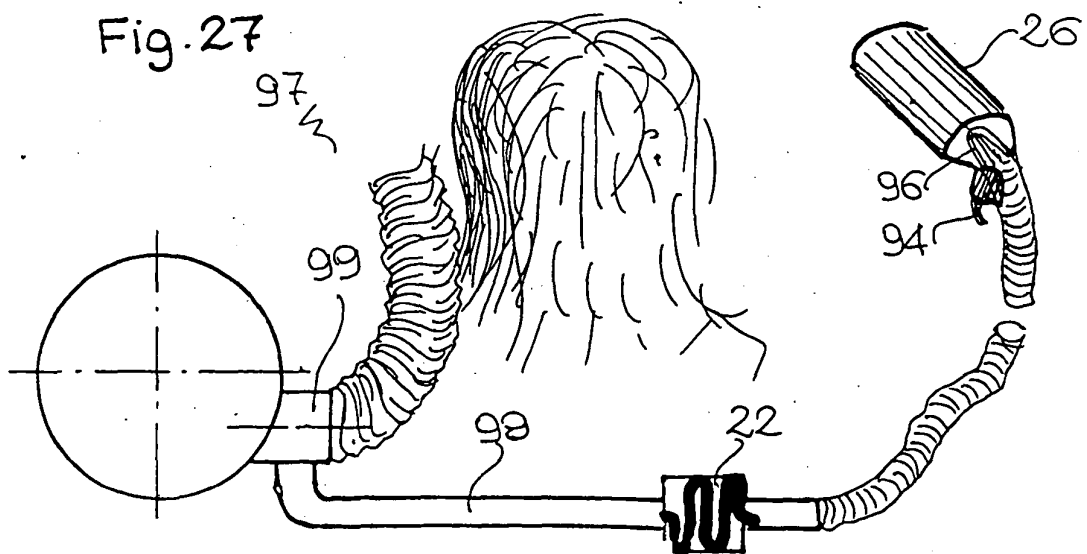
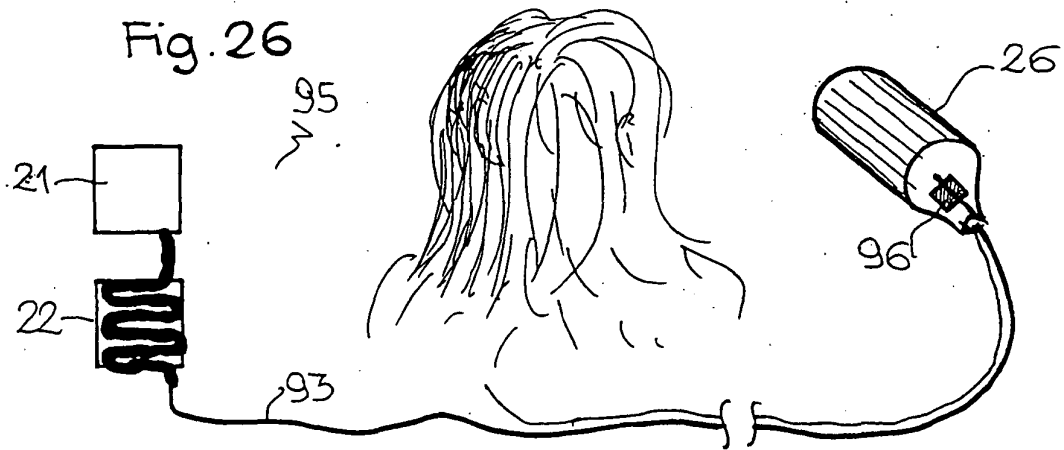
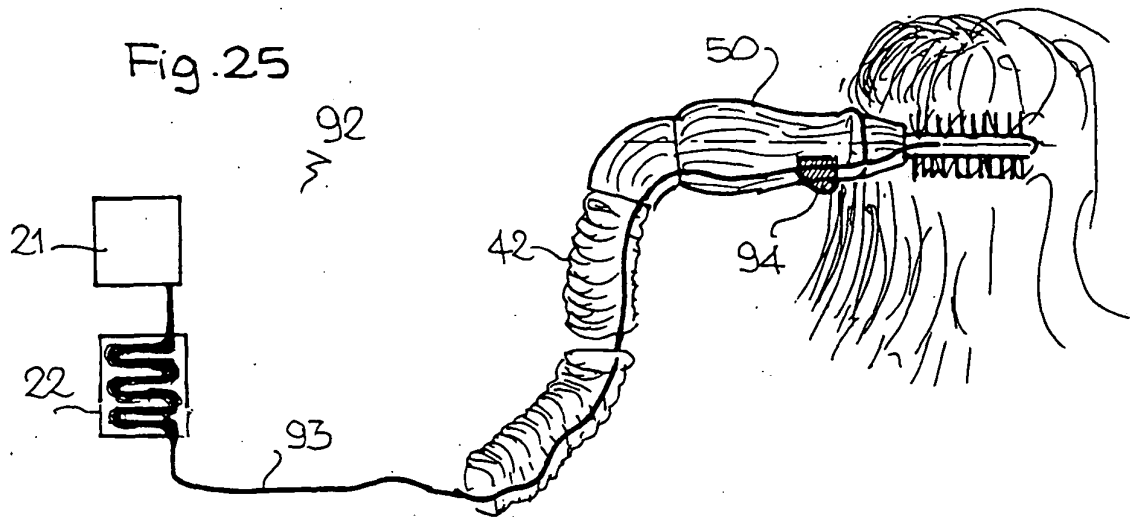


Fig. 28

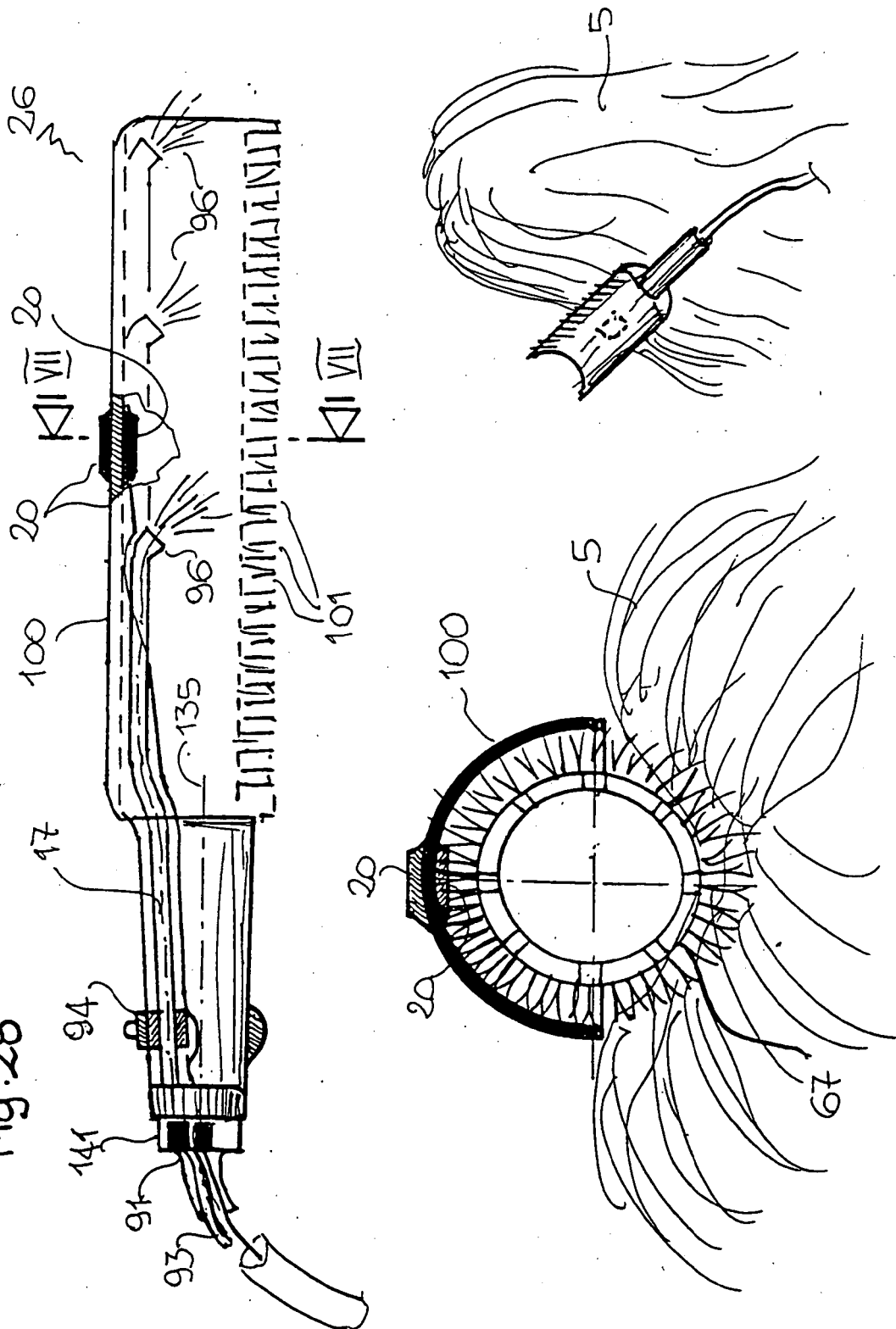


Fig. 29

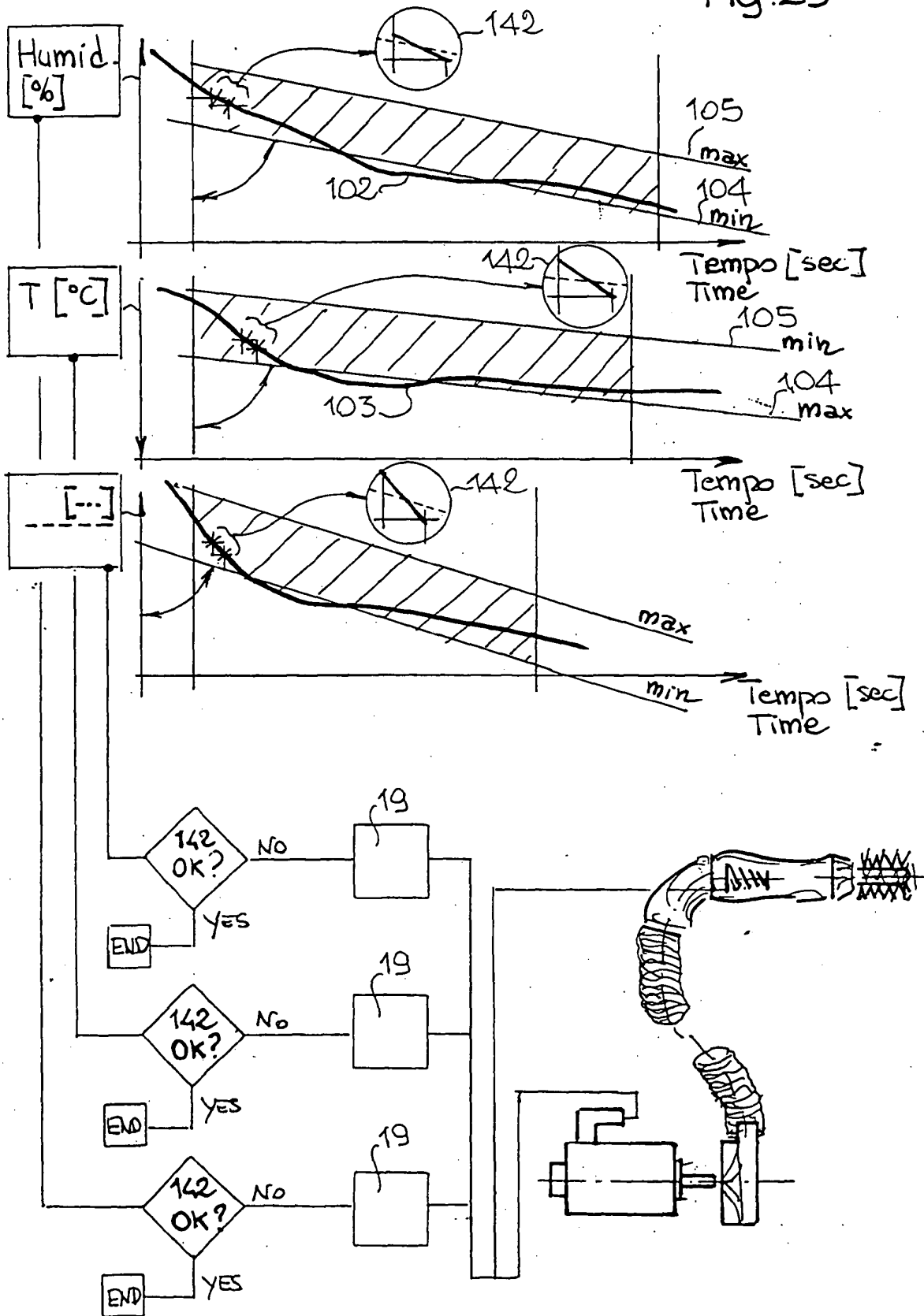
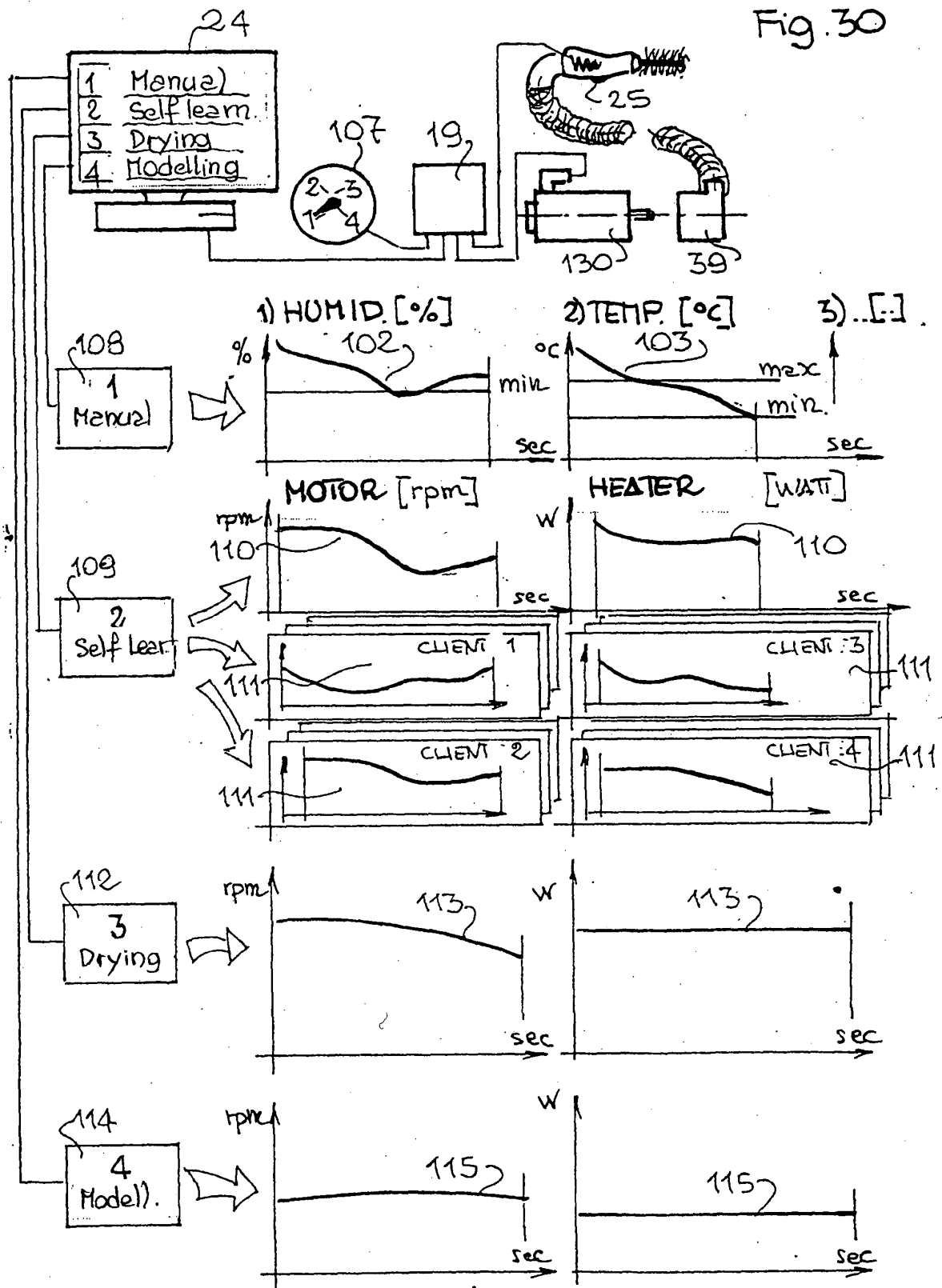
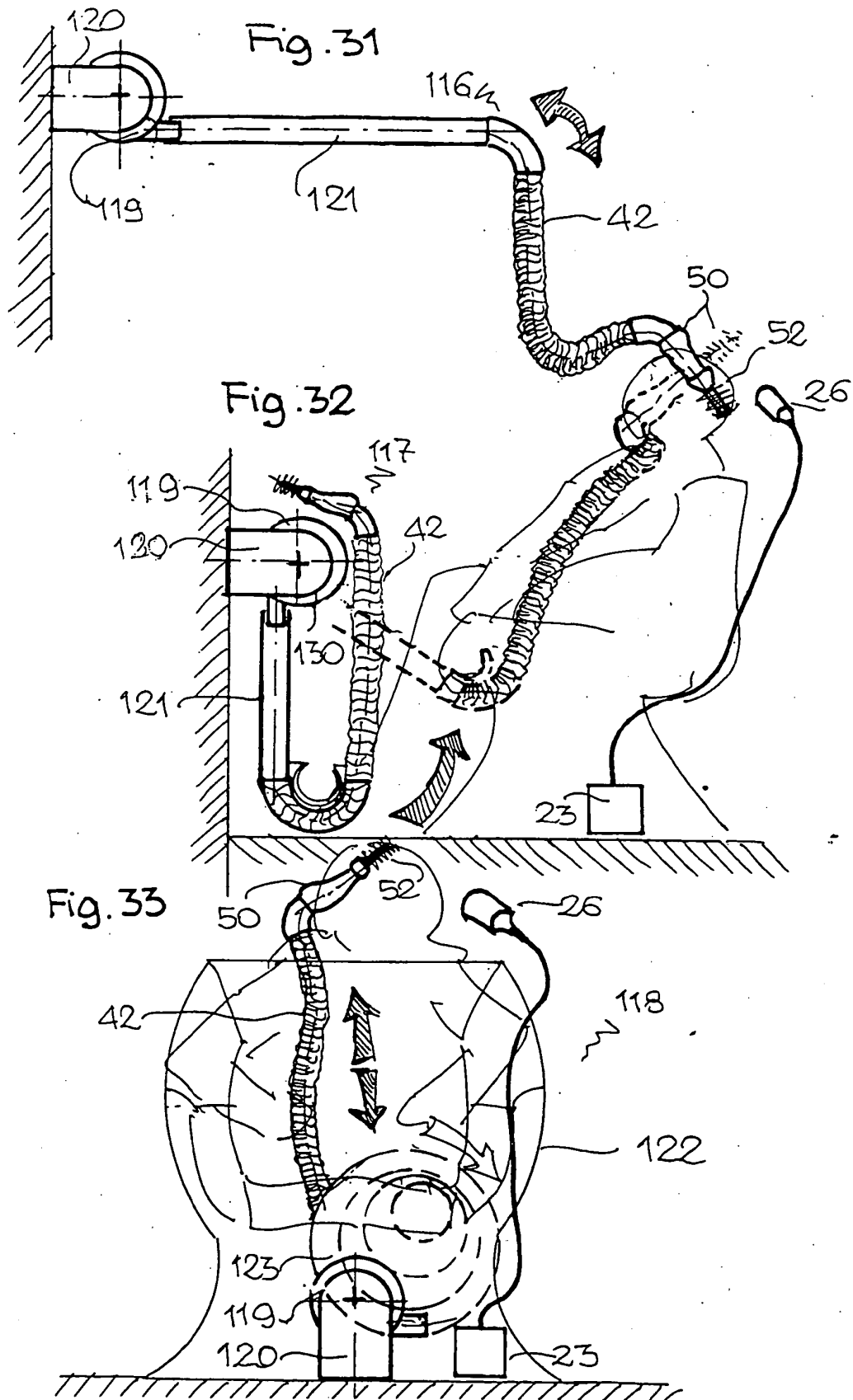


Fig. 30





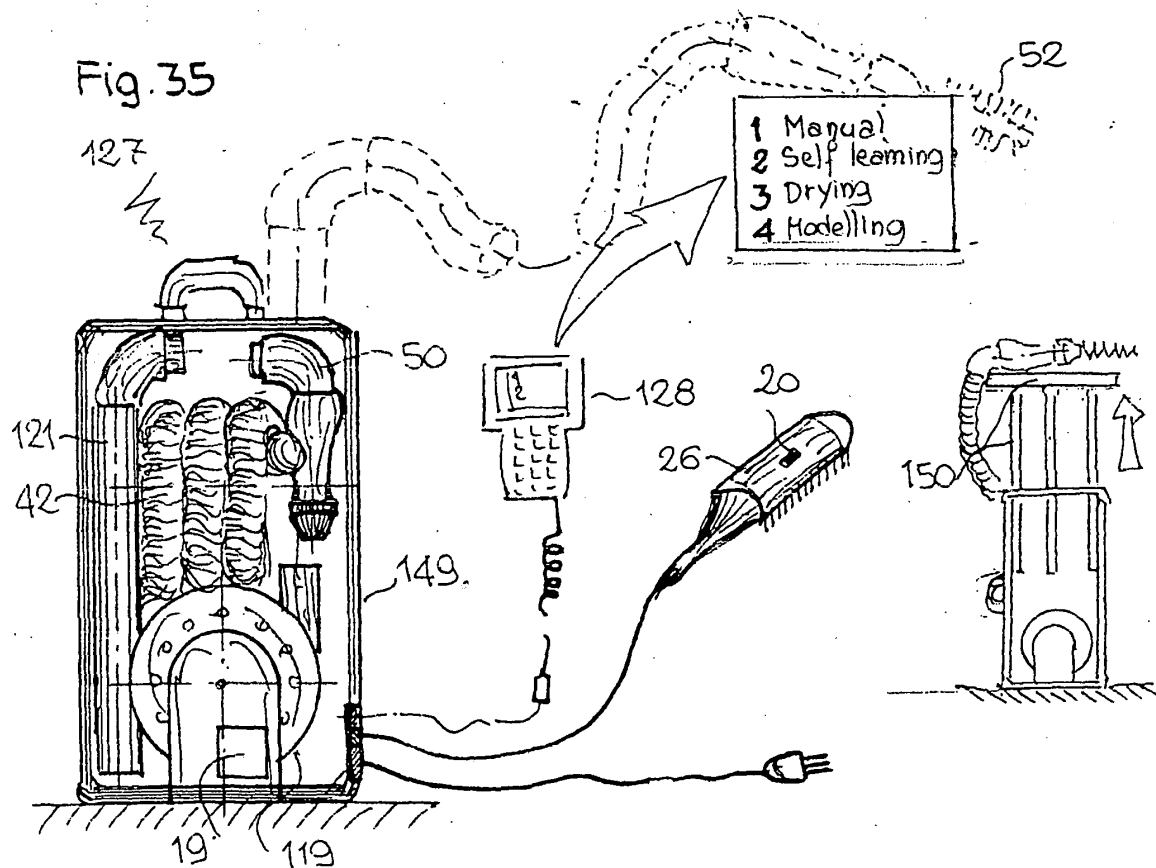
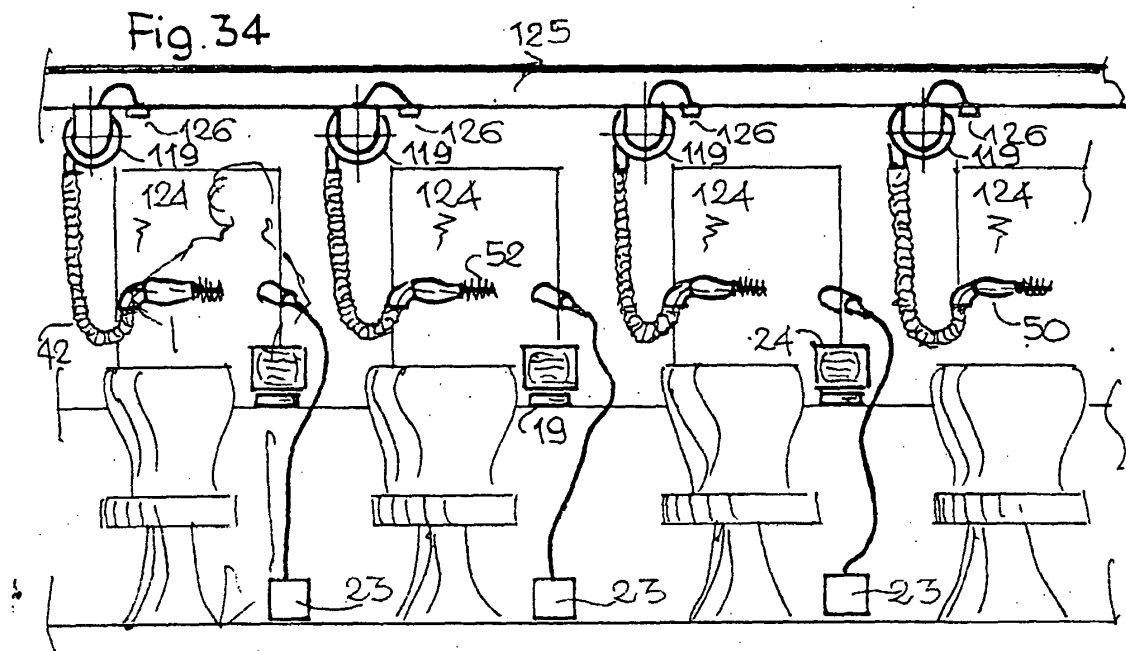
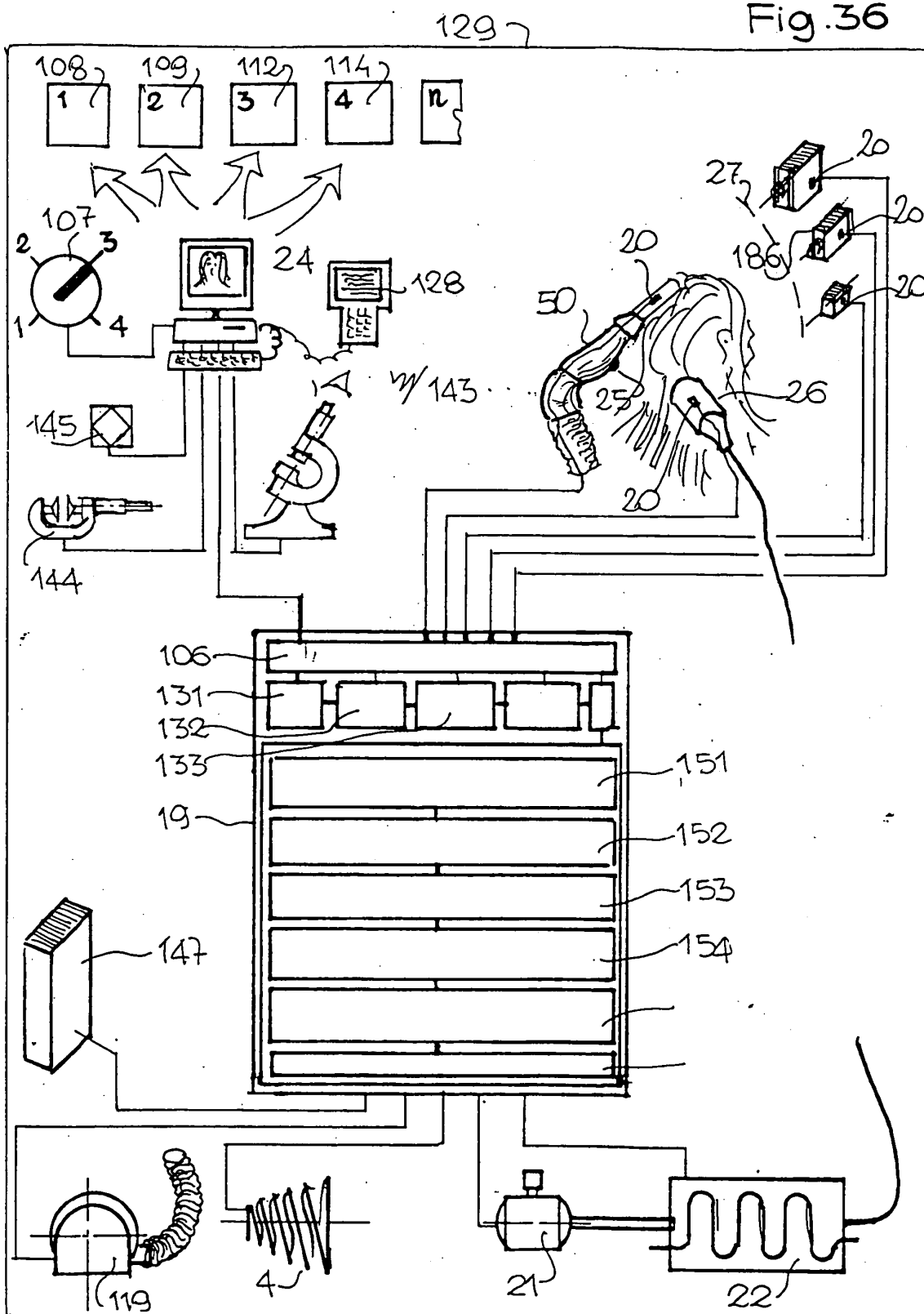
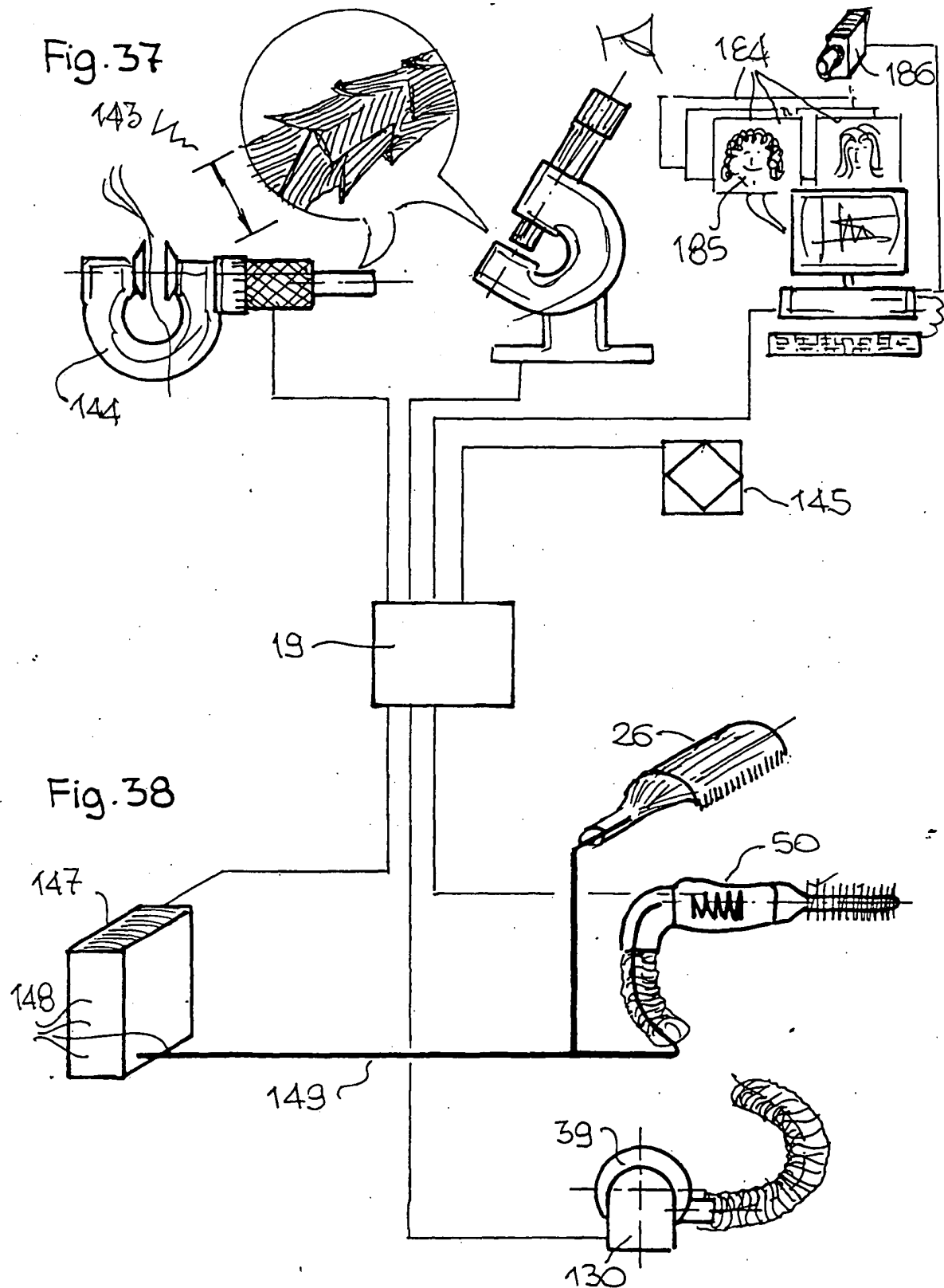


Fig. 36





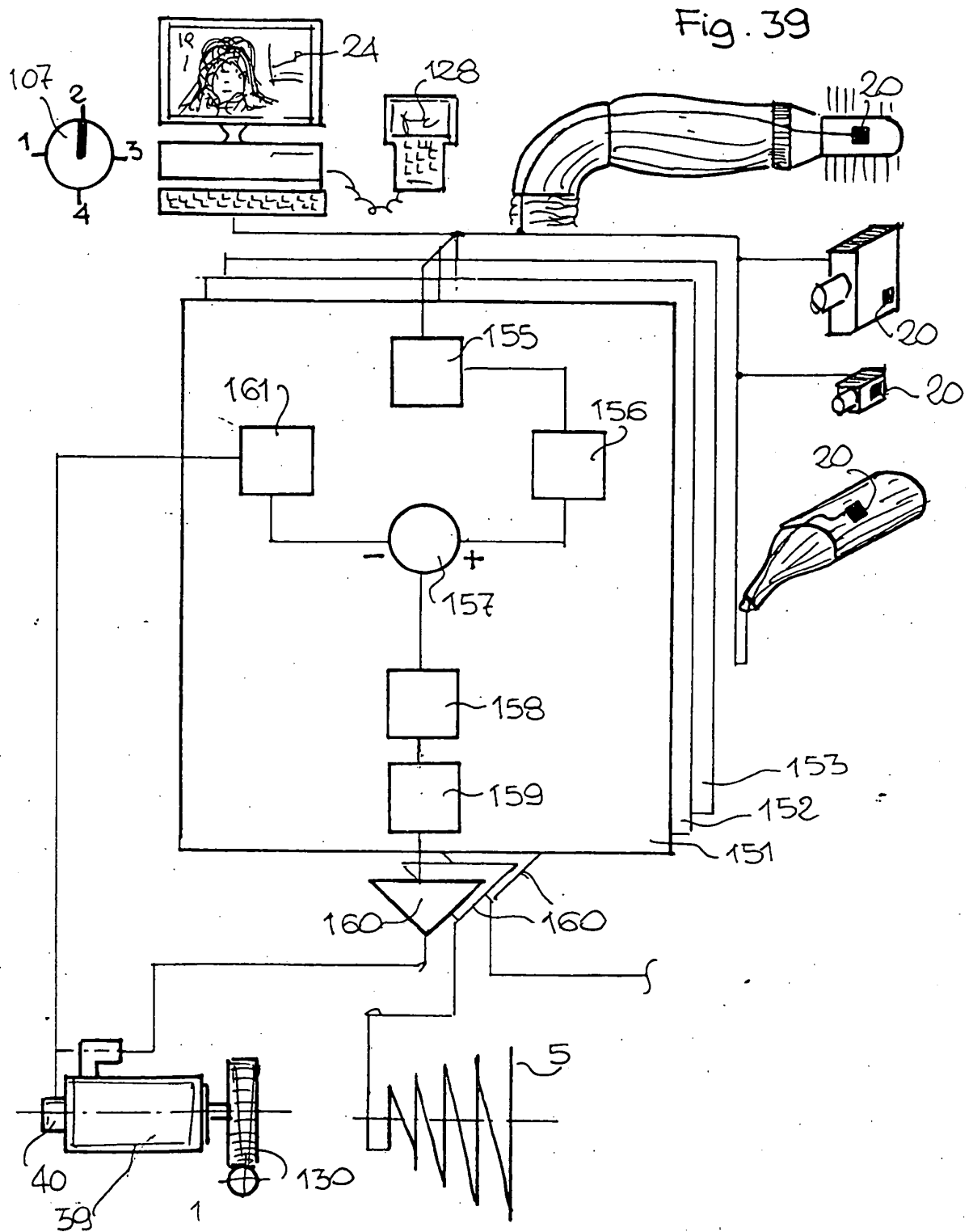


Fig. 40

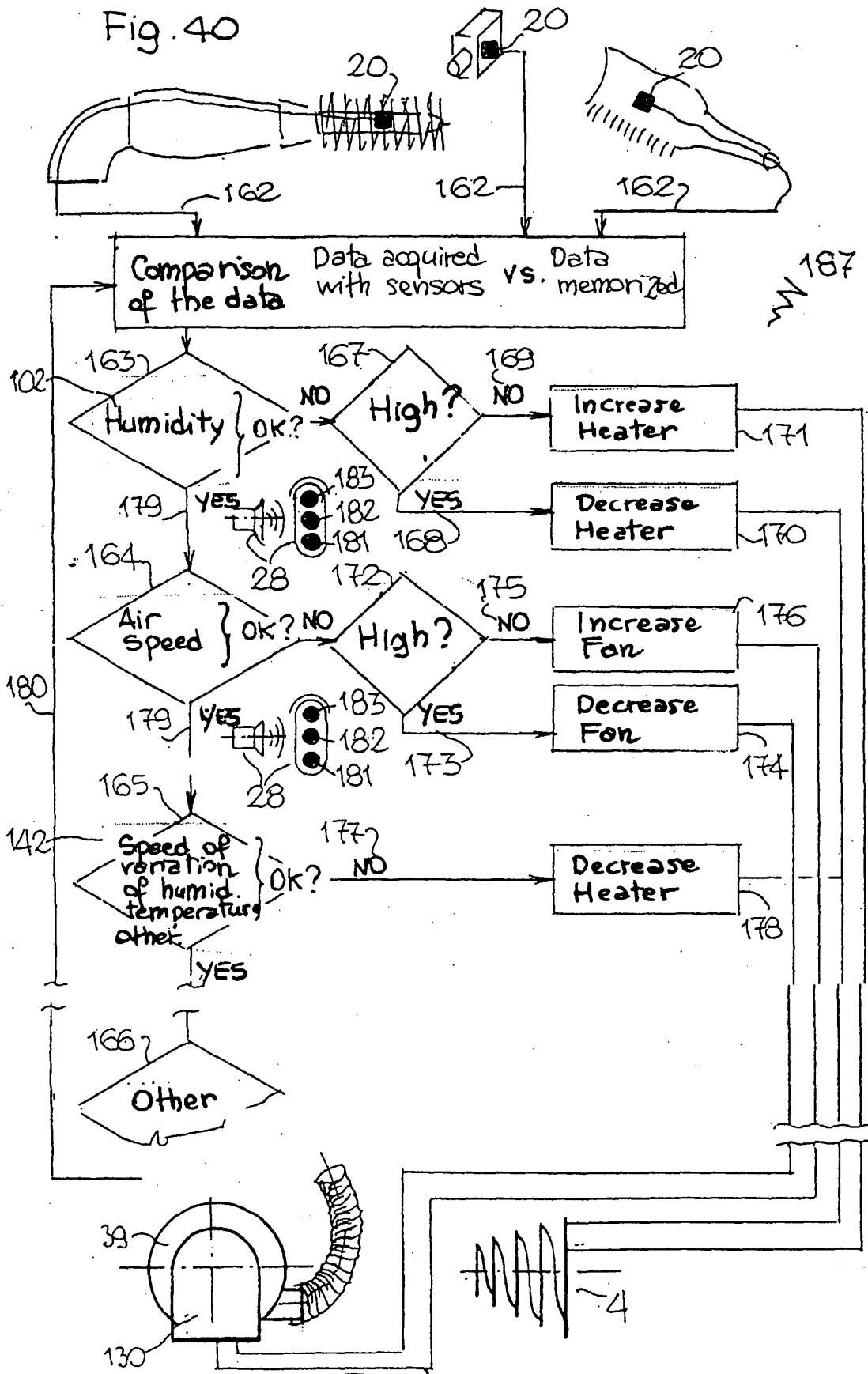
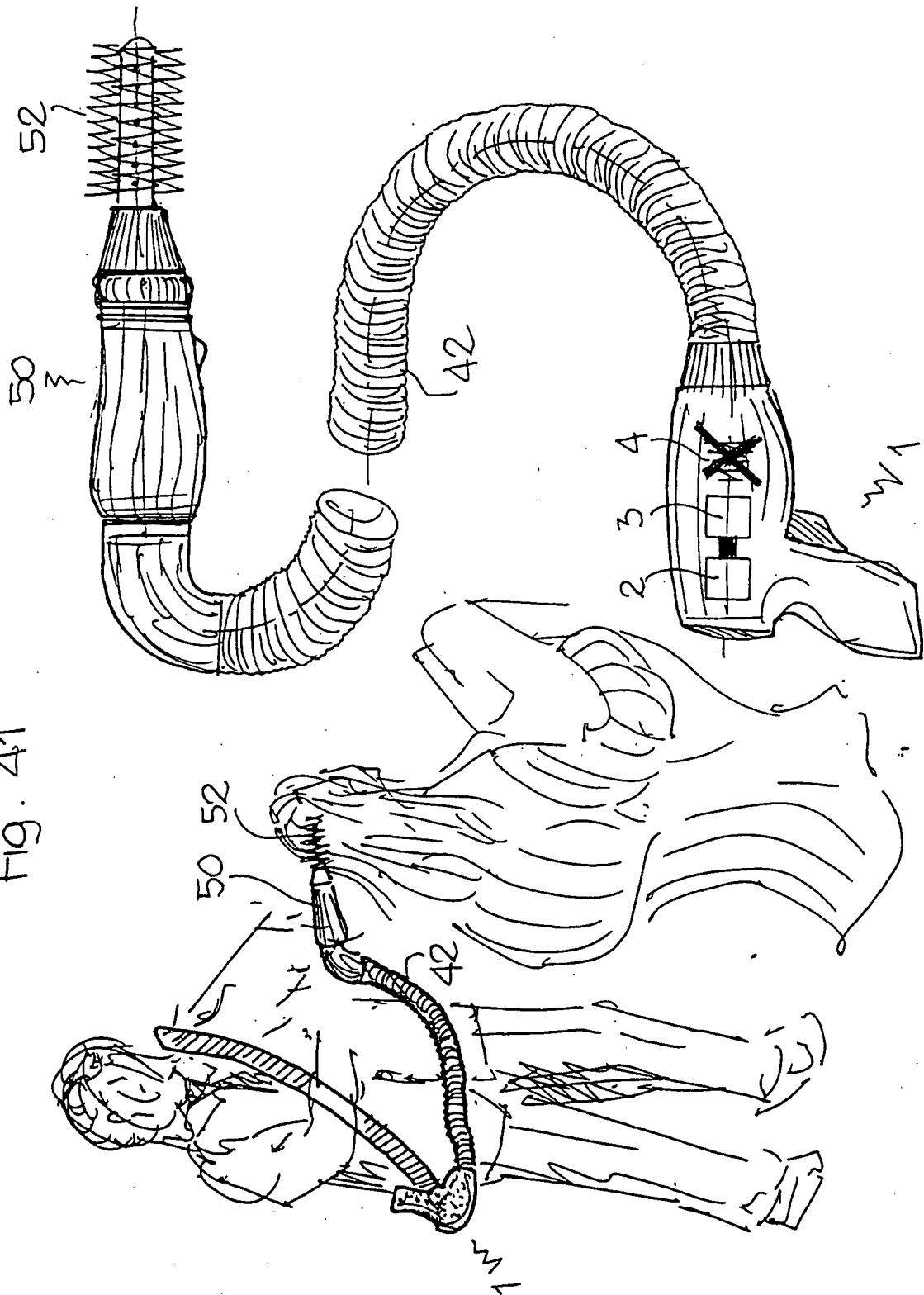


Fig. 41



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT 1995A000919 [0001]
- IT 2002U000007 [0001]
- US 3698402 A [0004]
- US 4676260 A [0005]
- GB 2082058 A [0006]
- US 6052915 A [0007]
- DE 3319403 A1 [0008]
- US 5640781 A [0009]
- FR 2215183 A [0010]
- US 4376441 A [0011]
- US 3057364 A [0012]
- US 2003234100 A1 [0014] [0018]