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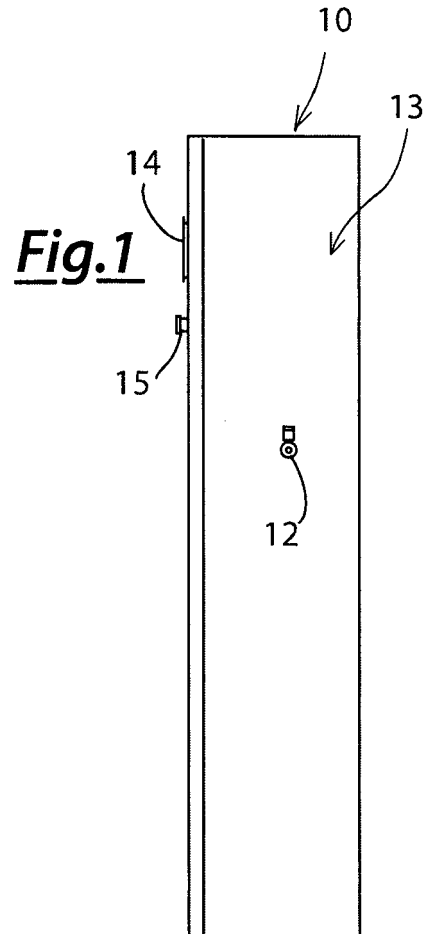
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(54) **A plant for spray painting**

(57) A plant for spray painting, comprising a device (10) which provides atomizing air to a plurality of series-connected mixed-air painting spray guns, i.e. having two separate piping for paint and air and able to simultaneously eject air and paint during the painting operation; the device (10) is able to draw air at an input (11) and to provide atomizing air at an output (12), to which said painting spray guns are connected, and includes a circuit for conditioning air at said input (11), which has a first pipe (18), along which one air filtering stage (19) is installed; a probe (20) for controlling the air flow, means (21) for heating air at a given operating temperature and a air de-ionisation system (22) are placed downstream said filtering stage (19).



EP 2 933 024 A1

Description

[0001] The present invention generally relates to a plant for an industrial spray painting of metal articles and/or other articles made of wood, plastic, aluminum, ceramic, etc. and practically of all paintable surfaces, such as sheets, profiles and the like.

[0002] More particularly, the invention relates to an industrial plant for spray painting, which uses air-mixed or air-mix spray guns having an output from which air and paint are released at the same time (for example, the plant cannot be employed with airless spray guns) and which allows to connect one or more series-connected guns, thus having a considerable saving of the paint and of the working hours, with respect to the known painting systems, and which drastically reduces the emission of harmful substances into the environment, also reducing the replacement of the components, such as air cleaning filters, with respect to the prior art.

[0003] It is known that the spray painting of articles and/or goods is typically performed by spraying a covering product, made with powder or liquid particles, on said articles inside special spray booths and by means of guns, disks or other spraying means.

[0004] After having applied a paint layer, the article is moved into a baking oven, where polymerization of the paint resin and hardening of the paint occur. Moreover, the surface of the article which must be coated is usually subjected to a prior chemical treatment of degreasing and passivation, so that the paint is able to hold on said surface.

[0005] Vertical or horizontal coating devices are usually employed.

[0006] Vertical coating devices have a transport system of the articles which includes a mono-rail track, inside of which a biplanar chain runs and the elements which support the articles (through a hole at one of the ends) are hung to said chain; on the other hand, horizontal coating devices are provided for loading the articles on so-called "seedlings", which are hung to special balanced supports, mounted on a conveyor belt.

[0007] The industrial powder coating or painting is based on the electrostatic attraction occurring between a powder paint particle, which is positively or negatively charged, and the article to be painted, which is grounded.

[0008] The powder paint particles are electrostatically charged, so that the double effect of the spray action and the electrostatic charge allows to provide a whole coverage of the metal surface to be painted and the best efficiency in the painting use.

[0009] The particles can be charged, for example, by employing ionized air (the so-called "crown process") through a high voltage ionizer which is placed inside the spray gun and which injects the ionized air inside a channel, where the paint fluidized powder flows; the spray gun has an electrode near the spray nozzle, so as to electrify the dust particles before said particles are placed on the article's surface, while the article is electrically grounded.

[0010] Alternatively, the paint particles can be charged within a channel of the spray gun by wiping, namely by pushing them according to a spiral-like direction onto the inner walls of the channel of the spray gun.

[0011] In order to effectively ground the article to be painted, said article is hung on metal supports, which contact other structures or devices that are electrically grounded.

[0012] However, the known spray painting plants still have relevant drawbacks, including a considerable use of raw material, the high operating pressures, a rapid wear and many replacement of components, as well as expense of time and increased costs.

[0013] Moreover, it is commonly known that the use of paint involves problems regarding environmental pollution.

[0014] An object of the present invention is therefore to provide a plant for spray painting and in particular for painting metal articles, which obviates the above mentioned drawbacks and to provide a spray painting plant which allows a remarkable saving of raw material, with respect to the prior art, thus allowing a reduction of the environmental pollution and maintaining a good coating of the article.

[0015] Another object of the present invention is to provide a spray painting plant, in particular for painting metal articles, which is efficient and reliable and which is usable, in particular, in powder industrial coating equipments with air-mix or air-mixed spray guns.

[0016] Another object of the invention is to provide a spray painting plant, in particular for metal articles, which uses air at a low pressure with respect to prior art and which allows to maintain cleaned filters, unlike the prior art spray painting plants.

[0017] A further object of the present invention is to provide a spray painting plant, which allows a considerable saving of working hours for making the articles, with respect to the known plants.

[0018] These and other objects, according to the present invention, are achieved by a spray painting plant for coating articles according to the enclosed claim 1.

[0019] Other features are contained in the dependent claims.

[0020] Advantageously, the spray paint plant of the invention comprises an air emission device which is able to let out air of nebulization, which is brought in turn to one or more series-connected spray guns, so as to obtain a considerable saving of paint, as well as reduced pollutant emissions in the environment and a substantial savings of working hours for painting the article, with respect to the prior art.

[0021] Furthermore, the air emission device requires a reduced maintenance with respect to the prior art, as it works at reduced pressures and maintains a substantial cleaning of all the components.

[0022] Finally, the method for spraying air according to the invention can be used for any coating process that requires the application of the electrostatic principle.

[0023] Further characteristics and advantages of the invention will become more clear from the following description, which relates to a preferred embodiment of the spray painting plant of the invention, and from the enclosed drawings, in which:

- figure 1 is a side view of a device for delivering atomizing air to painting spray guns which are used in a plant for spray painting, according to the present invention;
- figure 2 is a front view of the device of figure 1, according to the invention;
- figure 3 is a perspective view of the device of figure 1, according to the present invention;
- figure 4 is an inner front view of the device of figure 1, according to the present invention;
- figure 5 is an inner side view of the device of figure 1, according to the present invention;
- figures 6 and 7 show two inner perspective views of the device of figure 1, according to the present invention.

[0024] With reference to the above mentioned figures, the spray painting plant according to the present invention comprises a device 10 which provides atomizing air to a plurality of series-connected air-mixed painting spray guns, i.e. having two different pipes for air and paint and able to let out simultaneously air and paint during a painting operation.

[0025] In particular, the device 10 draws air at the input 11 and provides the atomizing air at the output 12 and from here to the different uses.

[0026] The device 10 is constituted by a cabinet 13, which can be equipped with a front LCD screen 14, a synoptic frame and a classical frame with a control panel.

[0027] The device is equipped with emergency push-buttons 15 and with an electric/electronic control circuit 16, below which an air conditioning circuit is provided for conditioning the air which flows at the input 11.

[0028] The above mentioned air conditioning circuit includes a first pipe 17, which directly connects the input 11 to the output 12 and which is used for flowing air only in emergency conditions (for example, when the air pressure reaches and exceeds prefixed maximum values), and a second pipe 18, in which, in normal operating conditions, the air which is drawn at the input 11 is conveyed.

[0029] Said second pipe 18 comprises a filtering stage 19 for cleaning the air at the input 11, downstream of which a probe 20 for controlling the air flow and a resistor 21 for heating the air to a maximum operating temperature of 40-45 °C are placed; the resistor 21 is connected to an air de-ionization system 22, which is formed by a transformer 23 and a plurality of needles 24, connected together so as to make a magnetic field able to remove the static charges and additional dirt from the air which circulates at the output of the resistor 21 and inside the de-ionization system 22.

[0030] Moreover, downstream the de-ionization system 22 further control probes 25 are provided for controlling the air temperature; said control probes 25 are placed at the connection between the second pipe 18 and the direct pipe 17.

[0031] A control valve unit 26 is also placed at said connection and said valve unit 26 is connected with the electronic circuit 16 and allows the circulation of air inside the pipe 18, thus obtaining a homogeneous temperature of the air both along the pipe 18 and at the output 12, from which atomizing air is drawn for sending it to the users (i.e. to the spray guns, which are series-connected).

[0032] Said control valve unit 26 is idle when the air is going to flow inside the pipe 18, in order to create a suitable inner fluid turbulence, thus obtaining a suitable homogeneous heating of the whole mass of air which is contained inside the pipe 18.

[0033] The operation of the plant for spray painting, according to the present invention, is substantially the following.

[0034] Firstly, by using the buttons 15 and the display screen 14, the user can set a prefixed value of air temperature for painting.

[0035] Therefore, the resistor 21 and the de-ionization system 22 provide heating and removal of the static charges and dirt of the air at the input 11, when the probe 20 measures at least one determined value of the airflow passing inside the pipe 18.

[0036] When the probe 20 stops heating and de-ionization (i.e. when the airflow at the input is less than a given and prefixed value), the control valve unit 26 allows an air recirculation, in order to obtain a homogeneous heating of the whole mass of air flowing inside the pipe 18 and at the outlet 12.

[0037] The increased heating power thus produced, with respect to the prior art and with the same features of the resistor, of the de-ionization system and the air flow flowing in the pipe 18, allows to connect an unlimited number of series-connected spray guns.

[0038] The device 10 for dispensing atomizing air to the spray painting guns, according to the present invention, thus allows a remarkable saving of paint during the treatment of the article, with respect to the prior art, thus obtaining a limited environmental impact and savings in working hours for performing the treatment.

[0039] Finally, the values of air pressure are limited and it is also possible to have a significant cleaning of the filtering stage 19, with respect to the known plants for spray painting, which therefore requires fewer and less frequent maintenance and/or replacement actions.

[0040] From the above description, the features of a plant for spray painting according to the present invention are clear as well as the related advantages.

[0041] It is finally clear that many other variations may be made to the plant for spray painting, without departing from the principles of novelty inherent in the inventive idea, as well as it is clear that the materials, shapes and

dimensions of the features may be any according to requirements and they can be replaced with other technically equivalent.

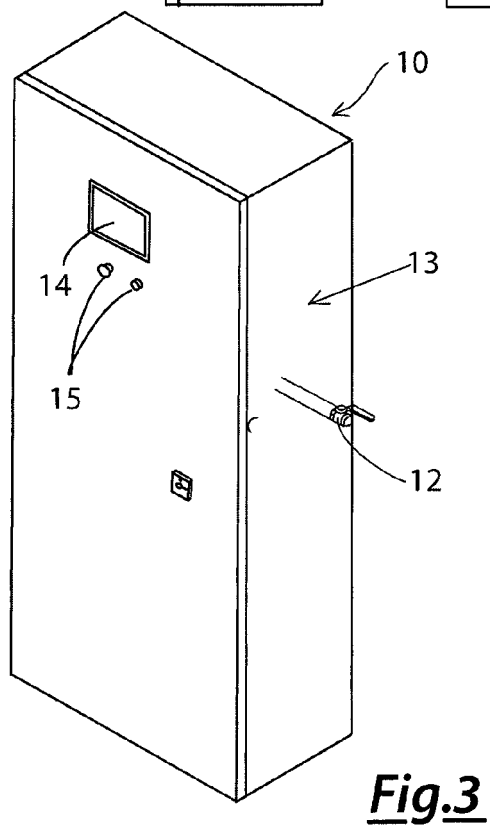
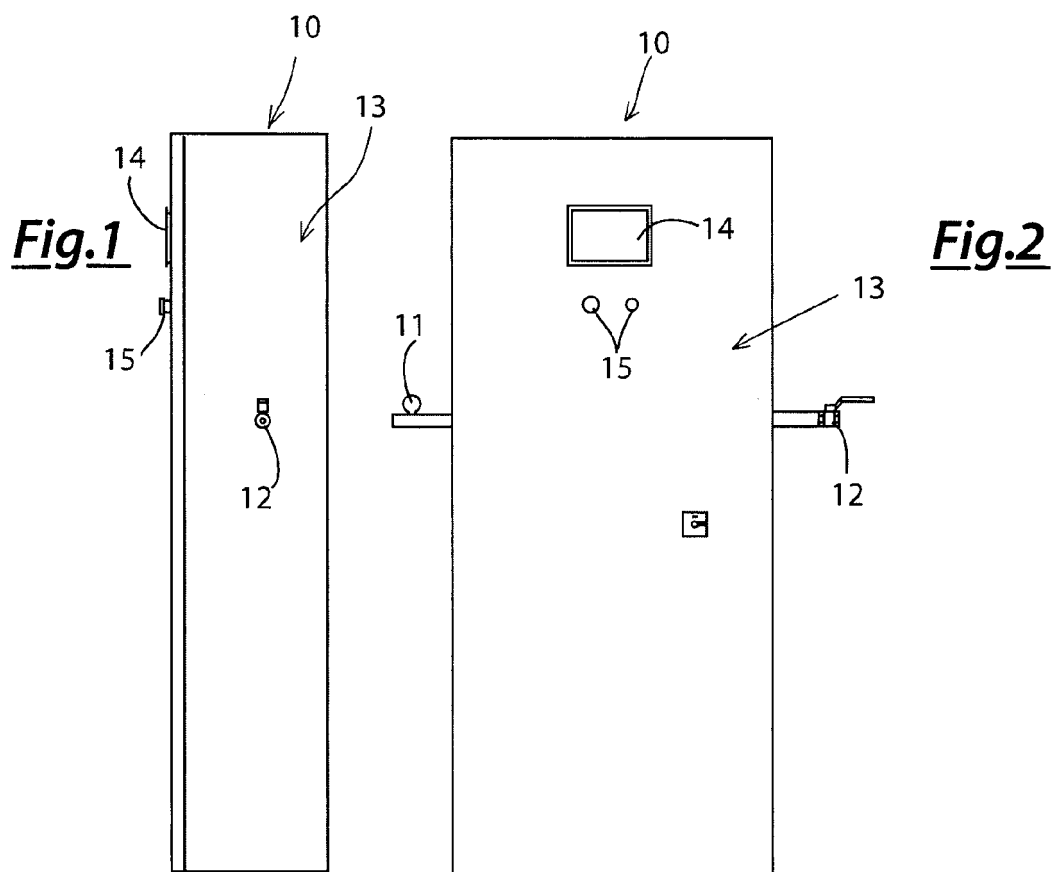
[0042] Where technical features mentioned in the subsequent claims are followed by reference signs, those reference signs have been introduced with the sole purpose of increasing the intelligibility of the claims themselves.

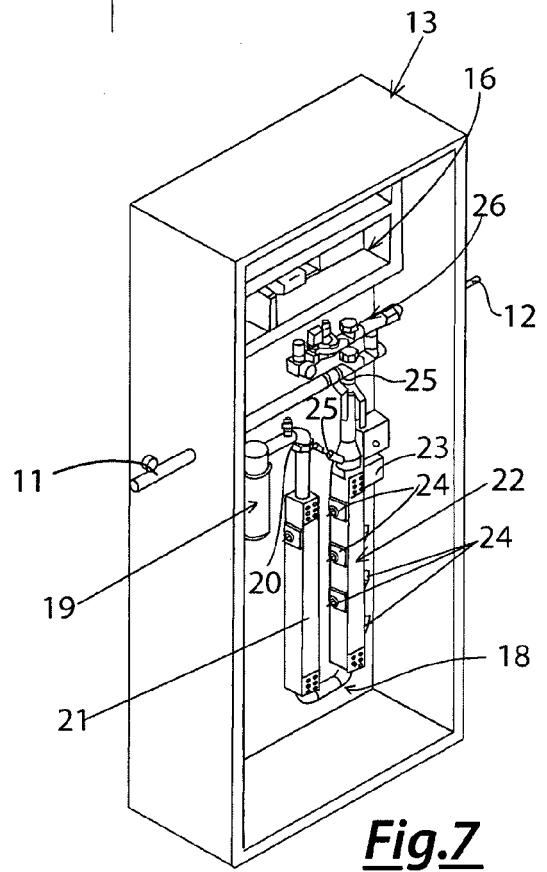
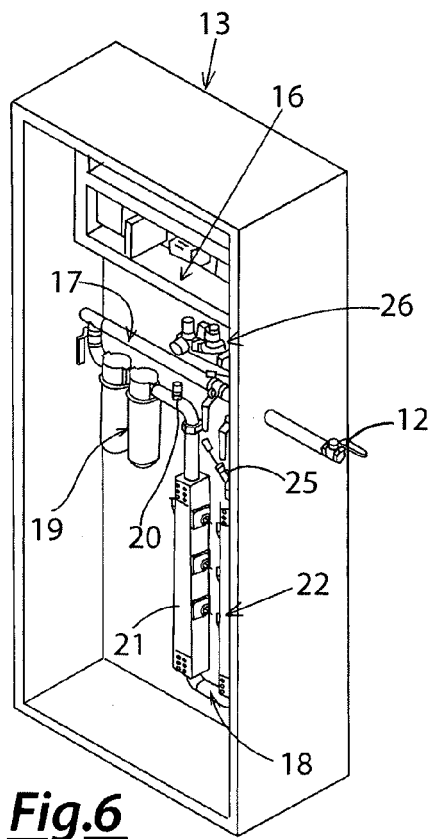
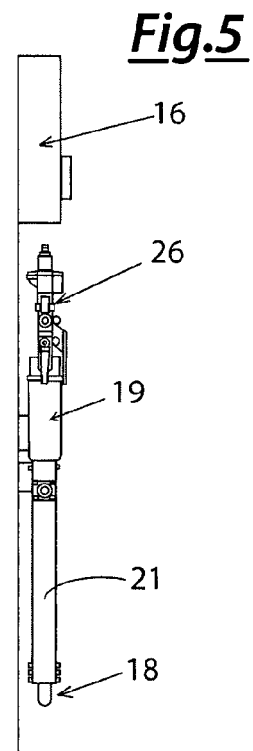
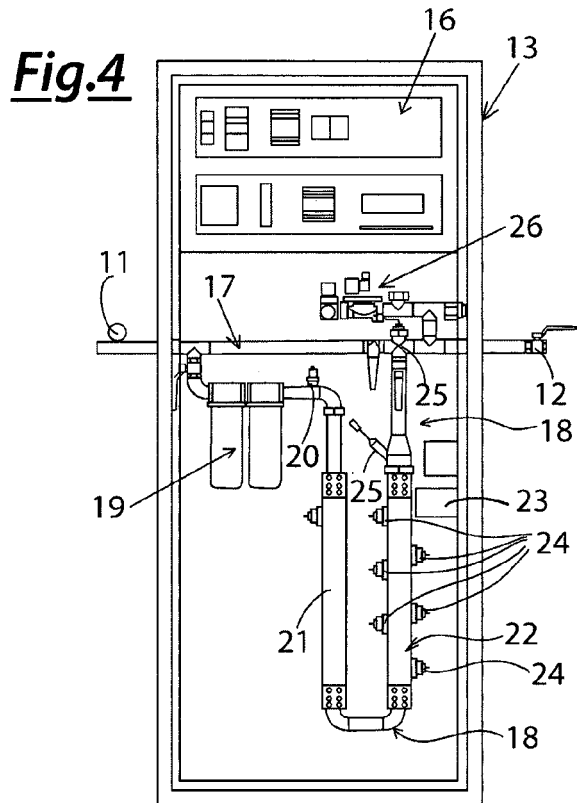
Claims

1. A plant for spray painting, comprising a device (10) which provides for atomizing air to a plurality of series-connected air-mixed paint spray guns, each of said guns having two separate piping, one for air and one for paint, which are able to simultaneously eject air and paint during the painting operation, said device (10) being provided for drawing air at an input (11) and for sending atomizing air to an output (12) where said spray guns are provided, said device including heating means (21) for heating air at a given prefixed temperature value, said device (10) also comprising a circuit for conditioning air at said input (11), which has at least one first pipe (18) along which an air filtering stage (19) is installed, at least one probe (20) for controlling the air flow and an air de-ionization system (22) being placed downstream said filtering stage (19), **characterized in that** probes (25) for controlling the air temperature are provided at the output of said de-ionization system (22), said probes (25) being placed in correspondence of said first pipe (18) and/or of at least one second pipe (17) connecting said input (11), said output (12) and said spray guns.
2. A plant according to claim 1, **characterized in that** a control valve unit (26), which is connected with an electronic control circuit (16), provides for having an air recirculation within said first pipe (18) and a homogeneous air temperature both inside the whole first pipe (18) and at the output (12).
3. A plant according to at least one of the preceding claims, **characterized in that** said device (10) comprises a cabinet (13), equipped with a front screen display (14), such as a keypad or a screen with push-button, and with emergency buttons (15), below which said air conditioning circuit is placed.
4. A plant according to at least one of the preceding claims, **characterized in that** said means (21) for heating air include at least one resistor, placed between said filtering stage (19) and said air de-ionization system (22), which allows to heat the air to a maximum operating temperature of about 40-45 °C.
5. A plant according to at least one of the preceding

claims, **characterized in that** said air de-ionisation system (22) is formed by a transformer (23) and by a plurality of needles (24), which are connected together and which provide for a magnetic field able to remove the static charges and further dirt of the air circulating in said de-ionization system (22).

6. A plant according to at least one of the preceding claims, **characterized in that** said control valve unit (26) is placed in correspondence of a connection between said first pipe (18) and said second pipe (17).
7. A plant according to at least one of the preceding claims, **characterized in that** said control valve unit (26) allows for air recirculation, in order to obtain a homogeneous heating of the whole air flowing inside said first pipe (18) and at the output (12).







EUROPEAN SEARCH REPORT

Application Number
EP 14 42 5042

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 867 392 A2 (APO GMBH MASSENKLEINTEILBESCHI [DE]) 19 December 2007 (2007-12-19) * the whole document *	1-7	INV. B05B5/00 B05B5/16 B05B7/24
A	DE 20 2012 012185 U1 (MAYER THOMAS [DE]) 25 March 2014 (2014-03-25) * the whole document *	1-7	ADD. B03C1/00
A	US 4 114 810 A (MASUDA SENICHI) 19 September 1978 (1978-09-19) * column 8, line 51 - line 60; figure 1A *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B05B B03C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 September 2014	Examiner Schork, Willi
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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

EP 14 42 5042

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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04-09-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1867392 A2	19-12-2007	DE 102006027341 A1	20-12-2007
		EP 1867392 A2	19-12-2007

DE 202012012185 U1	25-03-2014	DE 202012012185 U1	25-03-2014
		WO 2014095081 A2	26-06-2014

US 4114810 A	19-09-1978	DE 2642587 A1	07-04-1977
		FR 2326236 A1	29-04-1977
		GB 1549805 A	08-08-1979
		JP S5243846 A	06-04-1977
		JP S6113867 B2	16-04-1986
		US 4114810 A	19-09-1978
