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(71) Applicant: **GE.MA.TA. S.p.A.**
36070 Trissino (VI) (IT)

(72) Inventors:
- **CAON, Michele**
  36070 Trissino (VI) (IT)
- **MAITAN, Gianni**
  36070 Trissino (VI) (IT)

(74) Representative: **Piovesana, Paolo**
c/o Praxi Intellectual Property S.p.A.- Venezia
Via Francesco Baracca, 5/A
30173 Venezia-Mestre (IT)

(54) METHOD AND A MACHINE FOR DEPOSITING A SUBSTANCE ON A HIDE

(57) Method for depositing a substance (3) on a hide (2) which is handled, characterized in that at least one spray gun (16) configured to switch between:
- a first deactivated condition in which it does not send said substance (3) on said hide (2) and
- a second activated condition in which it sends said substance (3) onto said hide (2), and is controlled by a control and processing unit configured to calculate and/or measure, for said at least one spray gun (16), the spraying surface (22) and/or its projection and to send a first command for passing said at least one spray gun (16) from said first activated condition to said second deactivated condition, and a second command for passing said spray gun (16) from said second deactivated condition to said first activated condition, and characterized in that said first command is sent when the overlap between said moving hide (2) and the surface (22) sprayed by said spray gun (16) and/or its projection, which are calculated and/or measured by said control and processing unit exceeds a predefined value, said second command is sent when the overlap between said hide (2) and det the surface (22) and/or its projection is less than said predefined value.

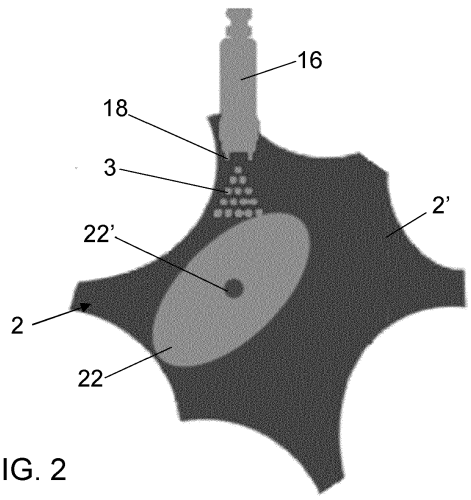

FIG. 2

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Description

FIELD OF THE TECHNIQUE

[0001] The present invention relates to a method and a machine for depositing a substance on a hide.

BACKGROUND OF THE INVENTION

[0002] It is known in the technical field of hide processing that it is possible to apply a layer of a coloring substance to the hide. This is usually carried out inside special machine called "spray booths", in which the hide to be treated, identified by the letter A in figure 1, which is stretched on a conveyor belt, is passed inside an environment in which which there are spray guns facing the hide and which spray the coloring substance on the upper surface of the hide itself.

[0003] Usually the spray guns are positioned on mobile supports, known in the sector as "carousels" so as to be able to cover the entire extension of the hide to be processed. In particular, these supports are usually rotating around a central axis, with the spray gun rigidly associated with a radial support, so as to follow a substantially circular trajectory, indicated with the letter B in figure 1.

[0004] This occurs in a substantially automated manner, since the size and position of the hide are acquired before the start of the coloring process, by means of special sensors. Subsequently, having known the speed of advancement of the conveyor belt on which the hide is laid, it is possible to know when a spray gun, whose positioning and/or movement is controlled by the machine, is facing the hide to be treated, and it is therefore possible to decide whether and when to trigger a single spray gun in order to obtain a homogeneous coloration of the hide itself.

[0005] In particular, the parameter that is commonly used to measure the position of the spray gun, and consequently its positioning with respect to the hide to be processed, is the center C of the surface C' which is colored by spraying from the spray gun itself. This can cause problems as the location of center C does not comprise the size and/or orientation of the surface that is actually to be sprayed, resulting in spraying inaccuracies and wasted color.

[0006] More particularly, since the hides have a substantially irregular shape, it is inevitable that often a spray gun is not perfectly facing a portion of the hide to be colored, but faces an edge of the hide to be treated, as can be seen for example in the two cases indicated with D and D' in fig. 1. Therefore in these cases D, D', if the spray gun is triggered there will be a waste of color as a part of the sprayed substance will fall outside the hide, or, if this is not triggered, a hide is obtained whose edges are colored unevenly.

[0007] Since it is not acceptable to obtain, following the coloring treatment, an unevenly colored hide, it is necessary to operate the spray gun even in conditions in which the nozzle of the spray gun and/or its projection do not face the hide to be treated. To obtain this result, a known solution provides for artificially increasing the size of the hide. In particular, therefore, the dimensions that have been measured by the sensors are increased, by means of special algorithms implemented in the computer that controls the operation of the machine, as shown by the difference between the two shapes indicated with A and A' in fig. 1, in which the first relates to the "real" hide, while the second relates to the part of the hide that is artificially increased.

[0008] This solution is not completely satisfactory as it can involve the activation of the spray guns even when the sprayed surface is completely outside the hide to be treated, as shown in the case indicated with D" in fig. 1.

[0009] Furthermore, in traditional machine, the spray guns are rigidly mounted on rotating trolleys, known as "carousels". In this case the orientation of the flame or spraying cone in space can change as a result of the rotation of the carousel, thus making a coloring procedure that is based solely on the position of the spray guns in space even more inaccurate.

[0010] WO2014/122862 describes a method and a machine for coloring a hide which allows to obtain a uniform coloring between the edges and the center by adjusting the flow of color that is sprayed by the spray guns according to the rules of harmonic motion. In particular, the flow is reduced in the positions in which the spray guns spend more time on the same portion of the hide, i.e. at the edges of the conveyor belt on which the hide to be colored is transported (and therefore at the edges of the hide itself), and is increased in the positions in which the spray guns spend less time on the same portion of the hide, i.e. in correspondence with the central band of the conveyor belt on which the hide to be colored is transported (and therefore in correspondence with the central area of the hide itself).

[0011] IT102011901974031 describes a method for coloring the hides in which the activation of the spray guns is adjusted according to the position of the spray gun with respect to the hide to be colored with possibly a variable advance linked to the pressure differences in the ducts that transport the paint to the different spray guns.

[0012] WO 2020/144512 discloses a booth for coloring hide objects in which the spray guns are activated when they are in a position above the conveyor belt on which the hides are transported.

[0013] GB 954 946 describes a method for controlling spray guns using sonars.

OBJECTIVES OF THE INVENTION

[0014] The object of the invention is to propose a method and a machine for depositing a substance on a hide which allow to overcome the drawbacks of the known art.

[0015] Another object of the invention is to propose a method and a machine which allow to treat the hides

homogeneously.

[0016] Another object of the invention is to propose a method and a machine which allow to reduce the waste of coloring substance.

[0017] Another object of the invention is to propose a method and a machine which allow to treat hides of different size and shape.

[0018] Another object of the invention is to propose a method and a machine which allow to operate in an agile and efficient manner.

[0019] Another object of the invention is to propose a method and a machine which allow to reduce the risk of treating a hide in a non-homogeneous way.

[0020] Another object of the invention is to propose a method and a machine which allow to correctly calculate the movement of the spray guns.

[0021] Another object of the invention is to propose a method and a machine which avoid the use of artifacts to approximate the process.

[0022] Another object of the invention is to propose a method and a machine whose operation is based on the actual operation of the hide coloring process.

[0023] Another object of the invention is to propose a robust and easy to correct method.

[0024] Another object of the invention is to propose a method which reduces the risk and the consequences of a human error.

SUMMARY OF THE INVENTION

[0025] All these objects, both individually and in any combination thereof, and others that will result from the following description, are achieved, according to the invention, with a method for depositing a substance on a hide having the characteristics indicated in the claim 1 and with a machine having the characteristics indicated in claim 12.

DESCRIPTION OF THE FIGURES

[0026] The present invention is further clarified hereinafter in a preferred embodiment thereof, given purely by way of example and not of limitation with reference to the attached drawings, in which:

- Figure 1 schematically shows the coloring modalities of a hide according to the state of the art,
- Figure 2 schematically shows a spray gun activated when treating a hide,
- Figure 3 schematically shows the coloring modalities of the hide with the use of the method according to the invention, and
- Figure 4 shows in lateral section a machine for coloring the hides according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0027] As clearly appears from the figures, the present invention relates to a machine, indicated as a whole with the number 1, for depositing a substance on a hide 2.

[0028] Hereinafter, hide 2 means an object made of animal hide or so-called "Synthetic hide", that is, made with a material that has aesthetic and structural characteristics - softness, consistency, texture, etc. - similar to those of natural hide. The hide to be processed has a substantially laminar shape - ie one of its dimensions, namely the thickness, is much smaller than the other two, namely the longitudinal and the transverse one.

[0029] Hereinafter, the word "substance" or "coloring substance" 3 generally refers to a substance intended to be sprayed on the surface of the hide 2 in order to modify its aesthetic properties such as color or gloss and/or structural properties, such as texture and/or weave. Said substances 3 can be in the liquid and/or solid state, in the latter case they can preferably be in the form of a fine-grained powder, so that they can be treated substantially as a liquid - ie so that they can be pushed along pipes and/or spray.

[0030] In particular, the machine 1 comprises a frame 4 which defines an internal environment 6 which is substantially closed and separated from the outside. The internal environment 6 can be put in communication with the outside by at least one, and preferably two openings 8, 8', which allow the hides 2 to be treated to enter and/or exit from the internal environment 6. In particular, the coloring treatment of the hides 2 can take place inside the internal environment 6.

[0031] The hides 2 can be positioned on movement means, for example a conveyor belt 10 which transports them inside the internal environment 6, through a first inlet opening 8, and carries them along the internal environment 6 to the second outlet opening 8'. Advantageously, the conveyor belt 10 can be wire or mesh. In this way it is possible to define an upper surface 2' of the hides, which is the one which is substantially not in contact with the surface of the conveyor belt 10.

[0032] Advantageously, the conveyor belt 10, and in particular its speed of advancement can be controlled by a appropriate first control and processing unit (not shown).

[0033] In a preferred embodiment, in correspondence with and/or in proximity of the first opening 8, i.e. inside or outside the environment 6, and preferably outside, there can be sensors configured to detect the shape and/or the size of the hide 2 to be treated. Said sensors are traditional in themselves and will not be further described, but preferably they are optical sensors. Conveniently, said sensors can be configured to communicate the information detected to a suitable second control and processing unit. Preferably the second control and processing unit can coincide with the first control and processing unit.

[0034] The machine also comprises a spraying apparatus 14 configured to spray one or more coloring substances on the hides 2, and in particular on the corresponding upper surface 2' in order to modify its aesthetic

appearance and/or structure and/or morphology.

[0035] Conveniently, the spraying apparatus 14 can comprise at least one, and preferably a plurality of spray guns 16, each equipped with a nozzle 18 through which coloring substances 3 pass to be sprayed on the hide 2. Advantageously, the nozzle 18 can have a shape substantially circular, or substantially elliptical, or substantially rectangular, according to operational needs.

[0036] In particular, each spray gun 16 is configured to spray the coloring substance 3 onto a surface 22. The surface 22 can be defined as the intersection of the spray cone with the surface of the hide or also the trace of the spray cone on the surface of the hide, substantially the surface 22 corresponds to the portion of the surface of the hide and/or of the advancement plane, which would be reached by the coloring substance if at that instant an activation command of said spray gun 16 was given. The sprayed surface 22 clearly has a shape and/or a dimension that depend on a plurality of parameters, such as for example the distance of the nozzle 18 from the hide 2, the shape of the nozzle itself, the nature of the coloring substance 3 being sprayed, or other as will become clear later. Conveniently, it may be possible to define the center 22' of the sprayed surface 22 as the center of the geometric shape which best describes and/or approximates the sprayed surface itself.

[0037] Conveniently, the second control unit can be configured to measure and/or calculate the size and/or shape of the sprayed surface 22 on the basis of a plurality of parameters, as will become clear hereinafter.

[0038] Conveniently, the nozzle 18 can be fluidly connected to at least one reservoir of pigments to be sprayed on the hide 2. Conveniently, the reservoir can be positioned outside the internal environment 6. Advantageously, at least one corresponding pump can be present which allows to send the coloring substance 3 from the tank to the spray gun 16 and to the nozzle 18.

[0039] Advantageously, each spray gun 16 can be fluidically connected to a plurality of fluidic circuits which can be distinguished and separated from each other, in order to bring different coloring substances 3 to the nozzle 18. In particular, therefore, each spray gun 16 can be connected to a different pigment reservoir. Advantageously, at least one valve can be present, preferably electrically and/or remotely controlled, which allows to select substantially in real time with which circuit to supply the spray gun 16. Conveniently said valve can be controlled by a corresponding third control unit and processing which can preferably coincide with said first and/or said second control and processing unit. Advantageously, there may be a further valve - which may coincide with said valve - which allows to activate and/or deactivate the spray gun 16, that is to say which allows or prevents the escape of said coloring substance 3 from the nozzle 18.

[0040] Substantially said valve can allow to pass the spray gun 16 by:

- a first deactivated condition in which it does not send said coloring substance 3 onto said hide 2, a
- a second activated condition in which it sends said coloring substance 3 onto said hide 2,

and vice versa.

[0041] Advantageously, the spray guns 16 can be oriented so as to be substantially facing the upper surface 2' of the hide 2 to be treated, and in particular they can be in a higher position with respect to the conveyor belt 10. Substantially therefore the spray guns 16 can be oriented in a direction which is substantially perpendicular to the plane described by the hides 2 to be treated.

[0042] Advantageously, each spray gun 16 can be mounted on a corresponding movement assembly 20 configured to allow the movement of the spray gun 16 in order to allow the nozzle 18 to be in correspondence with different portions of the hide 2 to be treated. Advantageously, in a substantially traditional manner, the movement assembly 20 can be configured to allow each nozzle to follow a zig-zag trajectory configured to intercept the conveyor belt 10 preferably along its entire transverse extension, or preferably it can be circular. In a further embodiment, the machine 1 can comprise a so-called "elliptical spray booth", in which each spray gun 16 can be associated with a suitable flexible support, for example a chain, which can be stretched between two connection points, such as two pulleys; in this way each spray gun travels a trajectory which is partially rectilinear, and in particular can comprise two rectilinear segments substantially orthogonal to the direction of advancement of the conveyor belt 10, joined by two substantially circular portions, substantially describing an oval.

[0043] In particular, the spray gun 16 can be rigidly associated with the movement assembly 20. In this way the surface 22 which is sprayed by the spray gun 16 moves, and preferably rotates, together with the spray gun itself, and therefore the mutual orientation of the hide 2 and of the surface 22 varies continuously.

[0044] Preferably if several spray guns 16 are present, each spray gun 16 can be moved substantially independently of the others.

[0045] In particular, the movement assembly 20 can be controlled by a corresponding fourth control and processing unit, which preferably can coincide with the first and/or with the second and/or with the third control and processing unit. Advantageously, the fourth control and processing unit can be configured to calculate in real time the position and/or orientation of the sprayed surface 22 based on the positioning of the spray gun 16 and/or of the movement assembly 20.

[0046] The machine 1 according to the invention is controlled by an overall control and processing unit, which can preferably coincide with said first and/or said second and/or said third and/or said fourth control and processing unit. In particular, the operation of the machine 1 and of all its components can preferably be controlled only by said overall control and processing unit. Advanta-

geously, said overall control and processing unit can have an appropriate user interface that is simple and intuitive to use, for example it can be connected to a touchscreen from which the user can control the operation of machine 1.

[0047] Advantageously in said overall control and processing unit can be stored a plurality of parameters, and a plurality of combinations of parameters, which correspond to pre-set modes of use that allow the operation of the machine 1.

[0048] For example, said operating parameters can include, but not be limited to to:

- parameters related to the hide 2 to be processed, such as for example:
  - ◦ size and shape of the hide 2 to be processed,
  - ◦ positioning of the hide itself on the conveyor belt 10,
  - ◦ precision required on the edges, which will be better described later,
  - ◦ expansions possibly applied artificially to the size of the hide, and in particular to its longitudinal dimension,
  - ◦ others,
- parameters relating to the product used for the treatment, such as:
  - ◦ spray guns used, and in particular for example the shape of the nozzle and/or the size of the spray gun itself,
  - ◦ the positioning of the nozzle 18 with respect to the position of the mechanical arm with which the spray gun 16 is associated, which substantially defines the circumference along which the spray gun itself moves,
  - o others,
- processing related parameters, such as
  - ◦ factors that could make a specific spray gun 16 unavailable for certain periods of time, such as cleaning cycles, or mechanical failures,
  - ◦ the size of the arcs 17 used, i.e. the circular sector and/or the angle swept by the spray gun 16 when it is in a triggerable condition,
  - ◦ the number of arcs 17 used, that is, if the motion of the spray guns is substantially circular, and therefore the conveyor belt intersects the arc described by the spray guns in correspondence with two circular sectors, one upstream and one downstream,
  - ◦ the angle of the spray gun 16 on the horizontal plane and/or with respect to the vertical axis,
  - ◦ other.

[0049] Advantageously, the overall control and processing unit can be configured to automatically store any changes made to said parameters and/or said combinations of parameters.

[0050] Furthermore, the overall control and processing unit can advantageously be configured to implement the method according to the invention described below.

[0051] Advantageously, the machine 1 can be inserted inside a production line for hides 2, which is also an object of the invention.

[0052] The operation of the machine 1 according to the invention clearly follows from what has been said above.

[0053] In particular, a hide 2 is made available at one end of the conveyor belt 10 with the surface 2' to be treated facing upwards - ie not in contact with the surface of the conveyor belt itself. The conveyor belt 10 directs the hide to be processed in the direction of the internal environment 6 of the machine 1 through the first opening 8. Conveniently, the speed of advancement of the conveyor belt 10 can be controlled by the overall control and processing unit and/or by the first control and processing unit.

[0054] Before or after entering the environment 6, the hide 2 to be treated is measured by the sensors in order to detect its size and/or shape. This information is sent to the overall control and processing unit which stores it. Advantageously, the overall control and processing unit can process the measurement of the hide 2 as it is sent to it. Therefore, the measurement stored and/or used can substantially correspond exactly to the measurement of the hide 2, net of measurement errors and/or uncertainties that are intrinsic in the procedure. In particular, therefore, the overall control and processing unit and/or the second control and processing unit can be configured so as not to modify the measurements of the size of the hide 2 to be treated, and more particularly they can be configured so as not to artificially increase the size of the hide itself.

[0055] In one embodiment, the size of the hide 2 to be treated can be artificially increased, but only in the longitudinal direction.

[0056] Furthermore, the overall control and processing unit and/or the fourth control and processing unit can activate the movement assembly 20 in order to suitably move the spray guns 16.

[0057] Furthermore, the overall control and processing unit and/or the third control and processing unit can be configured to open the valve and/or the further valve and thus allow the spray gun 16 to spray said substance on the upper surface 2' of the hide to be treated when the sprayed surface 22 is in matching the hide itself. In particular, the overall control and processing unit can be configured to generate a first command following which the spray gun 16 can substantially pass from a first deactivated condition in which it does not send said coloring substance 3 on said hide 2, to a second condition activated in which it sends said coloring substance 3 onto said hide 2. Advantageously, the overall control and processing unit can be configured to generate said first

command when a portion of the sprayed surface 22 is superimposed on the hide 2 to be treated.

[0058] Similarly, the overall control and processing unit can be configured to generate a second command following which the spray gun 16 can substantially pass from said second activated condition to said first deactivated condition. Advantageously, the overall control and processing unit can be configured to generate said second command when a portion of the sprayed surface 22 is not in an external and/or non-superimposed position with respect to the hide 2 to be treated.

[0059] Conveniently, the sprayed surface 22 on the basis of whose position said first and/or said second command are generated can be measured and/or calculated, so as to be known precisely.

[0060] In one embodiment the sprayed surface 22 can be measured by means of a test surface, for example a graduated sheet onto which the spray gun 16 is sprayed. For example, said test surface can be positioned inside the machine 1, preferably in a position that corresponds to that in which the hide 2 to be treated will be, and subsequently sprayed with the spray gun 16 whose surface 22 is to be measured. for a predefined time interval. Conveniently, the sprayed surface 22 can be defined as the surface affected by all the sprays of coloring substance 3 which are present on the test surface. Alternatively it can be defined as the surface affected by a predefined percentage of all the coloring substance sprayed on the test surface. In the embodiment in which the test surface is squared, the sprayed surface 22 is defined as corresponding to all the squares showing stains of coloring substance.

[0061] Advantageously, therefore, when the overall control and processing unit calculates that the entire sprayed surface 22, and not just a point substantially corresponding to its center, is at least partially superimposed on the shape of the hide 2 measured by the sensors, it can send an appropriate first command in order to open the valve and/or the further valve, and to allow the spray gun 16 to spray the coloring substance 3 onto the hide.

[0062] Conveniently, the user can set a parameter, for example called "work threshold", which substantially corresponds to the minimum percentage of overlap of the sprayed surface 22 to the shape of the hide 2 to be treated, necessary for sending the spraying command. Therefore, if the overall control and processing unit calculates that the percentage of overlap of the sprayed surface 22 to the shape of the hide 2 to be treated which is stored in the control and processing unit itself exceeds said "working threshold", it sends a first command for activating the spray gun 16 to make it spray the coloring substance 3 on the surface of the hide to be treated, as shown in cases E, of figure 3 and that is, it makes said spray gun 16 pass from a first deactivated condition in which it does not spray the coloring substance 3 on the hide 2 to a second activated condition where it sprays the coloring substance 3 on the hide 2.

[0063] Subsequently, when the percentage of overlap of the sprayed surface 22 to the shape of the hide 2 to be treated which is stored in the control and processing unit itself is reduced below the "working threshold", the overall control and processing unit sends a second command which interrupts the spraying, as represented in case E" of figure 3, and that is, it makes said spray gun 16 pass from the first activated condition to the second deactivated condition.

[0064] Conveniently, since the hide 2 is on a conveyor belt 10 which is moving with a certain speed, and since the spray gun 16 is at a certain distance from the conveyor belt 10, it is possible that the spray gun 16 needs to be activated before the hide passes in correspondence with the spray gun itself, and in particular before it is in a position below the spray gun, in order to ensure that the spray arrives precisely on the hide 2. Therefore, the overall control and processing unit can be configured to calculate the projection of the surface 22, i.e. to define the position and/or orientation of the sprayed surface 22 not at the instant considered but at a later time and more precisely when the coloring substance actually reaches the surface of the hide 2 and/or of the conveyor belt 10.

[0065] In a preferred embodiment, the first command which leads to the passage of the at least one spray gun 16 from the first co Inactivated indication to the second activated condition can be sent when the sprayed surface 22 is not yet superimposed on the hide 2, and in particular it can be given with a suitable first advance.

[0066] Similarly, the second command that leads to the passage of the at least one spray gun 16 from the second activated condition to the first deactivated condition can be sent when the sprayed surface 22 is still superimposed on the hide 2, and in particular it can also be given with an appropriate second advance, which can be the same or different from the one with which the first command is given.

[0067] Said first and/or second advance can be calculated and/or measured on the basis of one or more advance parameters, such as:

- instrumental advance, which takes into account the characteristic reaction times of the spraying apparatus 14, and in particular of the time that elapses between the moment of issue of the first and/or second command by the control and overall processing unit, and the effective start/end of the spraying action by the spray gun 16, said instrumental advance in particular can be determined by:
    - ◦ the opening/closing time of the valve and/or the further valve,
    - ◦ the pressure exerted by the pump and/or the length of the tubes that lead from the pump to the nozzle 18, and which substantially determine the transit time of the coloring substance 3 inside the corresponding fluid circuit,
    - ◦ any anomalies and/or transients in the spraying by the spray gun 16 in correspondence with the

opening and/or closing of said valve and/or said further valve,

- process advance, which takes into consideration the space covered by the hide 2 and the spray gun 16 between the moment in which the first and/or second command is sent and preferably the moment from which the spray leaves the nozzle and the moment in which the coloring substance 3 reaches the hide 2, and in particular its upper surface 2', and/or the conveyor belt 10, said space advance in particular can be determined by:

  ◦ the speed of the conveyor belt 10, and therefore the speed of advancement of the hide 2,
  ◦ the linear and/or angular speed and direction of advancement of the spray gun 16,
  ◦ the height of the nozzle with respect to the surface 2' of the hide to be processed,
  ◦ the pressure to which the coloring substance 3 is subjected, and therefore its exit speed from the nozzle 18,
  ◦ the kinematics and/or dynamics of the coloring substance 3 during spraying.

[0068] Advantageously, the overall control and processing unit can be configured to calculate the projection of the sprayed surface 22 on the basis of said advance parameters and/or said operating parameters.

[0069] In a preferred embodiment, since the mechanical devices that make up the spray gun cannot be moved continuously and/or at too fast rates, to avoid damage and/or wear, the control and processing unit can implement, on the basis of the advance and/or operation parameters described above, predictive models that make it possible not to send said first and/or second command if it is not necessary and/or may be risky for the integrity of the machine 1.

[0070] In particular, if according to the predictive model created by the overall control and processing unit a first/second command must be followed by a second/first command after an interval of time less than a predefined interval and or set by the user on the basis of one or more of the parameters mentioned above, the overall control and processing unit can perform one of these options:

- advance the first/second command by an interval of time sufficient to separate said first/second command from said second/first command by an interval of time equal to or greater than the minimum time interval,
- delaying the second/first command by an interval of time sufficient to separate said first/second command from said second/first command by an interval of time equal to or greater than the minimum time interval,
- cancel said first command,
- cancel said second command.

[0071] In a preferred embodiment, the overall control and processing unit can be configured to delay the second command by an interval of time sufficient to separate said first command from said second command by an interval of time equal to or greater than the minimum time interval. In this way it is possible to be sure to treat the hide 2 in an optimal manner, even at the risk of wasting a small amount of coloring substance 3.

[0072] In an alternative embodiment the overall control and processing unit can be configured to delay the first command of a time interval sufficient to separate said second command from said first command of an interval of time equal to or greater than the minimum time interval. In this way it is possible to avoid any waste of coloring substance 3, even at the risk of not optimally treating the hide 2.

[0073] In particular, the method according to the invention is advantageous in that it is characterized by the fact that a spray gun 16 configured for sending a coloring substance 3 onto said hide 2 is made to pass by:

- a first deactivated condition in which it does not send said coloring substance 3 onto said hide 2 a
- a second activated condition in which it sends said coloring substance 3 onto said hide 2,

  when the overlap between the hide and the surface 22 sprayed by said spray gun 16 and/or its projection exceeds a predefined value and/or set by a user, and is made to pass from said second condition to said first condition when the overlap between said hide 2 and said surface 22 and/or its projection is lower than said predefined value and/or set by the user.

[0074] In particular, the solution according to the present invention is particularly advantageous, indeed optimal, since, unlike WO2014/122862, IT102011901974031, WO 2020/144512 and GB 954 946, in the present invention the activation and/or deactivation command of each spray gun is not imparted by the control and processing unit on the basis of the position reached in that instant by the spray gun itself, but with the use of an algorithm that takes into account a series of operating parameters of the machine, it estimates the position at any time and the orientation that the sprayed surface 22 would assume if the spray gun activation command were given at that instant and generates the actual activation/deactivation command when the estimated percentage of overlap of the sprayed surface 22 to the hide at the instant in which this will be reached by the coloring substance is higher/lower than a predetermined value.

[0075] This allows you not to spray coloring substance on the hide when this is not necessary, limiting the waste of coloring substance, and at the same time allows you to treat the hide in a homogeneous and correct way at the edges.

Claims

1. Method for depositing a substance (3) on a hide (2) which is handled, **characterized in that** at least one spray gun (16) configured to switch between:

   - a first deactivated condition in which it does not send said substance (3) on said hide (2) and
   - a second activated condition in which it sends said substance (3) onto said hide (2), and is controlled by a control and processing unit configured to calculate and/or measure, for said at least one spray gun (16), the spraying surface (22) and/or its projection and to send a first command for passing said at least one spray gun (16) from said first activated condition to said second deactivated condition, and a second command for passing said spray gun (16) from said second deactivated condition to said first activated condition, and **characterized in that** said first command is sent when the overlap between said moving hide (2) and the surface (22) sprayed by said spray gun (16) and/or its projection, which are calculated and/or measured by said control and processing unit exceeds a predefined value, said second command is sent when the overlap between said hide (2) and det the surface (22) and/or its projection is less than said predefined value.

2. Method according to claim 1 **characterized in that** said surface (22) corresponds to:

   - the area comprising all the sprays of said substance (3) which are present on a test surface which is sprayed by said spray gun (16),
   - the area that contains a predefined percentage of all the substance (3) deposited on said test surface.

3. Method according to one or more of the preceding claims **characterized in that** said first and/or said second command can also be issued on the basis of one or more of the following operating parameters:

   - parameters related to said hide (2) to be processed, such as for example

     ◦ size and shape of said hide (2) to be processed,
     ◦ positioning of said hide on movement means, for example a conveyor belt (10),
     ◦ precision required on the edges, substantially defined by said parameter selected and/or defined by the user,
     ◦ expansions possibly applied artificially to the size of the hide, and in particular to its longitudinal dimension,

   - parameters relating to the product used for the treatment, such as:

     ◦ spray guns used, and in particular for example the shape of said nozzle (18) and/or the size of the spray gun itself,
     ◦ the positioning of said nozzle (18) with respect to the position of the mechanical arm with which said at least one spray gun (16) is associated, which substantially defines the circumference along which the spray gun itself moves,

   - processing related parameters, such as:

     ◦ factors that could make at least one specific spray gun (16) unavailable for certain periods of time, such as cleaning cycles, or mechanical failures,
     ◦ the size of the arcs (17) used, i.e. the circular sector and/or the angle swept by the spray gun (16) when it is in a triggerable condition,
     ◦ the number of arcs (17) used, that is, if the motion of the spray guns is at least partly substantially circular, and therefore the conveyor belt intersects the arc described by the spray guns in correspondence with two circular sectors, one upstream and one downstream.

4. Method according to one or more of the preceding claims **characterized in that** the position and/or size of the hide (2) to be treated is measured by means of automatic sensors.

5. Method according to one or more of the preceding claims **characterized in that** said parameters on the basis of which said first and/or said second command are issued are automatically stored in said control and processing unit in order to be subsequently recalled.

6. Method according to one or more of the preceding claims **characterized in that** said surface is measured through the use of a graduated sheet which is preferably positioned in correspondence with the hide (2) to be treated and/or the position that this must assume during the treatment.

7. Method according to one or more of the preceding claims **characterized in that** the dimensions of said hide (2) which have been measured by said sensors are not artificially increased and preferably are not increased in the direction transverse to the direction of advancement of said movement means (10).

8. Method according to one or more of the preceding

claims **characterized in that**:

- said first command which leads to the passage of said at least one spray gun (16) from said first deactivated condition to said second activated condition is generated when said surface (22) is not yet superimposed on said hide (2), and in particular is generated with an appropriate first advance and/or
- said second command is sent when said surface (22) is still superimposed on said hide (2), and in particular it is generated with a suitable second advance.

9. Method according to one or more of the preceding claims **characterized in that** said first and/or said second advance are determined according to at least the following parameters:

- instrumental advance, which takes into account the characteristic reaction times of said spraying apparatus (14), and in particular of the time that elapses between the moment of emission of said first and/or said second command by said unit control and processing, and the actual start/end of the spraying action by said at least one spray gun (16), said instrumental advance in particular being determined by:
  - ◦ the opening/closing time of a valve and/or of a further valve configured to control the release of said substance (3) from said nozzle (18),
  - ◦ the pressure exerted by a pump configured to push said substance (3) out of said nozzle (18) by means of a fluidic circuit and/or the length of the tubes leading to said nozzle (18) said substance (3), and which substantially determine the transit time of said substance (3) inside a corresponding fluidic circuit leading to said nozzle (18),
  - ◦ any anomalies and/or transients in spraying by the spray gun (16) in correspondence with the opening and/or closing of said valve and/or said further valve,
- process advance, which takes into consideration the space covered by said hide (2) and by said at least one spray gun (16) between the moment in which said first and/or said second command is sent and/or preferably the moment to be at which the spray exits from said nozzle and the moment in which said substance (3) reaches said hide (2), and in particular its upper surface (2'), and/or said movement means (10) on which said hide (2) is positioned during the coloring process, said space advance in particular can be determined by:
  - ◦ the speed of said movement means (10), and therefore the speed of advancement of said hide (2),
  - ◦ the linear and/or angular speed and direction of advancement of said spray gun (16),
  - ◦ the height of said nozzle with respect to said surface (2') of said hide (2) to be treated,
  - ◦ the pressure to which said substance (3) is subjected, and therefore its exit speed from said nozzle (18),
  - ◦ the kinematics and/or dynamics of said substance (3) during spraying.

10. Method according to the previous claim **characterized in that** if said first command is to be followed by said second command after an interval of time less than a predefined interval on the basis of one or more of the parameters mentioned above, yes:

- advances the first/second command by an interval of time sufficient to separate said first/second command from said second/first command by an interval of time equal to or greater than the minimum time interval, and/or
- delays the second/first command by an interval of time sufficient to separate said first/second command from said second/first command by an interval of time equal to or greater than the minimum time interval, and/or
- cancel said first command, and/or
- cancel said second command.

11. Method according to one or more of the preceding claims **characterized in that** said time interval less than a predefined interval and/or set by the user is calculated and/or measured on the basis of the speed and/or wear times of the mechanical components that compose the machine (1) by which the method is implemented.

12. Hide (2) dyeing machine (1) comprising:

- a frame (4) which defines an internal environment (6) substantially closed and separated from the outside, in which the coloring of said hide (2) takes place, and communicates with the outside through at least one opening (8,8'),
- movement means (10) configured to transport said hide (2) inside said environment (6),
- sensors, preferably optical, configured to measure the shape and/or size of said hide (2) to be treated,
- a spraying apparatus (14) comprising in turn at least one spray gun (16) configured to spray a coloring substance on said hide (2),
- a control and processing unit configured to control the operation of the components of the ma-

chine (1), in order to implement a method according to one or more of the preceding claims, - a movement assembly (20) to which said at least one spray gun (16) is rigidly associated and configured to move said at least one spray gun (16), preferably along a substantially circular trajectory.

13. Machine (1) according to the previous claim **characterized in that** said control and processing unit is configured to measure and/or calculate and/or memorize said surface (22).

14. Machine according to one or more of the preceding claims **characterized in that** each of said spray guns (16) is connected to a plurality of fluidic circuits which can be distinguished and separated from each other, in order to bring different coloring substances (3) to each nozzle (18) of each spray gun (16).

15. Machine according to one or more of the preceding claims **characterized in that** the flow of said substances (3) towards said spray guns (16) is controlled by means of at least one solenoid valve.

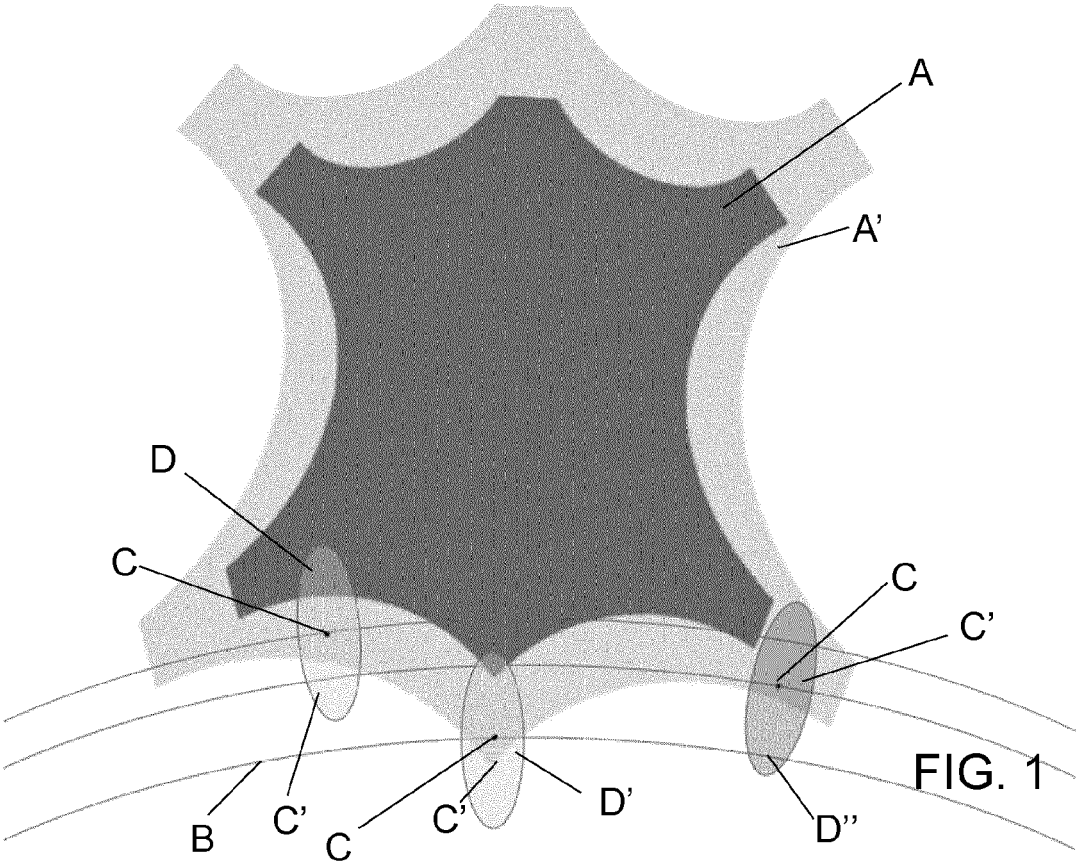

FIG. 1

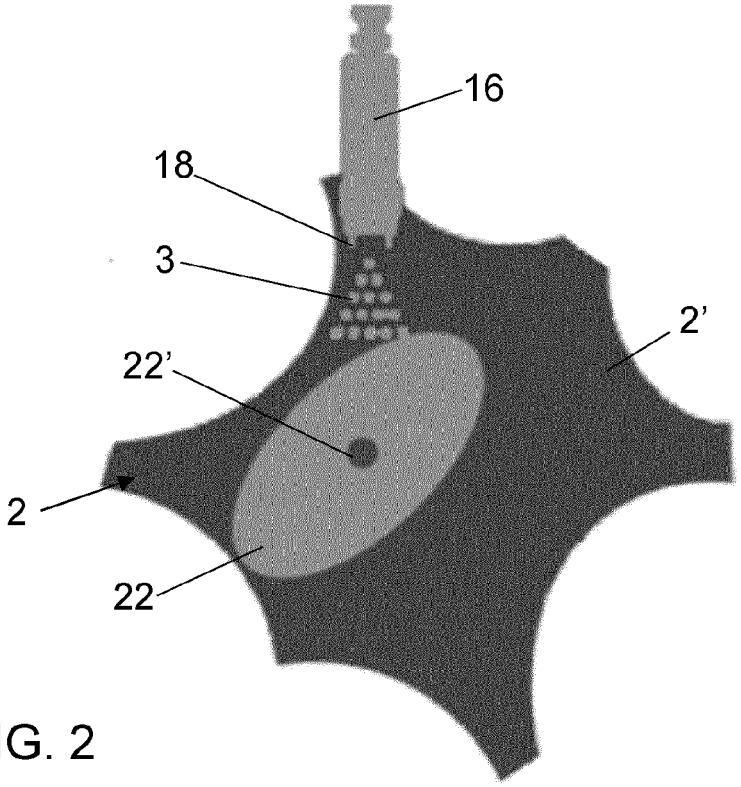

FIG. 2

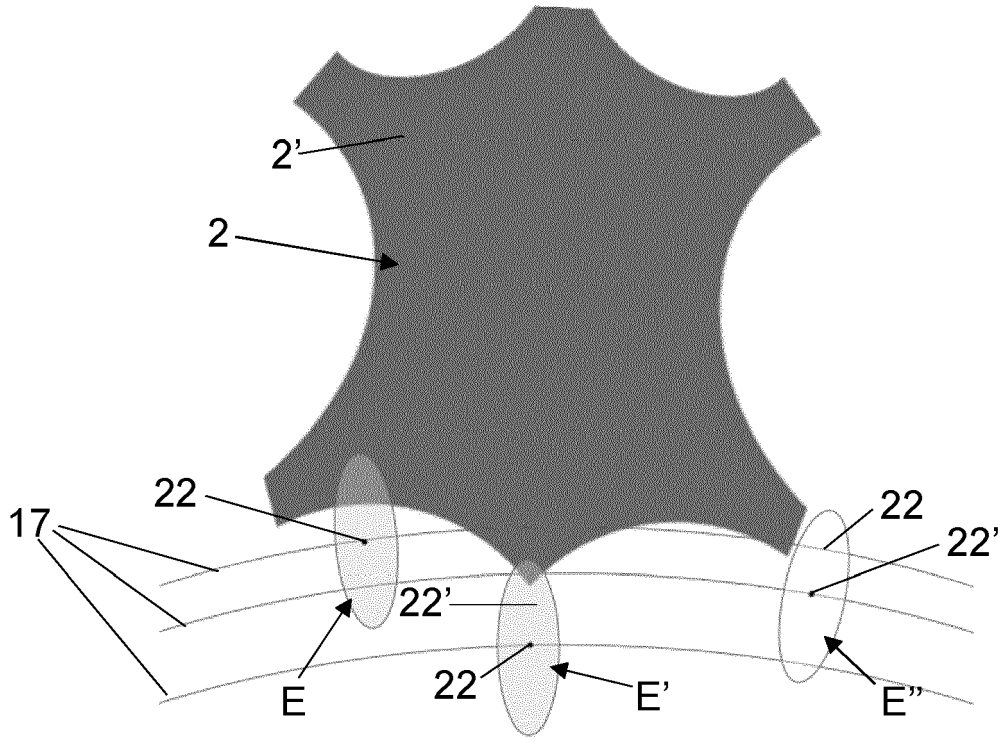

FIG. 3

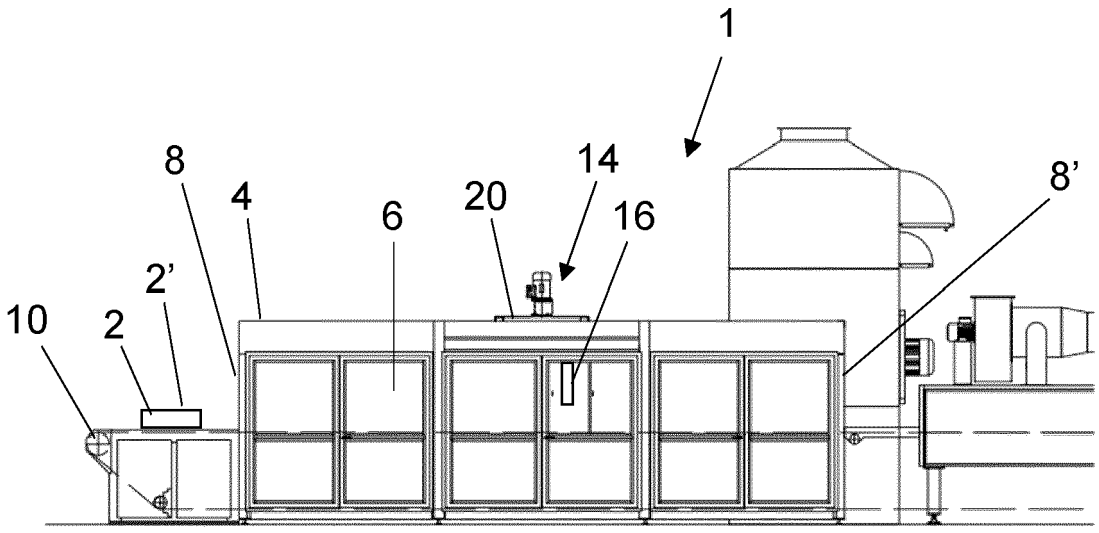

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 22 17 5656

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2014/122682 A1 (ERRETRE SPA [IT]) 14 August 2014 (2014-08-14) * abstract; figures 1-2 * * page 1, line 11 - page 3, line 32 * * page 4, line 2 - line 12 * * page 6, line 25 - page 8, line 12 *	1-7, 11-15	INV. B05B12/08 B05B12/12 B05B13/04 B05B16/00
X	IT VE20 110 060 A1 (GER ELETTRONICA S R L) 25 February 2013 (2013-02-25) * abstract; figures 1-4 * * paragraph [0003] - paragraph [0038] *	1,3-10, 12	
X	WO 2020/144512 A1 (ERRETRE SPA [IT]) 16 July 2020 (2020-07-16) * abstract; figures 1-8 * * page 1, line 10 - page 7, line 22 *	12-15	
X	GB 954 946 A (KITCHIN & COMPANY LTD) 8 April 1964 (1964-04-08) * abstract; figures 1-8 * * page 2, line 7 - line 90 *	12-15	
			TECHNICAL FIELDS SEARCHED (IPC) B05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 September 2022	Frego, Maria Chiara

CATEGORY OF CITED DOCUMENTS

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21-09-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014122682 A1	14-08-2014	BR 112015018671 A2	18-07-2017
		CN 104981296 A	14-10-2015
		EP 2953726 A1	16-12-2015
		TR 201900299 T4	21-02-2019
		WO 2014122682 A1	14-08-2014
IT VE20110060 A1	25-02-2013	---	
WO 2020144512 A1	16-07-2020	BR 112021013220 A2	14-09-2021
		CN 113286664 A	20-08-2021
		EP 3908409 A1	17-11-2021
		WO 2020144512 A1	16-07-2020
GB 954946 A	08-04-1964	NONE	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2014122862 A **[0010] [0074]**
- IT 102011901974031 **[0011] [0074]**
- WO 2020144512 A **[0012] [0074]**
- GB 954946 A **[0013] [0074]**