Description

The invention relates to a device for manufacturing a mould for a disc-shaped registration carrier, said device being provided with a station for applying a photosensitive layer, such as a photoresist layer, to a substrate, with a station for exposing said photosensitive layer in accordance with the registration data to be stored, with a station for developing the photosensitive layer and metallizing the side of the substrate carrying the developed photosensitive layer, with a station for applying a metal coating and with a station for applying a protective lacquer coating.

The term registration carriers is understood to mean sound and/or picture carriers and/or data carriers and the like, for example so-called compact discs, as well as carriers which can be processed at a later stage for storing sound, pictures or other data to be registered thereon.

A method for manufacturing such a mould is for example described in Dutch Patent Application No. 8802211. Said publication does not provide any indication with regard to the construction of a device to be used for carrying out such a method, however.

Dutch Patent Application No. 8702157 describes a device for carrying out a certain treatment of such registration carriers, whereby the device is provided with a rotary table for supporting a registration carrier, which rotary table and its driving mechanism are movable between several stations. Not only does this lead to a complicated construction of the device, but a further drawback is that the processing of a registration carrier in the first station cannot start before the processing in the last station has been completed and the rotary table has been returned to the first station. It will be apparent that an economical mass production cannot be realized with such a device.

Furthermore it has been proposed to design the various above-mentioned stations as separate units, and to transport registration carriers between the various stations in cassettes. An arrangement of separate stations of this kind requires a great deal of space, whilst also the transport between the various stations constitutes a disadvantageous factor, which slows down the production process.

The object of the invention is to obtain a device of the above kind, which can have an efficient and compact construction and wherein the successive operations can take place in succession and without the operator having to take action.

According to the invention this can be achieved in that the various stations are accommodated in a housing and means for receiving the substrates are provided in the various stations, whilst a transport mechanism disposed within the housing is provided with at least one transport means for gripping a substrate, which transport means is movable to and fro between the stations in a horizontal plane in a first direction and a second direction transverse to said first direction, and which is also capable of moving upward and downward within the housing.

When using the construction according to the invention the substrates may be transported in the desired manner by means of the transport mechanism, between the substrates receiving means provided in the various stations, whilst desired operations may be carried out, independently of each other, on the substrate in each of said stations.

The invention will be explained in more detail hereafter with reference to an embodiment of the construction according to the invention diagrammatically illustrated in the accompanying figures.

Figure 1 is a diagrammatic front view of the device according to the invention.

Figure 2 is a diagrammatic plan view of the various stations of the device according to the invention.

Figure 3 is a cross-sectional view of the device shown in figures 1 and 2.

Figure 4 is an elevational view of a device for removing a substrate from a stack of substrates and for transferring said substrate to the transport mechanism.

Figure 5 is a plan view of figure 4.

Figure 6 is an plan view of the mechanism for cleaning and applying a first coating and a photosensitive layer.

Figure 7 is a plan view of parts of a drying station.

Figure 8 is a side view of figure 7.

Figure 9 is a view, partly in section and partly in elevation, of the developing and metallizing station.

Figure 10 is an elevational view of the means for placing contact rings on a substrate.

Figure 11 is a plan view of Figure 10.

Figure 12 is an elevational view of the means for placing a clamping ring on a substrate.

Figure 13 is a plan view of Figure 12.

Figure 14 shows a mechanism for carrying out the immersing step in a bath (likewise shown) containing electrolytic fluid.

Figure 15 is a larger-scale view of a detail of the construction shown in Figure 14.

Figure 16 is an elevational view of a part of a station, where the mould obtained can be subjected to a finishing operation.

Figure 17 is a plan view of Figure 16.

The device shown in Figures 1 - 3 comprises a housing 1, which is closed during normal operation, in which several units 2 - 7 are accommodated. Preferably the design of said units 2 - 7 is such that it is possible to remove such a unit as a whole, so as to be replaced as desired by a unit carrying out (a) corresponding operation(s) or (an)other operation(s).

Near the upper side of the device a girder 8 is provided, which extends in the longitudinal direction of the device and which forms part of a transport mechanism. A slide 9 is reciprocatingly movable along said

girder by means of a driving mechanism (not shown), as indicated by means of the arrow A. The slide 9 supports a girder 10 extending perpendicularly to the girder 8, along which a further slide 9' is reciprocatingly movable in the direction according to the arrow B. The slide 9' functions to support two transport means 11 and 12, which are provided with radially movable hook-shaped fingers 13. The transport means 11 and 12 are reciprocatingly movable in vertical direction by driving means (not shown).

When the fingers 13 have been moved radially outwards a transport means can be placed on a substrate, and when the fingers 13 are moved inwards again the hook-shaped ends of the fingers will engage under the substrate, so that the substrate can thus be lifted by a respective transport means and be moved through the housing by means of the above-described transport mechanism.

As will furthermore be apparent from Figures 1 - 3 the housing may be subdivided into three compartments 14 - 16, one being located above the other. The uppermost compartment 14 actually accommodates the transport mechanism. The compartment 15 located thereunder, which may be subdivided near the units 2 - 7 in the manner shown in Figures 1 and 2, accommodates the various means yet to be described for processing the registration carrier. At least some of these units will be provided with a rotary table as diagrammatically indicated in Figure 3.

The lowermost compartment 16, likewise subdivided in correlation with the units 2 - 7, will accommodate auxiliary means, such as electronic equipment, liquid-containing vessels and the like. Preferably said auxiliary means are disposed on slides, so that they can be moved into and out of the housing transversely to the longitudinal direction of the housing in order to carry out maintenance work and the like.

The unit 3 is provided with an opening, through which a holder supporting a number of substrates arranged one on top of the other, generally glass discs, may be disposed in the device. A mechanism, which is shown in more detail in Figures 4 and 5, is disposed near said introduction opening, said mechanism functioning to remove a substrate from the stack and deliver said substrate to the transportmechanism.

As is shown in Figure 4 a number of substrates 18, for example glass discs, are stacked one on top of the other within the housing.

The mechanism shown in Figures 4 and 5 comprises a support 19 secured to the frame of the device, in which a vertical lead screw 20 is rotatably journalled. The lead screw 20 can be rotated by means of a driving motor 21 connected to said lead screw.

The lead screw 20 is passed through a nut means 22, which is locked against rotation about the central axis of the lead screw 20 in a manner not shown. Connected to said nut means 22 is one end of an arm 23, which is rotatable about the central axis of the lead screw 20 with respect to the nut means 22, by driving means not shown, and which is capable of vertical reciprocating movement along with the lead screw.

Three suction pads 24 facing upwards are secured to the free end of the arm 23.

When a stack of substrates 18 has been placed in the device, the arm 23 may be moved to a position under the stack by means of a suitable control mechanism, then be pivoted under the stack and be moved upwards until the suction pads 24 abut against the bottom side of the lowermost substrate 18. This position is detected by means of a sensor 25 mounted on the arm. In the suction pads 24 a sub-atmospheric pressure can be generated by means not shown, after which the lowermost substrate 18 can be pivoted away from its position under the stack of substrates remaining behind to a position beside the holder with substrates. In this position the substrate 18 can be taken over from the arm 23 by one of the transport means 11 or 12.

As will become apparent hereafter the registration carriers will be wet during certain stages of the process. On the basis of. this two transport means 11 and 12 are provided, as already mentioned above, so that the one transport means may be used for transporting dry substrates and the other transport means may be used for transporting wet substrates, as a result of which undesirable contamination of the substrate and the device can be avoided.

After a substrate 18, usually formed by a glass disc, has been picked up by a transport means 11, 12, said substrate may be moved upwards into the space 14 through a hole 27 provided in the wall 26 closing the compartment 15 at its upper side and be transported to the unit 4, in order to be moved downwards there through a hole 27 provided in the wall 26 to a station 28 for cleaning and applying a first coating and a so-called lacquer coating or photosensitive layer.

As is diagrammatically shown in Figure 6 this station 28 comprises a rotary table 29, which is disposed within a cup-shaped means 30, whose construction at least substantially corresponds with the cup-shaped means yet to be described in more detail with reference to Figure 9.

Furthermore two supply pipes 33 and 34, which are pivotable about vertical axes of rotation 31 and 32 respectively, are provided in this station, as well as a cleaning means, which is pivotable about a vertical axis of rotation 35 and which is capable of vertical reciprocating movement, such as for example a brush means 36, said brush means being rotatable about a horizontal axis of rotation.

Whilst the substrate placed on the rotary table 29 is rotated by means of said rotary table a rinsing liquid, deionized water in this case, will be spread over the upper surface of the substrate by means of the supply pipe 33 in order to rinse the substrate. While rinsing liquid is being supplied the upper surface of

the substrate is also brushed clean by means of the brush 36, which has been pivoted to a position above the substrate. After cleaning the brush may be pivoted back to the position shown in Figure 6, in which the brush is located above a pan 37 (diagrammatically shown), to which a drain pipe 38 is connected for draining moisture dripping from the brush. After rinsing a first coating may be applied via pipe 33. After a first coating has been applied the material for forming the eventual lacquer coating or so-called photosensitive layer is applied by means of the supply pipe 34 and spread over the substrate surface.

Furthermore a suction pipe 39 for exhausting vapours is connected to the cup-shaped pan 30.

After the lacquer coating or photosensitive layer has thus been applied to the substrate, said substrate will be moved by means of the transport mechanism to the station 40 for drying the lacquer coating.

An air line with a horizontal pipe part 41 shown in station 40 in the Figures is provided for the drying of the lacquer. A rotary table 42 is at least partially disposed within the interior of the pipe part 41, through a hole provided in the bottom wall of the pipe part 41. Said rotary table is provided with three suction pads 43, in which a sub-atmospheric pressure can be generated for fixing a substrate 18 on the rotary table in question. The rotary table can be rotated by means of a driving motor 44 coupled to the rotary table.

The substrate 18 can be placed on the rotary table by means of the transport mechanism, through an opening provided in the upper wall of the pipe part 41, which opening can be closed by means of a cover 45. The cover 45 is secured to one end of a supporting arm 45'. The supporting arm 45' is secured to a vertical shaft 46, which can be rotated about its central axis by means of a rotation motor 47.

The shaft 46 is furthermore supported by a supporting mechanism 48, which can be moved upwards and downwards by means of a setting cylinder 49. Thus, in order to open the aperture provided in the upper wall of the pipe part 41, the cover 45 may be moved upwards and then be pivoted horizontally from the position illustrated in full lines in Figure 7 to the position illustrated in dotted lines in Figure 7.

After the substrate has been placed on the rotary table the air passage may be closed by moving the cover in opposite direction. Then an air flow may be generated in the air passage by means of a fan (not shown). Heating coils 50 extending perpendicularly to the longitudinal direction of the air passage are provided for the heating of the air in the air passage, said heating coils in Figure 7 being shown in a position turned through 90° with respect to their actual position.

As is furthermore apparent from Figure 7 a diaphragm 51, which slightly narrows the air passage, is provided between the rotary table and the heating coils in the air passage, in order to effect an air flow as even as possible over the substrate supported on the rotary table.

After the passage of hot air for the drying step cooler air for cooling the substrate is passed through the air line for some time.

In practice it has become apparent that in a suitable embodiment hot air is passed for ± 3 minutes and cooling air is passed for ± 7 minutes. In practice this implies that as a result of this a considerably shortening of the time required for drying the lacquer or photosensitive material has been obtained. So far it has been usual to have this drying take place in a separate oven, whereby the drying time amounts to ± 1 hour.

After the photosensitive layer has thus been dried and the pipe part 41 has been opened again by removing the cover 45, the substrate, which is now provided with a photosensitive layer, may be supplied to a station 52 for recording the desired information on the registration carrier. This station 52 comprises a rotary table 53, on which the substrate 18 provided with a lacquer coating or photosensitive layer can be placed by means of the transport mechanism. Furthermore the station 52 conventionally comprises a laser device 54, as well as an optical apparatus 55, by means of which the light beam is emitted to lenses 57 supported by a carrier 56. The carrier 56 is secured to a shaft 58, which can be moved lengthwise by means of a driving mechanism 59 in order to move the carrier over guide rails 60, in such a manner that the carrier moves over the substrate 18 supported by the rotary table 53. Thus the photosensitive layer will be exposed in the desired manner in accordance with information or the like to be recorded.

After having been exposed in this manner the substrate 18 is moved to a station 61 by means of the above-described transport mechanism.

As is shown in more detail in Figure 9 the station 61 comprises a rotary table 62 for receiving a substrate. The rotary table 62 can be rotated about a vertical axis by means of a motor 63.

The rotary table 62 is disposed in a cup-shaped means 65, to the bottom side of which a drain pipe 66 is connected. Near the upper side of the cup-shaped means 65 a circular recess 67 is provided in the cup-shaped means, the inner wall of said recess being located slightly lower than the outer wall, as will be apparent from Figure 9. A pipe 68 for exhausting vapours is connected to said recess 67.

A rotary shaft 70, which is rotatable about a vertical axis of rotation by means of a driving mechanism 69, is provided near the rotary table, to which rotary shaft the end of an arm 71 is secured. The end of the arm 71 functions to support a plurality of pipes 72 for supplying various liquids when the end of the arm 71 in question supporting the pipes is located above the cup-shaped means in the manner indicated in Figure 9.

From this position the arm 71 can be pivoted to a position in which the free end of the arm supporting the pipes is located above a pan 74 (Figure 2), so that any liquid dripping from the pipes or rinsing liquid used for flushing the pipes can be drained via the pan 74.

It is noted that for easy reference the diagrammatically indicated arm 71 and the pipes 72 in Figure 2 are not shown in their position above the pan 74, as is usual, but in a different position.

A further vertical shaft 76, which is rotatable by a driving means 75, supports an arm 77, to which three lenses 78 are secured. The lenses 78 function to pick up laser light beamed in the direction according to the arrow B, which can move through the substrate processed in the above-described manner and which is subsequently picked up by the lenses 78. The light picked up by the lenses is influenced by the configuration which the photosensitive layer obtains during the processing step, and thus it is made possible to check whether or not the desired processing is carried out in the desired manner.

Various liquids are supplied in succession by means of the various pipes. First the substrate will be rinsed, after which a basic developing fluid is washed over the photosensitive layer in order to remove the exposed materials from the photosensitive layer. Whilst the photosensitive layer is being developed in this manner the above-described checking by means of the laser light and the lenses 78 is in particular effected.

After that the remaining photosensitive layer and/or the upper surface of the substrate 18 is metallized by supplying suitable liquids, generally provided with a nickel coating, so that a product is obtained which in principle corresponds with the product depicted in Figure 2 of the aforesaid Dutch Patent Application No. 8802211.

After the substrate 18 and the photosensitive layer applied thereto have thus been treated in the station 61 and after the arms 77 and 71 have been pivoted to a position beside the cup-shaped means, the substrate is transported to a subsequent station 80 by means of the transport mechanism, and that on a supporting plate 81 (Figure 15) secured to the upper end of a supporting arm 82, which, when the substrate is being placed, occupies the vertical position shown in Figure 14. From this position the supporting arm 82 is pivotable about a horizontal pivot axis 84 to the position illustrated in dotted lines in Figure 14 by means of a setting cylinder (not shown), which is coupled to the arm 82 by means of a connecting rod 83.

More particularly the substrate 18 will thereby come to lie on the upper ends of a few compression springs 85 mounted within the supporting plate 81.

Then a thin metal contact ring 86, in particular made of stainless steel or nickel, must be placed on the substrate, the dimensions of said ring being such that the ring covers a narrow outer edge of the substrate and slightly projects beyond the substrate at the outer side.

The mechanism shown in Figures 10 and 11 is disposed in station 80 with a view of providing the metal contact ring 86.

This mechanism comprises a supporting means 87, which is vertically movable by means of a setting cylinder 88.

Said supporting means 87 supports a vertical shaft 89, to which one end of an arm 90 is secured.

The shaft 89 with the arm 90 secured thereto can be pivoted about the vertical axis of the shaft 89 by means of a setting cylinder 91 secured to the supporting means, the piston rod 91' of said setting cylinder being coupled to the shaft 89.

The free end of the arm 90 is formed by a plate 92. A disc 93 is supported on the plate 92, which disc is rotatable about an axis 94 with respect to the plate 92. The disc 93 is coupled to a piston rod 95 of a setting cylinder 96 secured to the arm 90 with a view to rotating the disc 93.

Three slotted holes 97 are provided in the disc 93, in such a manner that the distance between the axis 94 and the respective slotted holes from one end of each of said slotted holes to the other end of each of said slotted holes gradually increases. Vertical pins 98 are located within said slotted holes 97, said pins being connected to the ends of rods 99, which extend in radial direction with respect to the axis 94. The rods 99 are accommodated in guide blocks 99' secured to the plate 92 so as to be movable in longitudinal direction.

It will be apparent that when the disc 93 is being pivoted forwards and backwards by means of the setting cylinder 96, the rods 99 will be moved in their longitudinal direction.

Downwardly extending arms 100 are secured to the ends of rods 99, and fingers 101 are secured to the ends of said arms 100.

A plurality of rings 86, one lying above the other in a rack or the like, will be disposed near the station 80, for example in the position 86 diagrammatically indicated in Figure 10.

The uppermost ring from the stack may now be picked up by means of the mechanism described with reference to Figures 10 and 11, by first moving the fingers outwards by means of the arms 99, and furthermore moving the fingers to a position in which they are located under the uppermost ring of the stack, by pivoting and vertically moving the arm 90 in a suitable manner, after which the fingers may be moved towards each other again, so that the fingers 101 will come to lie under the uppermost ring of the stack. Then the uppermost ring may be moved to a position above the substrate supported by the' supporting plate 81, by suitably moving the arm 90 in vertical direction and pivoting said arm, so as to place the ring

on said substrate in this manner.

After that the substrate and the ring placed on the substrate are to be clamped down on the supporting plate 81 for further processing.

The mechanism shown in Figures 12 and 13 is disposed in station 80 with a view to providing a clamping ring 102.

As is apparent in particular from Figure 15, the clamping ring 102 has a more or less L-shaped section, the configuration being such that in the mounted position of the clamping ring 102 one leg of the clamping ring 102, with a sealing ring 103 provided therein, will come to lie on the ring 86, whilst the other leg will more or less extend along the outer circumference of the supporting plate 81. Three radially extending pins 104 are provided in the outer circumference of the supporting plate 81 in regularly spaced-apart relationship, in such a manner that said pins project beyond the outer circumference of the supporting plate 81, and are able to cooperate with L-shaped slotted holes 105 provided in the clamping ring 102, the short leg of said slotted holes being open at a point located at the inner side and bottom side of the clamping ring, and the long leg extending in circumferential direction.

The mechanism shown in Figure 12 and 13 for providing or removing the clamping ring 102, as the case may be, comprises a supporting means 106, which is vertically movable by means of a setting cylinder 107. The supporting means supports a vertical shaft 108, to which the free end of an arm 109 is secured. The shaft 108, together with the arm 109, is pivotable about the central axis of the shaft 108 by means of a setting cylinder 110 secured to the supporting means 106, a piston rod of said setting cylinder being coupled to the shaft 108.

The free end of the arm 109 supports a disc 113 by means of a vertical shaft 112, said disc being rotatable about the central axis of the vertical shaft 112 by means of a setting cylinder 114 secured to the arm 109. A further plate 115 is secured to the bottom side of the plate 113 by means of bolts 116. Said bolts 116 are passed through slotted holes 117, in order to enable a correct adjustment of the two plates 113 and 115 with respect to each other.

A few pins 117 extending under the plate 115 are secured to the plate 115 at regular intervals. Heads 118 are secured to the bottom ends of said pins, which heads are accommodated in curved slotted holes 119 provided in the interior of the clamping ring 102, said slotted holes at one end being provided with an enlarged hole 120, which is open at the upper side of the clamping ring, through which a head 118 may be introduced into the slotted hole 119 or be removed therefrom, as the case may be, upon suitable vertical movement of the arm 109 with the parts supported by the arm and rotation of the plates 113 and 115 about the shaft 112.

By pivoting of the arm 109 the clamping ring 102 can be moved to a position above the supporting plate 81 shown in Figure 15 and subsequently be moved downwards, in such a manner that the pins 104 will move towards the inside through the vertically extending parts of the L-shaped slotted holes 105 and the clamping ring 102 will be supported on the ring 86. Then the clamping ring may be rotated by rotating the interconnected plates 113 and 115 by means of the setting cylinder 114, whereby the clamping ring is taken along by the plates 113 and 115 via the bolts 117. At the end of the rotation the pins 104 will be located near the closed ends of the horizontally extending parts of the slotted holes 105. Then the plates 113 and 115 may be pivoted to a position in which the heads 118 will come to lie near the recesses 120, so that the plates 113 and 115 can then be moved upwards with the pins 117 whilst leaving behind the clamping ring 102 on the supporting plate 81.

Then, as is illlustrated in dotted lines in Figure 14, the substrate 18 thus clamped down and the stainless steel contact ring 86 clamped down thereon may be pivoted into a vessel 125 containing electrolytic fluid. A housing 126 is disposed within said vessel, which housing is provided with an opening 127 at one side, opposite which the supporting plate 81 with the substrate 18 clamped down thereon is disposed in the manner illustrated in dotted lines in Figure 14.

As is furthermore indicated in Figure 14 a plate 129 may be moved in front of the opening 127 within the housing 126, said plate being provided with a passage 130, which is adapted to the substrate surface to be metallized. Since the plate 129 is readily exchangeable with another plate having another passage, the size of the passage may readily be adjusted according to what is required.

Furthermore a receiving means 131 is placed within the vessel, in which receiving means a large number of metal balls, generally nickel balls 132, will be located. By using the construction illustrated the distance between the receiving means 132 containing the nickel balls and the substrate to be treated may be kept comparatively small, in the order of ± 35 mm, which has a positive effect on the quick and even coating of the substrate.

As is furthermore indicated in Figure 14 a number of liquid passages 133 are provided over a circumferential angle of ± 50° in the wall of the housing 126 bounding the opening 127. Through these openings fresh electrolyte may be supplied, in such a manner that said fresh electrolyte approximately flows in a direction parallel to the surface of the substrate 18, as is indicated by means of the arrow C.

By constantly supplying fresh electrolyte a satisfactory deposition of the nickel on the substrate surface will be effected.

It will be apparent that the nickel deposit on the substrate and the metal contact ring placed thereon

will for example act as a cathode thereby, and the nickel balls will form the anode, as is usual in processes like this.

Thus a thick coating will be applied to the substrate in this station, within the spirit as shown in Figure 3 of the aforesaid Dutch Patent Application No. 8802211.

Once a sufficiently thick coating has been formed, the supporting plate 81 will be pivoted back again, whereby the supporting plate with the substrate and the coating will be rinsed with hot deionized water. Then the supporting plate is pivoted back to the position shown in Figure 14, after which the clamping ring 102 can be removed by reversing the above-described steps for providing the clamping ring 102. Then the substrate with the coating provided thereon, which is now integral with the ring 86 placed on the substrate, may be removed by means of the transport mechanism and be placed on a pivotable arm 140, which is disposed in a further station 141. The construction of the pivotable arm 140 at least substantially corresponds with the above-described arm 23, and the substrates may be placed in a rack 142 provided in the station 141 by means of said arm 140, which is pivotable about a vertical axis and which is vertically movable as well.

The substrates processed in this manner can be removed from the device through an access door (not shown), so that the substrate can be removed in the usual manner, for example by hand, from the so-called male mould formed on the substrate in the above-described manner, which will look as shown in Figure 4 of the above-mentioned Dutch Patent Application No. 8802211.

If necessary said male mould may be placed on a rotary table 145 present in the station 141 with its embossed surface turned upwards, after which a light source 146 (diagrammatically indicated), which is secured to an arm 147, which is pivotable about a vertical axis, may be moved over the plate so as to develop the residual lacquer or photosensitive material remaining behind on the male mould that has been formed. Then a spraying mechanism 149 secured to the end of an arm 148 (Figures 16, 17) may be pivoted above the male mould supported on the rotary table. The arm 148 can be moved upwards and downwards, in a similar manner as described above, by means of a setting cylinder 150, and also be pivoted about a vertical pivot axis by means of a horizontal setting cylinder 151.

In the position of the spraying mechanism 149 shown in Figure 16 rinsing liquid may be sprayed on the male mould 152 supported on the rotary table 145 (not shown in Figure 16), so as to rinse the male mould.

Then a lacquer coating may be provided on the male mould 152 via the spraying device 149. For this purpose the arm 148 is moved downwards, so that a receiving ring 153 coupled to a shell 153' secured to the arm 148 and surrounding the spraying mechanism will come to rest on the upwardly tapering circumferential surface of the cup-shaped means 154 accommodating the rotary table 145. For this purpose a bottom ring 155 of the receiving ring is designed to slope upwards from its outer circumference towards the inside, as a result of which a space 156 for catching any residual lacquer is formed between the outer wall of the receiving ring 153 and the bottom ring 155. The receiving ring 153 is coupled to the shell 153' by means of pins 157 and suitable L-shaped slotted holes, which form some kind of bayonet catch, so as to be readily detachable, so that the receiving ring 153 can readily be removed and cleaned when a certain amount of lacquer has been collected in the ring.

The male mould thus completed may be discharged from the device so as to be stored and/or be supplied to further processing machines.

During operation the housing 1 will be closed and clean air can be supplied to the substrate processing stations through ducts 158 bounded by the housing and a grid 159.

The sequence in which the various stations are arranged may be different from the sequence described above and depicted in the Figures.

It is to be preferred, however, to provide the station 52 near one end of the housing 1, since the equipment disposed in said station, such as the laser device and the optics, comprises sensitive components, which require regular maintenance.

As a result of the arrangement of this equipment near one end of the device the equipment can be accommodated so as to be readily accessible.

Furthermore it is not necessary for the various stations to be arranged in a straight line. The housing 1 may also be curved, for example.

Although in the above several references have been made to Dutch Patent Application No. 8802211 it will be apparent that when using the device according to the invention, it will be possible to form a male mould on the substrate 18 by using a method which deviates from the method described in Dutch Patent Application No. 8802211.

Claims

1. A device for manufacturing a mould for a disc-shaped registration carrier, said device being provided with a station (28) for apllying a photosensitive layer, such as a photoresist layer, to a substrate (18), with a station (52) for exposing said photosenstive layer in accordance with the registration data to be stored, with a station (61) for developing the photosensitive layer and metallizing the side of the substrate carrying the developed photosensitive layer, and with a station

will for example act as a cathode thereby, and the nickel balls will form the anode, as is usual in processes like this.

Thus a thick coating will be applied to the substrate in this station, within the spirit as shown in Figure 3 of the aforesaid Dutch Patent Application No. 8802211.

Once a sufficiently thick coating has been formed, the supporting plate 81 will be pivoted back again, whereby the supporting plate with the substrate and the coating will be rinsed with hot deionized water. Then the supporting plate is pivoted back to the position shown in Figure 14, after which the clamping ring 102 can be removed by reversing the above-described steps for providing the clamping ring 102. Then the substrate with the coating provided thereon, which is now integral with the ring 86 placed on the substrate, may be removed by means of the transport mechanism and be placed on a pivotable arm 140, which is disposed in a further station 141. The construction of the pivotable arm 140 at least substantially corresponds with the above-described arm 23, and the substrates may be placed in a rack 142 provided in the station 141 by means of said arm 140, which is pivotable about a vertical axis and which is vertically movable as well.

The substrates processed in this manner can be removed from the device through an access door (not shown), so that the substrate can be removed in the usual manner, for example by hand, from the so-called male mould formed on the substrate in the above-described manner, which will look as shown in Figure 4 of the above-mentioned Dutch Patent Application No. 8802211.

If necessary said male mould may be placed on a rotary table 145 present in the station 141 with its embossed surface turned upwards, after which a light source 146 (diagrammatically indicated), which is secured to an arm 147, which is pivotable about a vertical axis, may be moved over the plate so as to develop the residual lacquer or photosensitive material remaining behind on the male mould that has been formed. Then a spraying mechanism 149 secured to the end of an arm 148 (Figures 16, 17) may be pivoted above the male mould supported on the rotary table. The arm 148 can be moved upwards and downwards, in a similar manner as described above, by means of a setting cylinder 150, and also be pivoted about a vertical pivot axis by means of a horizontal setting cylinder 151.

In the position of the spraying mechanism 149 shown in Figure 16 rinsing liquid may be sprayed on the male mould 152 supported on the rotary table 145 (not shown in Figure 16), so as to rinse the male mould.

Then a lacquer coating may be provided on the male mould 152 via the spraying device 149. For this purpose the arm 148 is moved downwards, so that a receiving ring 153 coupled to a shell 153' secured to the arm 148 and surrounding the spraying mechanism will come to rest on the upwardly tapering circumferential surface of the cup-shaped means 154 accommodating the rotary table 145. For this purpose a bottom ring 155 of the receiving ring is designed to slope upwards from its outer circumference towards the inside, as a result of which a space 156 for catching any residual lacquer is formed between the outer wall of the receiving ring 153 and the bottom ring 155. The receiving ring 153 is coupled to the shell 153' by means of pins 157 and suitable L-shaped slotted holes, which form some kind of bayonet catch, so as to be readily detachable, so that the receiving ring 153 can readily be removed and cleaned when a certain amount of lacquer has been collected in the ring.

The male mould thus completed may be discharged from the device so as to be stored and/or be supplied to further processing machines.

During operation the housing 1 will be closed and clean air can be supplied to the substrate processing stations through ducts 158 bounded by the housing and a grid 159.

The sequence in which the various stations are arranged may be different from the sequence described above and depicted in the Figures.

It is to be preferred, however, to provide the station 52 near one end of the housing 1, since the equipment disposed in said station, such as the laser device and the optics, comprises sensitive components, which require regular maintenance.

As a result of the arrangement of this equipment near one end of the device the equipment can be accommodated so as to be readily accessible.

Furthermore it is not necessary for the various stations to be arranged in a straight line. The housing 1 may also be curved, for example.

Although in the above several references have been made to Dutch Patent Application No. 8802211 it will be apparent that when using the device according to the invention, it will be possible to form a male mould on the substrate 18 by using a method which deviates from the method described in Dutch Patent Application No. 8802211.

Claims

1. A device for manufacturing a mould for a disc-shaped registration carrier, said device being provided with a station (28) for applying a photosensitive layer, such as a photoresist layer, to a substrate (18), with a station (52) for exposing said photosenstive layer in accordance with the registration data to be stored, with a station (61) for developing the photosensitive layer and metallizing the side of the substrate carrying the developed photosensitive layer, and with a station

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(80) for applying a metal coating, characterized in that the various stations (28, 52, 61, 80) are accomodated in a housing (1) and means (29, 53, 62, 81) for receiving the substrates (18) are provided in the various stations, whilst a transport mechanism (9-12) disposed within the housing is provided with at least one transport means (11, 12) for gripping a substrate, which transport means (11, 12) is movable to and fro between the stations in a horizontal plane in a first direction and in a second transverse to said first direction, and which is also capable of moving upward and downward within the housing.

2. A device according to claim 1, characterized in that said device, at the location of a feed station (3) is provided with an arm (23) which is pivotable about a vertical axis (20) and which is vertically movable, to one end of which means (24) are provided for picking a substrate.

3. A device according to claim 2, characterized in that a sub-atmospheric pressure can be generated in said means (24) for picking up the substrate.

4. A device according to any one of the preceding claims, characterized in that the station (28) for applying a photosensitive layer is provided with a rotary table (29) for receiving a substrate (18) as well as with movable, for example being pivotable about vertical axes (31, 32), supply pipes (33, 34) for supplying rinsing liquid and first coating material and photosensitive material to the upper side of the substrate (18) supported on the rotary table (29), whilst furthermore a brush device (36), which is pivotable about a vertical axis (35) and which is vertically movable, is provided in said station.

5. A device according to claim 4, characterized in that a pan (37) is disposed beside said rotary table (29), above which said brush (36) may be placed, whilst said pan (37) is connected to a drain pipe (38).

6. A device according to any one of the preceding claims, characterized in that said device is provided with a drying station (40) for drying a photosensitive layer has been applied, whereby said drying station (40) comprises an air line (41) for receiving a substrate (18) as well as means for passing air through said air line (41) and means (50) for heating the air passed through said air line.

7. A device according to claim 6, characterized in that an opening is provided in an upper wall of the air line (41) in order for a substrate to be introduced into said air line, which opening can be closed by means of a vertically movable cover (45), which is pivotable about a vertical axis of rotation.

8. A device according to claim 6 or 7, characterized in that a diaphragm (51) is provided in said air line (41), upstream of the location where a substrate (18) is introduced into the air line.

9. A device according to any one of the preceding claims 2-8, characterized in that said drying station (40) is disposed near the feed station (3) for the substrates.

10. A device according to any one of the preceding claims, characterized in that the station (61) for developing the photosensitive layer and for metallizing the developed photosensitive layer is provided with a rotary table (62) and an arm (71) which is pivotable about a vertical axis of rotation (70) near said rotary table, which arm supports pipes (72) through which fluids for treating said photosensitive layer and for metallizing can be supplied.

11. A device according to claim 10, characterized in that a pan (74), which is connected to a drain pipe, is disposed beside said rotary table (62), above which the arm (71) supporting the pipes (72) can be pivoted.

12. A device accoding to claim 10, 11, characterized in that an arm (77) supporting lenses (78), which is pivotable about a vertical axis of rotation, is disposed near said rotary table (62), whilst a laser light source is disposed under said rotary table, in such a manner that light moving (B) from said laser through the substrate (18) can be picked up by the lenses (78) and be processed in order to determine the quality of the substrate with the developed photosensitive layer applied thereto.

13. A device according to any one of the preceding claims, characterized in that the station (80) for applying a metal coating to the substrate is provided with a supporting means (81) which is pivotable about a horizontal axis (84) between a position suitable for receiving a substrate (18) and a position in which the substrate supported by said supporting means is immersed in a vessel (125) containing electrolytic fluid.

14. A device according to claim 13, characterized in that a gripping means (92-100) mounted on the end of an arm (90) which is pivotable about a vertical axis is disposed in said station (80) for applying a metal coating, which gripping means com-

prises a few fingers (101) capable of reciprocating movement in radial direction with respect to the axis of the gripping means, for picking up annular objects (86) to be placed on the substrate.

15. A device according to claim 13 of 14, characterized in that a pivotable arm (109), which is pivotable about a vertical axis, is disposed in the station for applying a metal coating, whereby a mechanism (113-115) for securing a clamping ring (102) to the supporting means (81) is mounted on the end of said arm.

16. A device according to claim 15, characterized in that said clamping ring (102) and the supporting means (81) intended for receiving the substrate (81) are provided with pins (104) and substantially L-shaped slotted holes (105) which in combination form some form of bayonet catch for fixing the clamping ring (102) to the supporting means (81).

17. A device according to claim 15 or 16, characterized in that the mechanism for fixing the clamping ring (102) comprises a carrier (115) which is rotatable about an axis of rotation (112) with respect to the arm (109), and that a few pins (117) projecting under the carrier are secured to said carrier, said pins at their bottom ends being provided with heads (118), which fit in the interior of slotted holes (119) provided in the interior of the clamping ring (102) and concentrically surrouding the axis of rotation, said slotted holes (119) being accessible near one end for inserting and pulling out the heads (118) secured to the bottom ends of the pins (117).

18. A device according to any one of the preceding claims 13-17, characterized in that the position where the supporting means (81) is located inside the vessel (125) containing eletrolytic fluid the substrate (18) supported by the supporting menas (81) is located opposite an opening (127) provided in a housing (126) disposed in said vessel (125), which contains grains (132) of the material from which the coating is to be formed, whilst furthermore means (133) are provided by which a flow of fresh eletrolytic fluid supplied can be generated along the side of the substrate (18) facing the interior of the housing (126).

19. A device according to claim 19, characterized in that an exchangeable plate (129) is provided within the housing (126) said plate (129) being provided with an opening (130) whose centre substantially corresponds with the centre of the opening (127) provided in the housing (126).

20. A device according to any one of the preceding claims, characterized in that said device is provided with a station (141) in which a rack (142) for receiving treated substrates (18) is disposed as well as an arm (140), which is pivotable about a vertical pivot axis and which is vertically movable, said arm (140) at its end being provided with means for picking up the substrate (18), all this in such a manner, that substrates (18) placed on the arm by means of the transport mechanism (9-12) can be placed in the rack (142) by means of said arm (140) and also be removed from said rack by means of said arm.

21. A device according to any one of the preceding claims, characterized in that said device is provided with a station (141) in which a rotary table (145) is disposed, on which a formed mould may be placed, in such a manner that the mould rests on the coating applied, whilst the station furthermore accommodates an arm (147) being pivotable about a vertical axis, which supports a light source (146) for exposing the mould, more in particular any residual photosensitive material present on the mould.

22. A device according to claim 21, characterized in that said station (141) furthermore accommodates an arm (148) being pivotable about a vertical pivot axis and being capable of vertical reciprocating movement, which arm supports spraying means (149), by which a rinsing liquid and/or a lacquer can be applied to the upper surface of the mould.

23. A device according to claim 21, characterized in that spraying means (149) are surrounded by an annular shell (153) which is joined at its bottom side by a bottom edge (155) which slopes upwards towards the inside.

24. A device according to claim 23, characterized in that said shell (153) is coupled to the arm so as to be readily detachable.

25. A device according to any one of the preceding claims, characterized in that said station (52) for exposing the photosensitive layer is disposed near one end of the device.

26. A device according to any one of the preceding claims, characterized in that said transport mechanism (9-12) is provided with two transport means (11, 12) for gripping a substrate, whereby the two transport means (11, 12) are secured to a slide (91), which is movable in opposite directions, whilst each of said transport means (11, 12) can be moved upwards and downwards indepen-

dently of the other transport means.

27. A device according to any one of the preceding claims, characterized in that each station (28, 52, 61, 80, 40) is disposed in a space (2-7) in which means (158, 159) are provided for supplying clean air to said space.

28. A method for manufacturing a mould for a disc-shaped registration carrier, wherein a substrate (18), which said mould is to be formed, is automatically moved by transport means (11, 12) within a housing (1) which is closed during normal operation, between several stations, including a station (28) for applying a photosensitive layer to said substrate, a station (52) for exposing said photosensitive layer in accordance with the registration data to be stored, a station (61) for developing the photosensitive layer and metallizing the side of the substrate carrying the developed photosensitive layer, and a station (80) for applying a metal coating whereby the transport means (11, 12) grips the substrate (18) and moves between the stations in a horizontal plane to and fro in a first direction and to and fro in a second direction transverse to said first direction and also upwards and downwards within the housing.

29. A method according to claim 28, characterized in that said substrate (18) is first rinsed and/or brushed clean in a station (28) suitable for that purpose, after which a photosensitive layer is applied to said substrate in said station.

30. A method according to claim 28 or 29, characterized in that after the photsenistive layer has been applied said substrate (18) is moved to a station (40) in which heated air is passed over said photosensitive layer, so as to dry said photosensitive layer.

31. A method according to claim 30, characterized in that said substrate (18) is placed in an air line (41) which can be closed, through which first heated air and then cooling air is passed.

Patentansprüche

1. Gerät zur Herstellung einer Matrize für einen scheibenförmigen Aufzeichnungsträger, wobei das Gerät mit einer Station (28) zum Auftragen einer lichtempfindlichen Schicht, z. B. einer Fotolackschicht, auf ein Substrat (18), mit einer Station (52) zum Belichten der lichtempfindlichen Schicht entsprechend den zu speichernden Aufzeichnungsdaten, mit einer Station (61) zum Entwickeln der lichtempfindlichen Schicht und Metallisieren der die lichtempfindliche Schicht tragenden Seite des Substrats und mit einer Station (80) zum Auftragen einer Metallauflage versehen ist, dadurch gekennzeichnet, daß die verschiedenen Stationen (28, 52, 61, 80) in einem Gehäuse (1) untergebracht und Einrichtungen (29, 53, 62, 81) zum Aufnehmen der Substrate (18) in den verschiedenen Stationen vorgesehen sind, während ein in dem Gehäuse angeordneter Transportmechanismus (9 bis 12) mit mindestens einer Transporteinrichtung (11, 12) zum Greifen eines Substrats versehen ist, wobei die Transporteinrichtung (11, 12) zwischen den Stationen in einer waagerechten Ebene in eine erste Richtung und in eine zweite Richtung quer zu der ersten Richtung hin- und hergehend beweglich ist und sich außerdem in dem Gehäuse aufwärts und abwärts bewegen kann.

2. Gerät nach Anspruch 1, dadurch gekennzeichnet, daß das Gerät an der Stelle einer Zuführstation (3) mit einem um eine senkrechte Achse (20) schwenkbaren und senkrecht beweglichen Arm (23) versehen ist, an dessen einem Ende eine Einrichtung (24) zum Aufheben eines Substrats vorgesehen ist.

3. Gerät nach Anspruch 2, dadurch gekennzeichnet, daß in der Einrichtung (24) zum Aufheben des Substrats ein Unterdruck erzeugt werden kann.

4. Gerät nach einem der vorausgegangenen Ansprüche, dadurch gekennzeichnet, daß die Station (28) zum Auftragen einer lichtempfindlichen Schicht mit einem Drehtisch (29) zum Aufnehmen eines Substrats (18) sowie mit beweglichen, z. B. um senkrechte Achsen (31, 32) schwenkbaren Zuführrohren (33, 34) zum Zuführen von Spülflüssigkeit sowie erstem Auflagematerial und lichtempfindlichem Material zu der Oberseite des auf dem Drehtisch (29) gestützten Substrats (18) versehen ist, während ferner ein um eine senkrechte Achse (35) schwenkbares und senkrecht bewegliches Bürstengerät (36) in der Station vorgesehen ist.

5. Gerät nach Anspruch 4, dadurch gekennzeichnet, daß neben dem Drehtisch (29) eine Pfanne (37) angeordnet ist, über der die Bürste (36) angeordnet sein kann, während die Pfanne (37) mit einem Abflußrohr (38) verbunden ist.

6. Gerät nach einem der vorausgegangenen Ansprüche, dadurch gekennzeichnet, daß das Gerät mit einer Trocknungsstation (40) zum Trocknen einer aufgetragenen lichtempfindlichen Schicht versehen ist, wobei die Trocknungsstati-

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on (40) eine Luftleitung (41) zum Aufnehmen eines Substrats (18) sowie eine Einrichtung zum Leiten von Luft durch die Luftleitung (41) und eine Einrichtung (50) zum Erwärmen der durch die Luftleitung geleiteten Luft aufweist.

7. Gerät nach Anspruch 6, dadurch gekennzeichnet, daß eine Öffnung in einer oberen Wand der Luftleitung (41) vorgesehen ist, um ein Substrat in die Luftleitung einzuführen, wobei die Öffnung mit einem senkrecht beweglichen Deckel (45) verschlossen werden kann, der um eine senkrechte Drehachse (46) schwenkbar ist.

8. Gerät nach Anspruch 6 oder 7, dadurch gekennzeichnet, daß eine Membran (51) in der Luftleitung (41) stromaufwärts vor der Stelle vorgesehen ist, an der ein Substrat (18) in die Luftleitung eingeführt wird.

9. Gerät nach einem der vorausgegangenen Ansprüche 2 bis 8, dadurch gekennzeichnet, daß die Trocknungsstation (40) in der Nähe der Zuführstation (3) für die Substrate angeordnet ist.

10. Gerät nach einem der vorausgegangenen Ansprüche, dadurch gekennzeichnet, daß die Station (61) zum Entwickeln der lichtempfindlichen Schicht und Metallisieren der entwikkelten lichtempfindlichen Schicht mit einem Drehtisch (62) und einem um eine senkrechte Drehachse (70) schwenkbaren Arm (71) in der Nähe des Drehtischs versehen ist, wobei der Arm Rohre (72) stützt, durch die Fluide zum Behandeln der lichtempfindlichen Schicht und zum Metallisieren zugeführt werden können.

11. Gerät nach Anspruch 10, dadurch gekennzeichnet, daß eine mit einem Abflußrohr verbundene Pfanne (74) neben dem Drehtisch (62) angeordnet ist, über dem der die Rohre (72) stützende Arm (71) geschwenkt werden kann.

12. Gerät nach Anspruch 10 oder 11, dadurch gekennzeichnet, daß ein Linsen (78) stützender Arm (77), der um eine senkrechte Drehachse schwenkbar ist, in der Nähe des Drehtisches (62) angeordnet ist, während eine Laserlichtquelle unter dem Drehtisch so angeordnet ist, daß Licht, das sich von der Laserquelle durch das- Substrat (18) bewegt (B), durch die Linsen (78) erfaßt und verarbeitet werden kann, um die Qualität des Substrats mit der darauf aufgetragenen entwickelten lichtempfindlichen Schicht zu bestimmen.

13. Gerät mach einem der vorausgegangenen Ansprüche, dadurch gekennzeichnet, daß die Station (80) zum Auftragen einer Metallauflage auf das Substrat mit einer Stützeinrichtung (81) versehen ist, die um eine waagerechte Achse (84) zwischen einer zum Aufnehmen eines Substrats geeigneten Position und einer Position schwenkbar ist, in der das durch die Stützeinrichtung gestützte Substrat in einen Behälter (125) getaucht wird, der Elektrolysefluid enthält.

14. Gerät nach Anspruch 13, dadurch gekennzeichnet, daß eine an dem Ende eines um eine senkrechte Achse schwenkbaren Arms (90) angebrachte Greifeinrichtung (92 bis 100) in der Station (80) zum Auftragen einer Metallauflage angeordnet ist, wobei die Greifeinrichtung mehrere in Radialrichtung zu der Achse der Greifeinrichtung hin- und hergehend bewegliche Finger (101) zum Aufheben ringförmiger Gegenstände (86) aufweist, die auf dem Substrat zu plazieren sind.

15. Gerät nach Anspruch 13 oder 14, dadurch gekennzeichnet, daß ein schwenkbarer Arm (109), der um eine senkrechte Achse schwenkbar ist, in der Station zum Auftragen einer Metallauflage angeordnet ist, wobei ein Mechanismus (113 bis 115) zum Befestigen eines Klemmrings (102) an der Stützeinrichtung (81) an dem Ende des Arms angebracht ist.

16. Gerät nach Anspruch 15, dadurch gekennzeichnet, daß der Klemmring (102) und die zum Aufnehmen des Substrats (18) vorgesehene Stützeinrichtung (81) mit Stiften (104) und im wesentlichen L-förmigen Schlitzlöchern (105) versehen sind, die in Kombination eine Art Bajonettverschluß zum Befestigen des Klemmrings (102) an der Stützeinrichtung (81) bilden.

17. Gerät nach Anspruch 15 oder 16, dadurch gekennzeichnet, daß der Mechanismus zum Befestigen des Klemmrings (102) einen Träger (115) aufweist, der um eine Drehachse (112) gegenüber dem Arm (109) drehbar ist, und daß mehrere unter dem Träger vorstehende Stifte (117) an dem Träger befestigt sind, wobei die Stifte an ihren unteren Enden mit Köpfen (118) versehen sind, die sich in das Innere von Schlitzlöchern (119) einpassen, die in dem Inneren des Klemmrings (102) vorgesehen sind und konzentrisch die Drehachse umgeben, und die Schlitzlöcher (119) in der Nähe eines Endes zum Einführen und Herausziehen der an den unteren Enden der Stifte (117) befestigten Köpfe (118) zugänglich sind.

18. Gerät nach einem der vorausgegangenen Ansprüche 13 bis 17, dadurch gekennzeichnet, daß in der Position, in der sich die Stützeinrichtung (81) in dem Elektrolysefluid enthaltenden Behäl-

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ter (125) befindet, sich das durch die Stützeinrichtung (81) gestützte Substrat (18) gegenüber einer Öffnung (127) befindet, die in einem in dem Behälter (125) angeordneten Gehäuse (126) vorgesehen ist, das Körner (132) des Materials enthält, aus dem die Auflage zu bilden ist, während ferner eine Einrichtung (133) vorgesehen ist, durch die eine Strömung von zugeführtem frischen Elektrolysefluid entlang der Seite des Substrats (18) erzeugt werden kann, die zu dem Inneren des Gehäuses (126) zeigt.

19. Gerät nach Anspruch 18, dadurch gekennzeichnet, daß eine austauschbare Platte (129) in dem Gehäuse (126) vorgesehen ist, wobei die Platte (129) mit einer Öffnung (130) versehen ist, deren Mitte im wesentlichen mit der Mitte der in dem Gehäuse (126) vorgesehen Öffnung (127) übereinstimmt.

20. Gerät nach einem der vorausgegangenen Ansprüche, dadurch gekennzeichnet, daß das Gerät versehen ist mit einer Station (141), in der ein Gestell (142) zum Aufnehmen behandelter Substrate (18) sowie ein um eine senkrechte Schwenkachse schwenkbarer und senkrecht beweglicher Arm (140) angeordnet ist, wobei der Arm (140) an seinem Ende mit einer Einrichtung zum Aufheben des Substrats (18) versehen und all dies so gestaltet ist, daß durch den Transportmechanismus (9 bis 12) auf den Arm gelegte Substrate (18) durch den Arm (140) in das Gestell (142) gelegt und außerdem durch den Arm aus dem Gestell entnommen werden können.

21. Gerät nach einem der vorausgegangenen Ansprüche, dadurch gekennzeichnet, daß das Gerät mit einer Station (141) versehen ist, in der ein Drehtisch (145) angeordnet ist, auf den eine geformte Matrize so plaziert werden kann, daß die Matrize auf der aufgetragenen Auflage ruht, während in der Station ferner ein um eine senkrechte Achse schwenkbarer Arm (147) untergebracht ist, der eine Lichtquelle (146) zum Belichten der Matrize und insbesondere von jedem auf der Matrize vorhandenen restlichen lichtempfindlichen Material stützt.

22. Gerät nach Anspruch 21, dadurch gekennzeichnet, daß in der Station (141) ferner ein um eine senkrechte Schwenkachse schwenkbarer und senkrecht hin- und hergehend beweglicher Arm (148) untergebracht ist, wobei der Arm eine Sprüheinrichtung (149) stützt, durch die eine Spülflüssigkeit und/oder ein Lack auf die Oberseite der Matrize aufgetragen werden kann.

23. Gerät nach Anspruch 22, dadurch gekennzeichnet, daß die Sprüheinrichtung (149) von einem ringförmigen Mantel (153) umgeben ist, an dessen unterer Seite sich eine untere Kante (155) anschließt, die nach innen schräg aufwärts verläuft.

24. Gerät nach Anspruch 23, dadurch gekennzeichnet, daß der Mantel (153) mit dem Arm so gekoppelt ist, daß er leicht abnehmbar ist.

25. Gerät nach einem der vorausgegangenen Ansprüche, dadurch gekennzeichnet, daß die Station (52) zum Belichten der lichtempfindlichen Schicht in der Nähe eines Endes des Geräts angeordnet ist.

26. Gerät nach einem der vorausgegangenen Ansprüche, dadurch gekennzeichnet, daß der Transportmechanismus (9 bis 12) mit zwei Transporteinrichtungen (11, 12) zum Greifen eines Substrats versehen ist, wobei die beiden Transporteinrichtungen (11, 12) an einem in entgegengesetzte Richtungen beweglichen Schieber (9) befestigt sind, während jede der Transporteinrichtungen (11, 12) unabhängig von der anderen Transporteinrichtung aufwärts und abwärts bewegt werden kann.

27. Gerät nach einem der vorausgegangenen Ansprüche, dadurch gekennzeichnet, daß jede Station (28, 52, 61, 80, 40) in einem Raum (2 bis 7) angeordnet ist, in dem eine Einrichtung (158, 159) zum Zuführen von sauberer Luft in den Raum vorgesehen ist.

28. Verfahren zum Herstellen einer Matrize für einen scheibenförmigen Aufzeichnungsträger, wobei ein Substrat (18), auf dem die Matrize auszubilden ist, automatisch durch eine Transporteinrichtung (11, 12) in einem im Normalbetrieb geschlossenen Gehäuse (1) zwischen mehreren Stationen mit einer Station (28) zum Auftragen einer lichtempfindlichen Schicht auf das Substrat, einer Station (52) zum Belichten der lichtempfindlichen Schicht entsprechend den zu speichernden Aufzeichnungsdaten, einer Station (61) zum Entwickeln der lichtempfindlichen Schicht und Metallisieren der die lichtempfindliche Schicht tragenden Seite des Substrats und einer Station (80) zum Auftragen einer Metallauflage bewegt wird, wobei die Transporteinrichtung (11, 12) das Substrat (18) ergreift und sich zwischen den Stationen in einer waagerechten Ebene in eine erste Richtung hin- und hergehend und in eine zweite Richtung quer zu der ersten Richtung hin- und hergehend sowie außerdem in dem Gehäuse aufwärts und abwärts bewegt.

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29. Verfahren nach Anspruch 28, dadurch gekennzeichnet, daß das Substrat (18) zunächst in einer dazu geeigneten Station (28) saubergespült und-/oder -gebürstet wird, wonach eine lichtempfindliche Schicht auf das Substrat in der Station aufgetragen wird.

30. Verfahren nach Anspruch 28 oder 29, dadurch gekennzeichnet, daß nach dem Auftragen der lichtempfindlichen Schicht das Substrat (18) zu einer Station (40) bewegt wird, in der erwärmte Luft über die lichtempfindliche Schicht geleitet wird, um die lichtempfindliche Schicht zu trocknen.

31. Verfahren nach Anspruch 30, dadurch gekennzeichnet, daß das Substrat (18) in eine verschließbare Luftleitung (41) eingeführt wird, durch die zunächst erwärmte Luft und anschließend Kühlluft geleitet wird.

Revendications

1. Un appareil pour la fabrication d'une matrice pour un support d'enregistrement en forme de disque, ledit appareil comprenant un poste (28) pour appliquer une couche photosensible, telle qu'une couche d'agent de réserve, à un substrat (18), un poste (52) pour exposer ladite couche photosensible en accord avec les données d'enregistrement à stocker, un poste (61) pour développer la couche photosensible et métalliser la face du substrat portant la couche photosensible développée, et un poste (80) pour appliquer un revêtement métallique, caractérisé en ce que les divers postes (28, 52, 61, 80) sont montés dans un boîtier (1) et en ce que des moyens (29, 53, 62, 81) sont prévus aux divers postes pour recevoir les substrats (18), tandis qu'un mécanisme de transport (9-12) disposé à l'intérieur du boîtier est muni d'au moins un moyen de transport (11, 12) pour saisir un substrat, ce moyen de transport (11, 12) étant mobile en va et vient entre les postes dans un plan horizontal dans une première direction et dans une seconde direction transversale à ladite première direction, et pouvant également se déplacer vers le haut et vers le bas à l'intérieur du boîtier.

2. Un appareil selon la revendication 1, caractérisé en ce que ledit appareil, à l'emplacement d'un poste d'alimentation (3), est muni d'un bras (23) qui peut pivoter autour d'un axe vertical (20) et qui est mobile verticalement, des moyens (24) étant prévus à une extrémité de celui-ci pour saisir un substrat.

3. Un appareil selon la revendication 2, caractérisé en ce qu'une pression inférieure à la pression atmosphérique peut être produite dans lesdits moyens (24) pour saisir le substrat.

4. Un appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que le poste (28) d'application d'une couche photosensible est muni d'une table rotative (29) pour recevoir un substrat (18) ainsi que des canalisations d'amenée (33, 34) mobiles, pouvant par exemple pivoter autour d'axes verticaux (31, 32), pour amener un liquide de rinçage et une première matière de revêtement ainsi qu'une matière photosensible sur la face supérieure du substrat (18) porté par la table rotative (29), tandis qu'en outre un appareil à brosse (36), qui peut pivoter autour d'un axe vertical (35) et qui est mobile verticalement, est prévu dans ledit poste.

5. Un appareil selon la revendication 4, caractérisé en ce qu'une cuve (37) est disposée à côté de ladite table rotative (29), au-dessus de laquelle peut être placée ladite brosse (36), tandis que ladite cuve (37) est reliée à un tuyau d'évacuation (38).

6. Un appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit appareil est muni d'un poste de séchage (40) pour sécher une couche photosensible qui a été appliquée, de sorte que ledit poste de séchage (40) comprend une canalisation d'air (41) pour recevoir un substrat (18), ainsi qu'un moyen pour faire passer de l'air à travers ladite canalisation d'air (41) et un moyen (50) pour chauffer l'air passé à travers ladite canalisation d'air.

7. Un appareil selon la revendication 6, caractérisé en ce qu'une ouverture est prévue dans une paroi supérieure de la canalisation d'air (41) de manière à ce qu'un substrat soit introduit dans ladite canalisation d'air, cette ouverture pouvant être fermée à l'aide d'un couvercle verticalement mobile (45) qui peut pivoter autour d'un axe vertical de rotation (46).

8. Un appareil selon la revendication 6 ou 7, caractérisé en ce qu'un diaphragme (51) est prévu dans ladite canalisation d'air (41), à l'amont de l'emplacement où un substrat (18) est introduit dans la canalisation d'air.

9. Un appareil selon l'une quelconque des revendications 2 à 8 précédentes, caractérisé en ce que ledit poste de séchage (40) est disposé près du poste d'alimentation (3) pour les substrats.

10. Un appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que le poste (61) de développement de la couche photosensible et de métallisation de la couche photosensible développée est muni d'une table rotative (62) et d'un bras (71) qui peut pivoter autour d'un axe vertical de rotation (70) près de ladite table rotative, ce bras supportant des tuyaux (72) à travers lesquels peuvent être amenés des fluides pour le traitement de ladite couche photosensible et pour la métallisation.

11. Un appareil selon la revendication 10., caractérisé en ce qu'une cuve (74), qui est reliée à un tuyau d'évacuation, est disposée à côté de ladite table rotative (62), au-dessus de laquelle peut être pivoté le bras (71) supportant les tuyaux (72).

12. Un appareil selon la revendication 10 ou 11, caractérisé en ce qu'un bras (77), supportant des lentilles (78) et qui peut pivoter autour d'un axe vertical de rotation. est disposé près de la table rotative (62), tandis qu'une source de lumière laser est disposée sous ladite table rotative de manière telle que la lumière (B) se déplaçant de ladite source laser à travers le substrat (18) peut être captée par les lentilles (78) et être traitée de manière à déterminer la qualité du substrat avec la couche photosensible développée qui lui est appliquée.

13. Un appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que le poste (80) permettant d'appliquer un revêtement métallique sur le substrat est muni d'un moyen de support (81) qui peut pivoter autour d'un axe horizontal (84) entre une position appropriée à recevoir un substrat (18) et une position dans laquelle le substrat, porté par ledit moyen de support, est plongé dans un récipient (125) contenant un fluide électrolytique.

14. Un appareil selon la revendication 13, caractérisé en ce qu'un moyen de prise (92-100) monté à l'extrémité d'un bras (90) qui peut pivoter autour d'un axe vertical est disposé dans ledit poste (80) d'application d'un revêtement métallique, ce moyen de prise comprenant un certain nombre de doigts (101) pouvant se déplacer en va-et-vient dans une direction radiale par rapport à l'axe du moyen de prise, afin de saisir des objets annulaires (86) devant être placés sur le substrat.

15. Un appareil selon la revendication 13 ou 14, caractérisé en ce qu'un bras pivotant (109), qui peut pivoter autour d'un axe vertical, est disposé dans le poste d'application d'un revêtement métallique, de sorte qu'un mécanisme (113-115) de fixation d'une bague de serrage (102) au moyen de support (81) est monté à l'extrémité dudit bras.

16. Un appareil selon la revendication 15, caractérisé en ce que ladite bague de serrage (102) et le moyen de support (81) prévu pour recevoir le substrat (18) sont munis de broches (104) et de trous fendus (105) sensiblement en L qui, en combinaison, définissent une certaine forme d'organe d'arrêt à baïonnette pour fixer la bague de serrage (102) au moyen de support (81).

17. Un appareil selon la revendication 15 ou 16, caractérisé en ce que le mécanisme de fixation de la bague de serrage (102) comprend un support (115) qui peut tourner autour d'un axe de rotation (112) par rapport au bras (109), et en ce qu'un certain nombre de broches (117), faisant saillie au-dessous du support, sont fixées audit support, lesdites broches étant, à leurs extrémités basses, munies de têtes (118) qui s'adaptent à l'intérieur de trous fendus (119) prévus à l'intérieur de la bague de serrage (102) et entourant l'axe de rotation de manière concentrique, lesdits trous fendus (119) étant accessibles près d'une extrémité pour insérer et tirer les têtes (118) fixées à l'extrémité basse des broches (117).

18. Un appareil selon l'une quelconque des revendications 13 à 17 précédentes, caractérisé en ce que, dans la position où le moyen de support (81) est placé à l'intérieur du récipient (125) contenant un fluide électrolytique, le substrat (18) porté par le moyen de support (81) est placé à l'opposé d'une ouverture (127) prévue dans un boîtier (126) disposé dans ledit récipient (125) qui contient des grains (132) de la matière à partir de laquelle doit être formé le revêtement, tandis qu'on prévoit des moyens supplémentaires (133) par lesquels peut être créé un écoulement de fluide électrolytique frais fourni le long du côté du substrat (18) dirigé vers l'intérieur du boîtier (126).

19. Un appareil selon la revendication 18, caractérisé en ce qu'une plaque échangeable (129) est prévue à l'intérieur du boîtier (126), ladite plaque (129) présentant une ouverture (130) dont le centre correspondant sensiblement au centre de l'ouverture (127) prévue dans le boîtier (126).

20. Un appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit appareil est muni d'un poste (141) dans lequel un ratelier (142) de réception des substrats traités (18) est disposé ainsi qu'un bras (140) qui peut pivoter autour d'un axe de pivotement vertical et qui

est mobile verticalement, ledit bras (140) étant, à son extrémité, muni d'un moyen pour prélever le substrat (18), tout ceci d'une manière telle que les substrats (18) placés sur le bras au moyen du mécanisme de transport (9-12) peuvent être placés dans le ratelier (142) au moyen dudit bras (140) et être également enlevés dudit ratelier au moyen dudit bras.

21. Un appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit appareil est muni d'un poste (141) dans lequel est disposée une table rotative (145), sur laquelle peut être placée une matrice formée,de telle manière que la matrice repose sur le revêtement appliqué, tandis que le poste permet en outre la mise en place d'un bras (147) pouvant pivoter autour d'un axe vertical, qui porte une source de lumière (146) pour exposer la matrice, plus particulièrement toute matière photosensible résiduelle présente sur la matrice.

22. Un appareil selon la revendication 21, caractérisé en ce que ledit poste (141) permet en outre la mise en place d'un bras (148) pouvant pivoter autour d'un axe de pivotement vertical et pouvant effectuer un mouvement de va-et-vient vertical, ce bras portant des moyens de pulvérisation (149) par lesquels un liquide de rinçage et/ou un vernis peut être appliqué sur la surface supérieure de la matrice.

23. Un appareil selon la revendication 22, caractérisé en ce que lesdits moyens de pulvérisation (149) sont entourés par une coquille annulaire (153') qui est réunie au niveau de son côté inférieur par un bord inférieur (155) qui s'incline vers le haut en direction de l'intérieur.

24. Un appareil selon la revendication 23, caractérisé en ce que ladite coquille (153') est reliée au bras de manière à pouvoir être facilement détachée.

25. Un appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit poste (52) d'exposition de la couche photosensible est disposé près d'une extrémité de l'appareil.

26. Un appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit mécanisme de transport (9-12) est muni de deux moyens de transport (11, 12) pour saisir un substrat, de sorte que les deux moyens de transport (11, 12) sont fixés à une glissière (9'), qui est mobile dans des directions opposées, tandis que chacun desdits moyens de transport (11, 12) peut être déplacé vers le haut et vers le bas indépendamment de l'autre moyen de transport.

27. Un appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que chaque poste (28, 52, 61, 80, 40) est disposé dans un espace (2-7) dans lequel des moyens (158, 159) sont prévus pour fournir de l'air propre audit espace.

28. Un procédé pour la fabrication d'une matrice pour un support d'enregistrement en forme de disque, dans lequel un substrat (18), sur lequel doit être formée ladite matrice , est automatiquement déplacé par des moyens de transport (11, 12) à l'intérieur d'un boîtier (1) qui est fermé en fonctionnement normal, entre plusieurs postes, comprenant un poste (28) pour appliquer une couche photosensible audit substrat, un poste (52) pour exposer ladite couche photosensible en accord avec les données d'enregistrement à stocker, un poste (61) pour développer la couche photosensible et pour métalliser la face du substrat portant la couche photosensible développée, et un poste (80) pour appliquer un revêtement métallique, de sorte que les moyens de transport (11, 12) saisissent le substrat (18) et se déplacent entre les postes dans un plan horizontal en va-et-vient dans une première direction et en va-et-vient dans une seconde direction transversale à ladite première direction et également vers le haut et vers le bas à l'intérieur du boîtier.

29. Un procédé selon la revendication (28), caractérisé en ce que ledit substrat (18) est tout d'abord rincé et/ou nettoyé par brossage dans un poste (28) approprié à cet effet, après quoi une couche photosensible est appliquée audit substrat dans ledit poste.

30. Un procédé selon la revendication 28 ou 29, caractérisé en ce qu'après l'application de la couche photosensible, ledit substrat (18) est déplacé vers un poste (40) dans lequel de l'air chaud est amené à passer sur ladite couche photosensible, afin de sécher ladite couche photosensible.

31. Un procédé selon la revendication 30, caractérisé en ce que ledit substrat (18) est placé dans une canalisation d'air (41) qui peut être fermée et à travers laquelle est amené à passer d'abord de l'air de chauffage et ensuite de l'air de refroidissement.