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(54) **SEALING MACHINE AND METHOD FOR ADJUSTING CHARACTERISTICS OF A SEALING MACHINE**

(57) A sealing machine comprising a transporter for transporting a product along a transport direction, a forming set for forming a sheetlike sealing material around a product transported through the forming set along the transport direction, and a sealing station downstream of the forming set for sealing the sealing material in a direction substantially parallel to the transport direction, the sealing machine further comprising a sensor arranged

upstream of the forming set and for measuring a height and/or a width of a product and a control device for receiving a signal from the sensor that is indicative of the height and/or the width of a product and wherein the control device is further configured to control adjusting means associated with the forming set and/or the sealing station to adjust at least one characteristic of the forming set and/or the sealing station based on the signal.

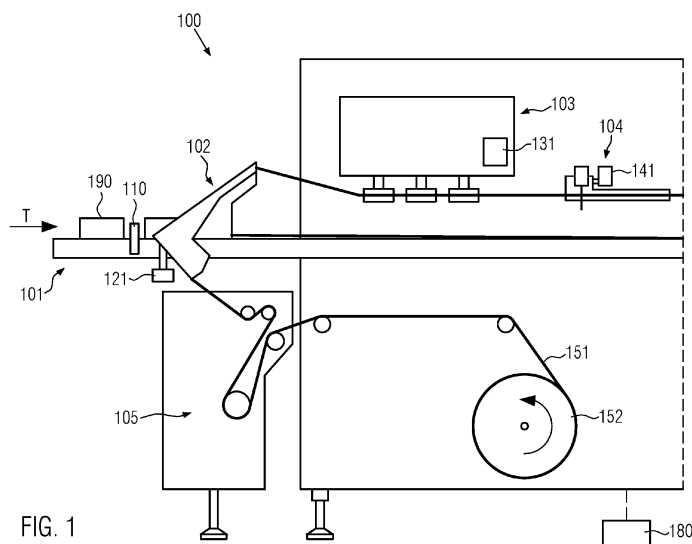


FIG. 1

Description

[0001] The present disclosure relates to a sealing machine according to claim 1 and a method for adjusting characteristics of a sealing machine according to claim 7.

Prior art

[0002] Sealing of products using, for example, sheetlike thin foils, like plastic foils has been known for some time now.

[0003] In one approach, the foil is provided in the form of a continuous tube through which the products are pushed and a cross sealing is applied to separate portions of the foil wrapped around a product from the remainder of the foil and at the same time seal the foil with the product within.

[0004] A second approach uses a sheetlike foil that is not provided in a tubular shape but is formed around the products from its original planar shape. The forming is done using a forming set that guides the sealing material so as to surround the product. This requires a longitudinal sealing of the sealing material above the product. This is achieved by using a sealing station that seals the sealing material by pressing its ends together, thereby forming a fin above the product.

[0005] The first approach is illustrated in EP 3 505 459 A1. Due to the varying size of the products, the cross sealing point varies as well. This is compensated for by measuring the height of the products adjusting the speed of the incoming products so as to ensure that the cross sealing point is set at a position where sufficient sealing material is provided for achieving sealing of the foil wrap.

[0006] The control of the relative transport speed is, however, not sufficient for handling different dimensions of products in case of using the second approach for providing a sealing to the products.

Object

[0007] Starting from the known prior art, it is an object of the present disclosure to provide a sealing machine for sealing products using a sheetlike sealing material with improved reliability of the sealing in case of varying product dimensions.

Solution

[0008] This object is addressed by the sealing machine according to independent claim 1 and the method for adjusting characteristics of a sealing machine according to independent claim 7. Further preferred embodiments are provided in the dependent claims.

[0009] The sealing machine according to the present invention comprises a transporter for transporting a product along a transport direction, a forming set for forming a sheetlike sealing material around a product transported through the forming set along the transport direction, and

a sealing station downstream of the forming set for sealing the sealing material in a direction substantially parallel to the transport direction, the sealing machine further comprising a sensor arranged upstream of the forming set and for measuring a height and/or a width of a product and a control device for receiving a signal from the sensor that is indicative of the height and/or the width of a product and wherein the control device is further configured to control adjusting means associated with the forming set and/or the sealing station to adjust at least one characteristic of the forming set and/or the sealing station based on the signal.

[0010] It will be understood that in case the sensor measures only one of the height and the width of a product, a signal that is indicative of either the measured height or the measured width is output.

[0011] The characteristics of the forming set and the sealing station may specifically pertain to production parameters of the forming set and the sealing station that are depending on specific product dimensions. For example, a height of the sealing point at which the sealing station seal the sealing material (usually in a region of the fin of the sealing material) depends on the height of the fin actually obtained and, therefore, also on the dimensions of the product.

[0012] Controlling the characteristics of the sealing machine makes, according to some embodiments, use of the constant width of the sealing material in a direction perpendicular to the transport direction. This width ensures wrapping of the sealing material around the product, thereby forming a fin of sealing material above the product on which the sealing station can act to apply a sealing. Thus, in a plane perpendicular to the transport direction, the width of the sealing material will at least be equal to or larger than the sum of two times the width of the product and the height of the product in this plane, potentially also including a tolerance. When the product size varies, this will result in the fin formed above the product when forming the sealing material around the product with the forming set taking different size and/or different position. By determining the height of the product and/or the width of the product, this can be pre-calculated. Controlling of the adjusting means may then encompass comparing the obtained height and/or width of the product to a preset value and then deriving, from the result of this comparison, how the forming set has to be adjusted and/or how the sealing station has to be adjusted.

[0013] Thereby, an automated and reliable control of the characteristics of the components of the sealing machine is achieved.

[0014] In one embodiment, the sealing machine further comprises a second sealing station downstream of the forming set, wherein the second sealing station is adapted to seal the sealing material along a direction that is substantially perpendicular to the transport direction and wherein the control device is further configured to control adjusting means associated with the second sealing sta-

tion to adjust at least one characteristic of the second sealing station.

[0015] By providing the second sealing station, an additional sealing can be provided as need be. Particularly, adjusting the at least one characteristic of the second sealing station may encompass adjusting a position where the sealing is applied to the sealing material with respect to a trailing edge of a product within the sealing station. This may then take into account deviations in the height and/or width of the product that may make repositioning of the cross sealing necessary.

[0016] In a further embodiment the characteristic of the forming set comprises at least one of an inclination angle of at least one forming set element in a plane perpendicular to the transport direction, an inclination height of at least one forming set element, a distance of forming set elements; and/or

wherein the characteristic of the sealing station comprises at least one of a sealing height, a sealing material tension, a height of a fin formed in the sealing material by the sealing station; and/or

wherein the characteristic of the second sealing station comprises at least one of a distance of a sealing point to an edge of a product, a sealing width, a sealing pressure..

[0017] These characteristics are particularly influenced by changes in the product dimensions, particularly in the width and height of the product and it is therefore advantageous if these are adjusted depending on the width and/or height of the product.

[0018] In a further embodiment, the sensor comprises a height sensor for measuring a height of a product and a width sensor for measuring a width of a product.

[0019] The sensor may, for example, be embodied in the form of a light barrier or a camera that is adapted to determine at least one of the widths and the height of a product. It can be provided that the sensor for measuring a height of a product and the sensor for measuring the width of the product are physically distinct sensors. Alternatively, it can also be provided that these sensors are embodied in a single sensor like a light barrier or a camera that are positioned in a way so as to allow determining the width and the height simultaneously.

[0020] In one embodiment, the sensor comprises a camera and/or an optical barrier for measuring a height and/or a width of a product.

[0021] It can further be provided that the sensor is configured to measure a height and/or a width of each product and to output, for each product, a signal to the control device that is indicative of the height and/or the width of the product, and wherein the control device is configured to control the adjusting means based on each received signal.

[0022] With this, controlling of the characteristics of the forming set and/or the sealing station and/or the second sealing station on a product-by-product basis is

achieved.

[0023] The present disclosure also pertains to a method for adjusting characteristics of a sealing machine, the sealing machine comprising a transporter transporting a product along a transport direction, a forming set forming a sheetlike sealing material around the product transported through the forming set along the transport direction, and a sealing station downstream of the forming set, wherein the sealing station seals the sealing material in a direction substantially parallel to the transport direction, the sealing machine further comprising a sensor arranged upstream of the forming set and a control device, wherein the method comprises measuring, by the sensor, a height and/or a width of a product and controlling, by the control device, upon receiving a signal from the sensor that is indicative of the height and/or the width of the product, adjusting means associated with the forming set and/or the sealing station to adjust at least one characteristic of the forming set and/or the sealing station based on the signal.

[0024] With this method, automated and reliable control of the components of the sealing machine is provided.

[0025] In one particular embodiment, the sealing machine further comprises a second sealing station downstream of the forming set, wherein the second sealing station seals the sealing material along a direction that is substantially perpendicular to the transport direction and wherein the control device controls adjusting means associated with the second sealing station based on the received signal to adjust at least one characteristic of the second sealing station.

[0026] With the second sealing station, a reliable sealing of parts of the sealing material transfers to the transport direction is realized also in cases where the characteristics of the product or products change particularly with respect to the width and/or the height of the products.

[0027] Further, the characteristic of the forming set may comprise at least one of an inclination angle of forming set elements in a plane perpendicular to the transport direction, an inclination height of at least one forming set element, a distance of forming set elements; and/or

wherein the characteristic of the sealing station comprises at least one of a sealing height, a sealing material tension, a height of a fin formed in the sealing material by the sealing station; and/or

wherein the characteristic of the second sealing station comprises at least one of a distance of a sealing point to an edge of a product, a sealing width, a sealing pressure.

[0028] With this embodiment, a reliable adjustment of the characteristics of the forming set and/or the sealing station and/or the second sealing station depending on the characteristics of the product is realized.

[0029] In a further embodiment, the sensor comprises a height sensor measuring the height of the product and a width sensor measuring the width of the product.

[0030] The height sensor and the width sensor can be implemented as a single sensor or as separate sensors, realizing determination of the relevant characteristics of the product.

[0031] In a further embodiment, the sensor comprises a camera and/or an optical barrier measuring the height and/or the width of a product.

[0032] It can also be provided that the sensor measures the height and/or the width of each product and outputs, for each product, a signal to the control device that is indicative of the height and/or the width of the product, and wherein the control device controls the adjusting means based on each received signal.

[0033] An individualized adjusting the forming set, the sealing station and the second sealing station is hereby realized.

Brief description of the drawings

[0034]

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| Figure 1 | Shows a schematic depiction of a sealing machine according to one embodiment |
| Figure 2 | Shows a schematic depiction of a product and the sealing material surrounding it |
| Figures 3a to c | Show different embodiments of adjusting any of the forming set, the sealing station and the second sealing station |

Detailed description

[0035] Figure 1 shows a schematic depiction of a sealing machine 100 that may be used in connection with embodiments of the present disclosure. The sealing machine 100 may be a sealing machine for sealing products 190 that have a regular form, for example the form of a rectangular prism, a cube, a trapezoid or the like. In any case, the products can be characterized by a width that is perpendicular to the transport direction T of the products in a transporting device 101 (like a chain transporter) and a height that is perpendicular to the transport plane defined by the transporting device 101. They may further be characterized by a length that is measured along the transport direction T, but this is not necessary for the present disclosure.

[0036] The sealing machine 100 may generally be adapted to use a sheetlike sealing material 151 that is provided by a provisioning device 105 encompassing for example a sealing material roll that is unwound by means of an unwinding device (including for example a driven unwinding rod 152) so that the sealing material is provided as a sheetlike material below the products 190.

[0037] In transport direction after the material has been

provided below the products 190, a forming set 102 can be arranged that allows for lifting up the free areas of the sheetlike material and wrap them around the product 190 so as to enclose the product 190 within the sealing material. As part of this process, the forming set 102 may form a fin by opposite edges of the sealing material where this fin continuously extends along the transport direction and is positioned above the products 190.

[0038] Subsequent to this forming set 102, one or more sealing stations 103 and 104 may be provided. A first sealing station 103 (this does not necessarily mean that it is the first sealing station downstream of the forming set 102) may seal the fin of the sealing material, by applying one or more pairs of heating rollers as will be explained further below. Subsequently or before that station, a second sealing station 104 can be provided that applies a sealing to the sealing material (for example also by applying heat) where this second sealing is applied in a direction that is substantially perpendicular to the transport direction T.

[0039] As the products 190 may vary with respect to their width and/or their height as will be explained further below, also the amount of sealing material that will actually be available for forming the fin by the forming set 102 will vary. Likewise, the actual position of the fin and the actual position where the cross sealing can be applied between two adjacent products may vary depending on the product dimensions.

[0040] In order to take this into account, a sensor 110 may be provided upstream of the forming set 102. The sensor 110 may be adapted to determine at least one of the width and the height of each product 190. For example, the sensor 110 can be embodied as a light barrier comprising one or more lasers and corresponding sensors that can optically detect the laser light (like a photodetector). Alternatively or additionally, the sensor may be realized as or may comprise one or more cameras that can obtain images of the products 190 as they are moved past the sensor.

[0041] The respective information obtained by the sensor 110 may then be provided in the form of a signal that is indicative of the information obtained by the sensor and may particularly be indicative of the width and/or the height of the product to a control unit 180. This control unit 180 is preferably coupled to adjusting means 121, 131, 141 that are associated with each of the forming set 102, the sealing station 103 and the second sealing station 104. The adjusting means 121, 131 and 141 may be controlled by the control unit 180 so as to adjust at least one characteristic of their associated component, i.e. either the forming set 102, the sealing station 103 or the second sealing station 104.

[0042] Particularly, the adjusting means may be realized as or may comprise stepping motors that are connected to moveable components of the forming set 102, the sealing station 103 or the second sealing station 104. By moving the respective components (as will be explained further below), the characteristics of the respec-

tive components can be adapted to changing characteristics of the products, particularly changing characteristics of the products with respect to the width and/or the height.

[0043] Thereby, the way in which the forming set 102, the sealing station 103 and the second sealing station 104 act upon the products 190 can be controlled. In a preferred embodiment, such control is performed on a product by product basis, i.e. each product is determined with respect to its height and/or width by the sensor 110 and the control unit 180 controls the adjusting means 121, 131 and/or 141 based on the measured height and/or width of the product.

[0044] Having described these general characteristics of the sealing machine 100, further more detailed explanations are provided below.

[0045] Figure 2 shows a view of a product 190 surrounded by sealing material 151. The view presented here is along a direction that is parallel to the transport direction T. The image plane depicted here is thus presenting a cross-section of the product 190 and the plane is perpendicular to the transport direction T. As is shown here, the product has a width W and a height H. The total width of the sealing material in a direction perpendicular to the transport direction and in the depicted plane may be denoted as L.

[0046] In order for the sealing material 151 to be at all able to be wrapped around a product 190, the total width L of the sealing material must correspond to at least $L=2(W+H)$.

[0047] It is further intended that the sealing material can form a fin 291 having a length F. This is achieved by pushing together the two opposing edges of the sealing material, each of which thus being required to have the length F. Correspondingly, the total width L of the sealing material must correspond to at least $L=2(W+H+F)$.

[0048] It may further be envisaged that the sealing of the product 190 is realized in a "drop like" manner. This means that sealing material extends from the upper surface of the product 190 in a tapered form so as to finally form the fin above the product. In this case, even further sealing material is required. The total amount of which may be denoted as 2S.

[0049] Considering the above, in order to obtain a sealing or wrapping around of sealing material 151 around a product 190 in the manner as shown in figure 2, the width L of the sealing material must be provided so as to fulfill the condition $L \geq 2(W + H + F + S)$.

[0050] While this can always be ensured by selecting with a sufficiently broad or wide sealing material, depending on the width W and the height H of the product 190, the distance S may vary. This results in the fin 291 being positioned at different heights with respect to the transport plane depending on the height and/or the width of the product 190.

[0051] The width and/or the height of the product thus have influence on whether at all a fin 291 can be formed by the forming set because the forming set only folds the

sealing material around the product at a specific height relative to the transport plane of the products. If there is insufficient material to bridge this distance to the forming set, a fin will not be formed.

[0052] Additionally, the sealing station 103 will seal the fin 291 by pressing together the two opposing edges of the sealing material 151 and applying heat. In order for this to work, it is necessary that the fin 291 of the sealing material 151 is at a height above the transport plane of the products that is sufficient to bring the fin into contact with the heating rollers of the sealing station 103.

[0053] Additionally, also the second sealing station (if provided) which provides a cross sealing to the sealing material between adjacent products in the transport direction T can only reliably apply this sealing if there is sufficient sealing material to bridge the distance of the fin to the transport plane so as to close the sealing material before and after a product.

[0054] Correspondingly, the control unit 180 discussed above with respect to figure 1 is preferably configured to control and actuate the adjusting means 121, 131 and 141 depending on at least one of a measured width and/or a measured height of a product so as to meet the above condition and so as to ensure that a fin that is basically positioned at a height that corresponds to the sum of $H+S$ is reliably sealed and, before that, formed.

[0055] Referring now to figure 3a, a forming set 202 as described above in relation to figure 1 is shown in relation to a product 390. The forming set basically comprises two forming set elements 321 and 322. These are usually positioned in a specific height above a transport plane of the products and spaced apart by a specific width w. The forming set elements 321 and 322 are further inclined so that an outer edge of the forming set is positioned at a height h that is smaller than the height of an inner edge of each of the forming set elements, where the inner edges are positioned so as to contact and form the fin 392 of a product.

[0056] Depending on the height H and/or the width W of the product, as already explained above, the achievable height F of the fin may change and consequently the adjusting means associated with the forming set are preferably able to control at least one of the distance w of the forming set elements 321 and 322, the height h of the forming set elements 321 and 322 and an angle α of inclination of at least one of the forming set elements.

[0057] In this respect, it can be provided that each of the forming set elements 321, 322 can be moved relative to the middle of the transport plane of the transporting device. This can specifically be provided for adjusting the distance between the forming set elements 321 and 322. Thereby, it can be ensured that the fin 392 is always formed at the middle of the transport plane and consequently also preferably in the middle of the products. Additionally, products 390 can pass through the forming set elements 321 and 322 even when their width varies.

[0058] In order to achieve this adjusting, it can be provided that the adjusting means 121 associated with the

forming set comprise, for each degree of freedom (i.e. changing the distance of the forming set elements, changing the height of the forming set elements, and changing the inclination angle α of the forming set elements) independently controllable actuators, like servomotors. These can then be controlled independently by the control unit 180 depending on the determined height and/or width of a particular product or each product 390 so as to adjust the height h , width w and/or angle a . However, in other embodiments it can also be provided that these 3 degrees of freedom are simultaneously adjusted by using only a single actuator, like a servomotor.

[0059] Figure 3b shows the sealing station 203 that applies a longitudinal sealing of the sealing material by clamping the fin 392 between at least one pair of heating rollers 312 and 313. The heating rollers contact the fin 392 and apply heat to the fin so as to seal the material forming the fin 392 by melting it.

[0060] According to embodiments of the present disclosure, the adjusting means 131 shown in relation to figure 1 can adjust the height h of at least one pair of these heating rollers so as to adjust the height at which the heating rollers will contact the fin 392. If the fin is positioned at a comparably low height relative to the transport plane of the products 390, the heating rollers can be lowered so as to be able to contact the fin. Alternatively, if the fin is positioned at a comparably large height relative to the transport plane of the products, the heating rollers can be lifted so as to contact the fin, but not additional the material that is placed between the top surface of the product and the actual fin 392, in the region denoted with the height S as in figure 2. Thereby, reliable sealing is ensured.

[0061] It is noted that the sealing station 203 depicted in figure 3b comprises a further set of tracking rollers 311. These can be provided as rollers that do not apply intentional heat to the fin 392 but apply a tensioning force to the fin 392 so as to tension the fin and reduce the distance between the opposing edges of the sealing material that actually form the fin. Also the height h of this pair of tracking rollers can be adjusted according to the embodiments described here by using corresponding adjusting means 131, like a servomotor.

[0062] Particularly, the adjusting means 131 associated with the sealing station 203 can be provided so as to simultaneously move the pairs of rollers, irrespective of whether the pairs are pairs of tracking rollers or pairs of heating rollers. Thereby, a reliable and simultaneous adjustment of all rollers used for treating the fin 392 of the sealing material is ensured.

[0063] Alternatively, the adjusting means can comprise independent actuators, like servomotors, that are adapted to independently move the rollers of exactly one pair of heating rollers and/or tracking rollers. Alternatively, it can also be provided that all pairs of heating rollers are associated with one actuator, like a servomotor, of the adjusting means and all pairs of tracking rollers are associated with another actuator, like a servomotor, of

the actuating means. These two actuators can then be controlled independently so as to adjust the pairs of heating rollers and the pairs of tracking rollers independently depending on the width and/or the height of the products.

[0064] In addition or alternatively to adjusting the position of the heating rollers and/or the tracking rollers 311, 312, 313, it may also be provided that heat that is applied by the heating rollers is controlled depending on the width and/or the height of the product. For example, in cases where the fin 392 is longer or comprises more material than in other cases, more heat may be applied to ensure reliable sealing. Additionally or alternatively, a tension applied to the fin of the sealing material may be adapted depending on the width and/or the height of the products. For example, in cases where the additional material forming the space with height S between the product itself and the fin is comparably large, more tension may be necessary to ensure reliable sealing of the sealing material. To achieve this, the adjusting means may encompass drives that cause rotation of the tracking rollers and/or the heating rollers. By changing the rotational characteristics (like rotational speed) of the tracking rollers and/or the heating rollers, the tension applied to the sealing material can be adjusted.

[0065] Figure 3c depicts an embodiment of the second sealing station 304. This sealing station may encompass two transporting devices 340 and 350 that are spaced apart from each other. In some embodiments, these transporting devices 340 and 350 may be provided as endless chains or endless conveyors, though this is not limiting.

[0066] The second sealing station 304 may further comprise a sealing element 331 that can be moved towards the transport plane (i.e. towards the plane defined by the transporting devices 340 and 350) and can be realized as an element that can at least apply heat to sealing material. Additionally, it can encompass a cutting element like a knife that is arranged in a direction transverse to the transport direction T of the products. While the heat can seal the sealing material (not shown here), the cutting element can cut the sealing material so as to separate products from each other after the sealing.

[0067] The products together with the sealing material are usually transported in the distance d to each other. Depending on the height and/or width of the products, the amount of material needed so as to allow for sealing the sealing material after a given product 392 can vary. The adjusting means 141 and the control unit 180 (see figure 1) controlling the adjusting means may thus be configured to control the cutting point (measured as a distance after a trailing edge of a product 392 and/or a distance before a leading edge of a product 391) so as to ensure reliable sealing but not increasing a size of the sealed package further than necessary.

[0068] Additionally, the adjusting means may encompass a lifting element 371 for lifting the sealing element 331 so as to allow products to pass below the cutting element. The lifting element 371 may be realized as a

servomotor or other drive that can adjust the position of the cutting element 331 by, for example, lifting or lowering a holding element 381 (like a frame) of the cutting element.

[0069] Moreover, it can be provided that, like for the sealing station 103, a heat applied for causing the sealing and/or a pressure applied for pressing together sealing material to form the sealing may be adjusted depending on the width and/or height of the product.

[0070] As was explained above, each of the forming set, the sealing station and the second sealing station may be adjusted with respect to at least one of its characteristics. This can be done jointly depending on the width and/or height of the product, i.e. the characteristics of all these stations can be simultaneously adjusted. It can also be provided that, depending on the width and/or the height measured for a particular product, only characteristics of one of these three stations, i.e. the forming set, the sealing station and the second sealing station, needs to be adjusted. In that case, it can be provided that, depending on the measured width and/or height of the product, the control unit 180 can decide which of the stations to adjust and can control the adjusting means associated with the respective stations so as to adjust characteristics of the station.

[0071] Furthermore, for example with respect to the second sealing station described in relation to figure 3c and the forming set described in relation to figure 3a, it can be provided that not all characteristics (for example the inclination angle, the distance of the forming set elements and the height of the forming set elements) are all adjusted, but it can also be provided that, depending on the width and the height of the product, only one of these characteristics is adjusted or one of these characteristics is not adjusted whereas the others are.

[0072] In this respect, the invention is not limited to a particular mode of adjusting the characteristics of the stations.

Claims

1. A sealing machine (100) comprising a transporter (101) for transporting a product (190) along a transport direction (T), a forming set (102) for forming a sheetlike sealing material (151) around a product transported through the forming set along the transport direction, and a sealing station (103) downstream of the forming set (102) for sealing the sealing material (151) in a direction substantially parallel to the transport direction (T), the sealing machine (100) further comprising a sensor (110) arranged upstream of the forming set (102) and for measuring a height (H) and/or a width (W) of a product (190) and a control device (180) for receiving a signal from the sensor (110) that is indicative of the height (H) and/or the width (W) of a product and wherein the control device (180) is further configured to control adjusting

means (121, 131) associated with the forming set (102) and/or the sealing station (103) to adjust at least one characteristic of the forming set and/or the sealing station based on the signal.

2. The sealing machine (100) according to claim 1, further comprising a second sealing station (104) downstream of the forming set (102), wherein the second sealing station (102) is adapted to seal the sealing material (151) along a direction that is substantially perpendicular to the transport direction (T) and wherein the control device (180) is further configured to control adjusting means (141) associated with the second sealing station (104) to adjust at least one characteristic of the second sealing station.

3. The sealing machine (100) according to claim 1 or 2, wherein the characteristic of the forming set (102) comprises at least one of an inclination angle (α) of at least one forming set element (321, 322) in a plane perpendicular to the transport direction (T), an inclination height (h) of at least one forming set element (321, 322), a distance (w) of forming set elements (321, 322); and/or

wherein the characteristic of the sealing station (103) comprises at least one of a sealing height, a sealing material tension, a height of a fin (391) formed in the sealing material by the sealing station (103); and/or

wherein the characteristic of the second sealing station (104) comprises at least one of a distance of a sealing point to an edge of a product (391, 392), a sealing width, a sealing pressure.

4. The sealing machine (100) according to any of claims 1 to 3, wherein the sensor (110) comprises a height sensor for measuring a height of a product and a width sensor for measuring a width of a product (190).

5. The sealing machine (100) according to any of claims 1 to 4, wherein the sensor (110) comprises a camera and/or an optical barrier for measuring a height (H) and/or a width (W) of a product (190).

6. The sealing machine (100) according to any of claims 1 to 5, wherein the sensor (110) is configured to measure a height (H) and/or a width (W) of each product (190) and to output, for each product, a signal to the control device (180) that is indicative of the height (H) and/or the width (W) of the product (190), and wherein the control device (180) is configured to control the adjusting means (121, 131, 141) based on each received signal.

7. A method for adjusting characteristics of a sealing machine (100), the sealing machine comprising a

transporter (101) transporting a product (190) along a transport direction (T), a forming set (102) forming a sheetlike sealing material (151) around the product transported through the forming set along the transport direction, and a sealing station (103) downstream of the forming set (102), wherein the sealing station (103) seals the sealing material (151) in a direction substantially parallel to the transport direction (T), the sealing machine (100) further comprising a sensor (110) arranged upstream of the forming set (102) and a control device (180), wherein the method comprises measuring, by the sensor (110), a height (H) and/or a width (W) of a product (190) and controlling, by the control device (180), upon receiving a signal from the sensor (110) that is indicative of the height (H) and/or the width (W) of the product (190), adjusting means (121, 131) associated with the forming set (102) and/or the sealing station (103) to adjust at least one characteristic of the forming set and/or the sealing station based on the signal.

8. The method according to claim 7, wherein the sealing machine (100) further comprises a second sealing station (104) downstream of the forming set (102), wherein the second sealing station seals the sealing material (151) along a direction that is substantially perpendicular to the transport direction (T) and wherein the control device (180) controls adjusting means (141) associated with the second sealing station (104) based on the received signal to adjust at least one characteristic of the second sealing station (104).
9. The method according to claim 7 or 8, wherein the characteristic of the forming set (102) comprises at least one of an inclination angle (α) of forming set elements (321, 322) in a plane perpendicular to the transport direction (T), an inclination height (h) of at least one forming set element (321, 322), a distance (w) of forming set elements (321, 322); and/or

wherein the characteristic of the sealing station (102) comprises at least one of a sealing height, a sealing material tension, a height of a fin formed in the sealing material by the sealing station; and/or

wherein the characteristic of the second sealing station (104) comprises at least one of a distance of a sealing point to an edge of a product, a sealing width, a sealing pressure.

10. The method according to any of claims 7 to 9, wherein the sensor (110) comprises a height sensor measuring the height (H) of the product and a width sensor measuring the width (W) of the product.
11. The method according to any of claims 7 to 10, wherein the sensor (110) comprises a camera and/or

an optical barrier measuring the height (H) and/or the width (W) of a product.

12. The method according to any of claims 7 to 11, wherein the sensor (110) measures the height (H) and/or the width (W) of each product (190) and outputs, for each product, a signal to the control device (180) that is indicative of the height and/or the width of the product, and wherein the control device controls the adjusting means (121, 131, 141) based on each received signal.

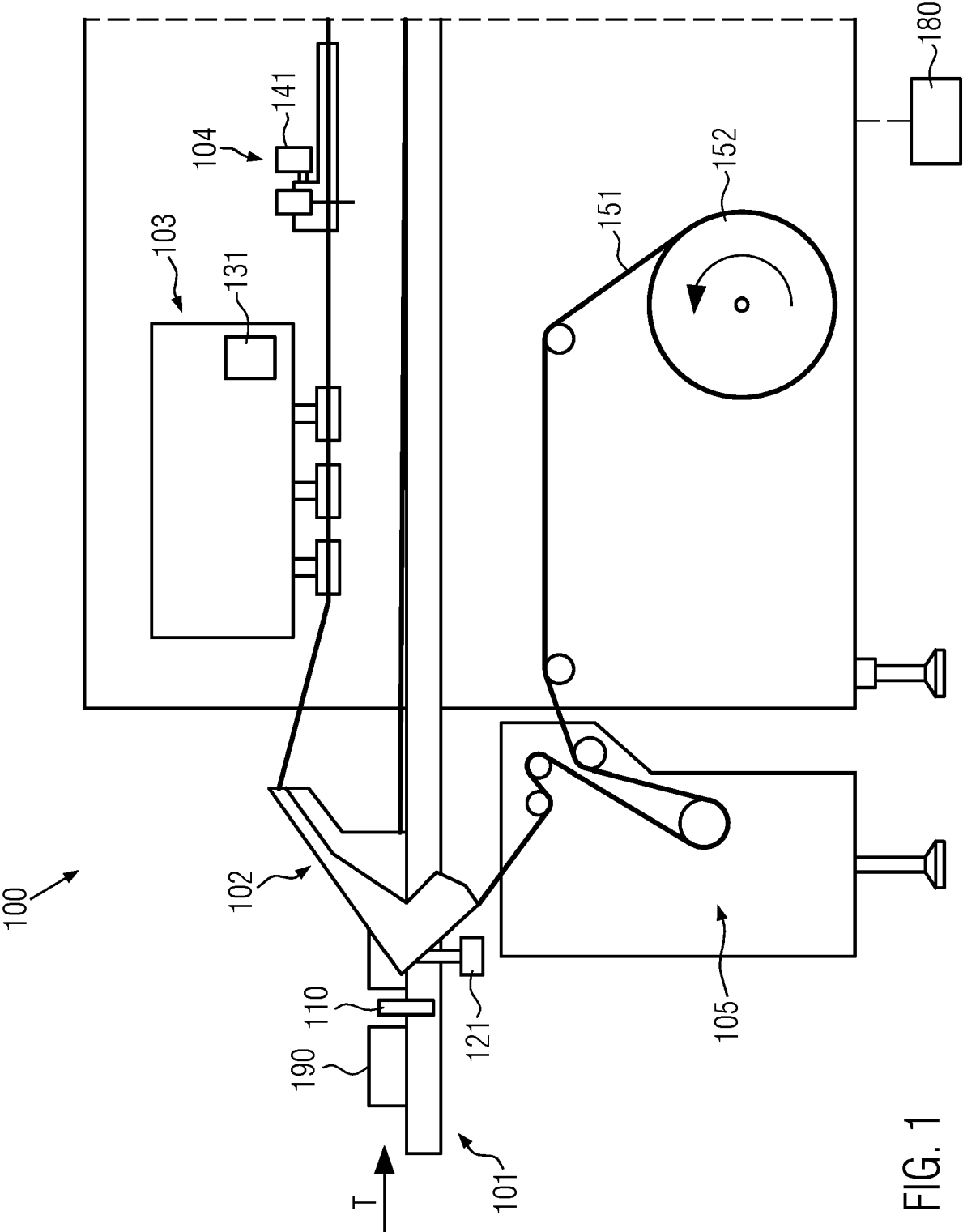


FIG. 1

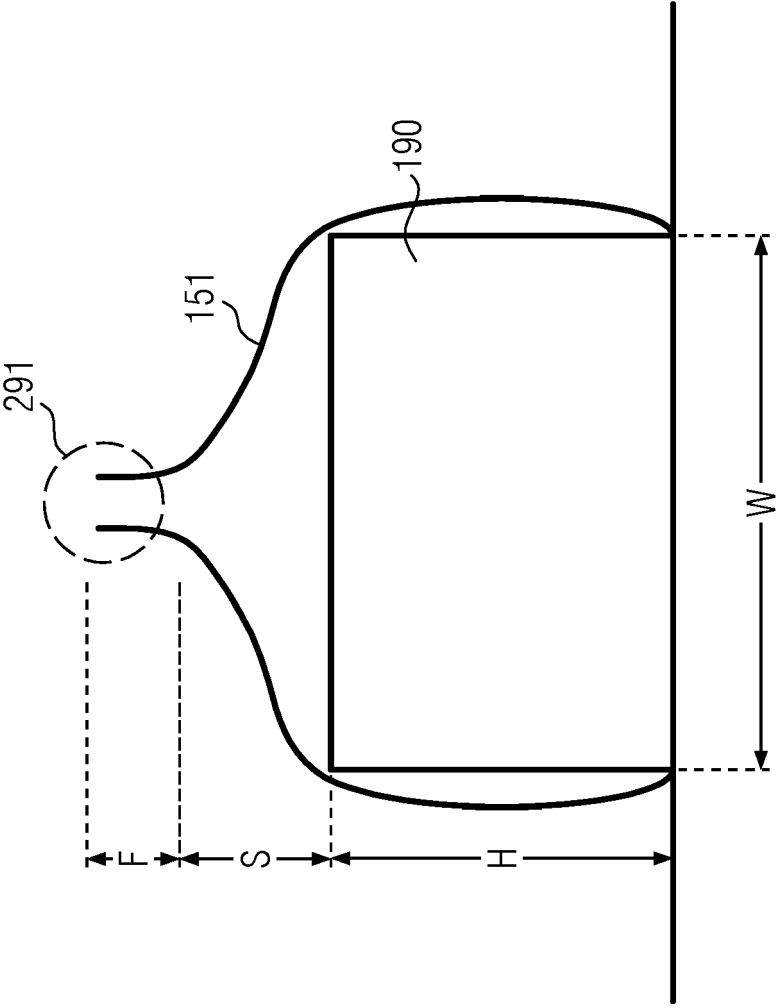


FIG. 2

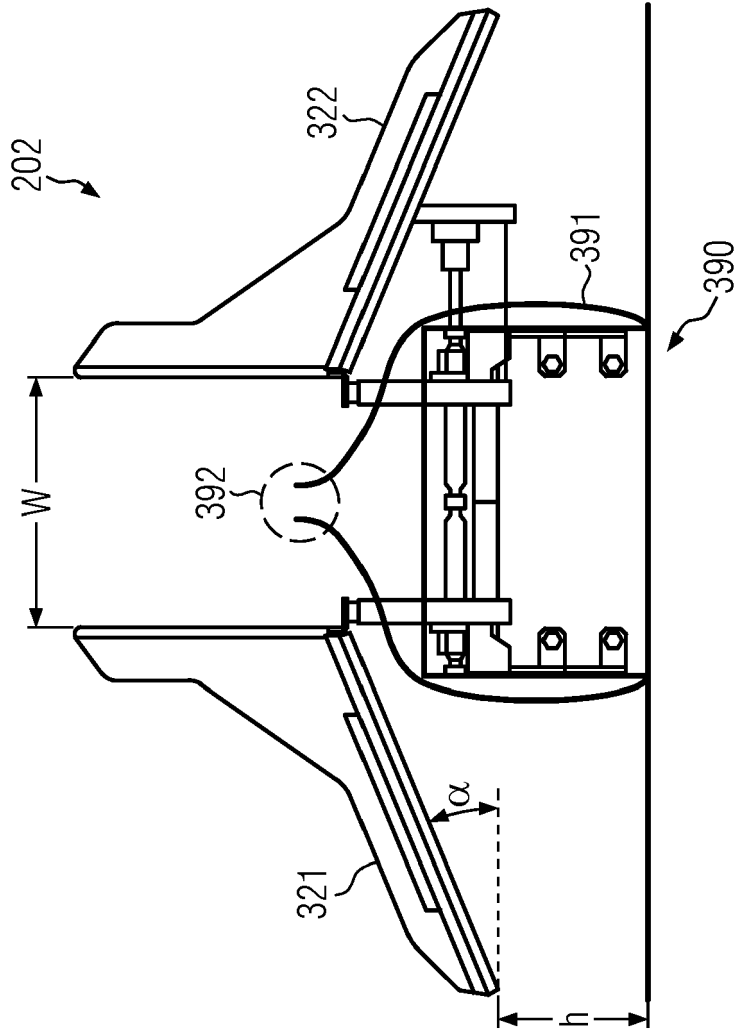


FIG. 3a

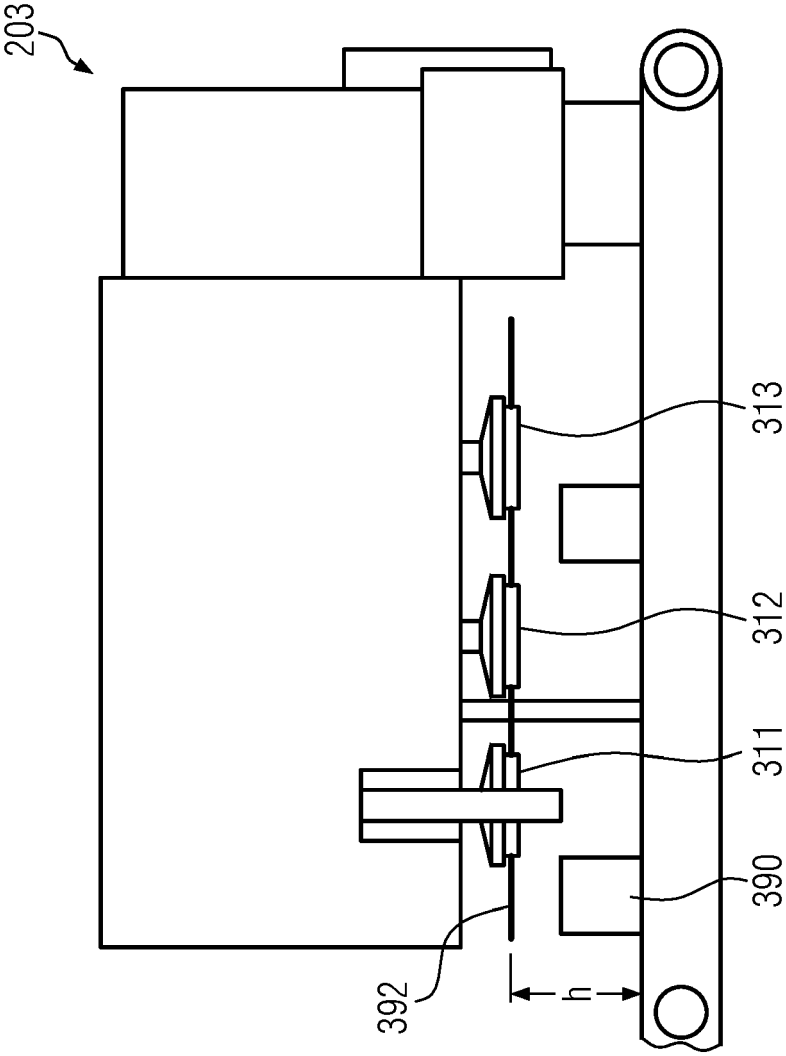


FIG. 3b

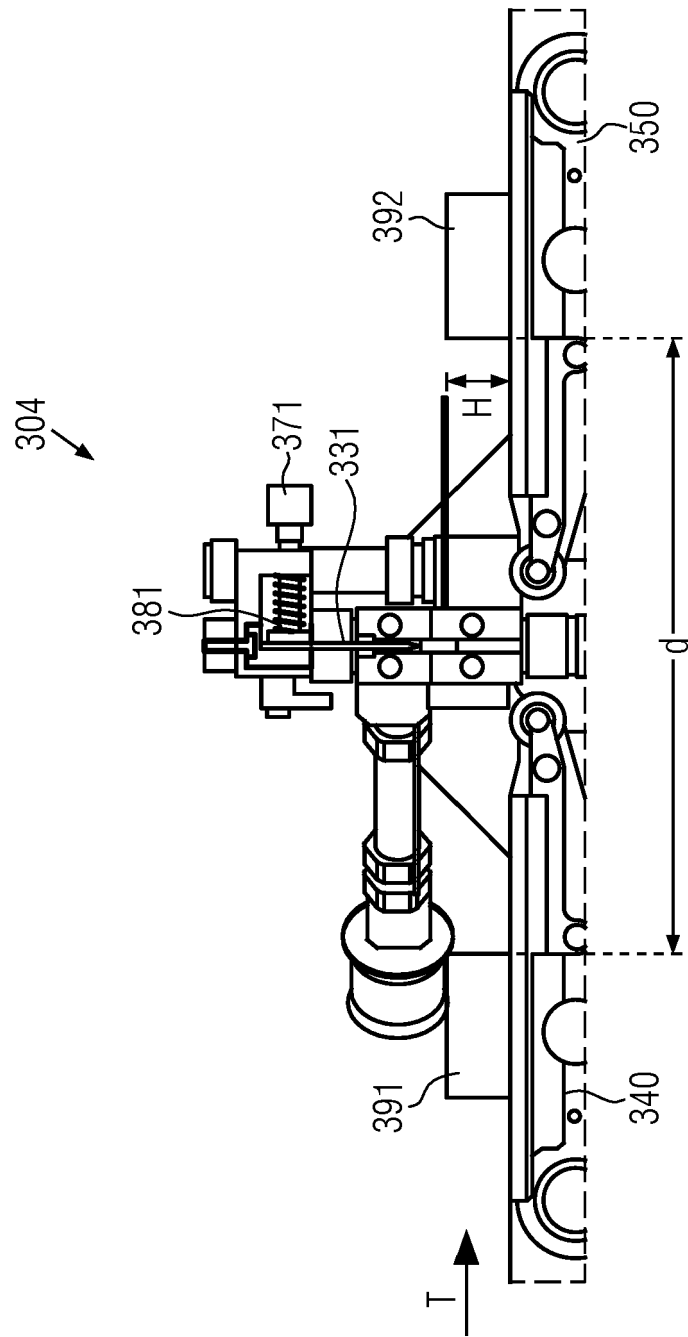


FIG. 3C



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Application Number

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Y	* figures 1, 2, 4-6 * * column 1, lines 5-12 * * column 2, line 58 - column 3, line 53 * * column 5, line 11 - column 6, line 14 * * column 7, line 5 - column 8, line 8 * * column 11, lines 8-67 * -----	3-6, 9-12	
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Place of search Munich		Date of completion of the search 23 March 2022	Examiner Schmitt, Michel
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