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(54) **Gluing apparatus and method**

(57) A gluing apparatus (1), comprises:
- advancement means (13) for advancing an edge element (300) along a first advancement path in an advancement direction (A);
- dispensing means (2) for dispensing an adhesive substance and arranged along the first advancement path, said dispensing means being suitable for distributing a layer of adhesive substance (400) on an edge element

(300) that advances along said first advancement path in the advancement direction (A) for gluing the edge element (300) to a respective side (200) of a panel (100);
- controlling means (4) for controlling the dispensing means (2);

and is **characterised in that** said controlling means (4) enables a width (h) of said layer (400) of adhesive substance to be adjusted.

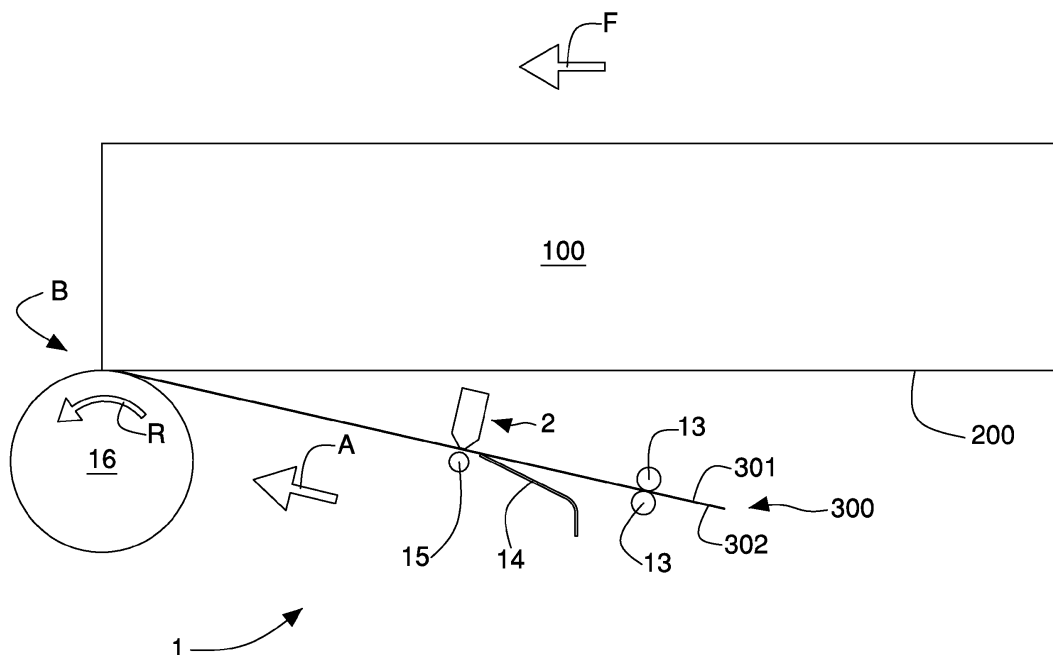


Fig. 1

Description

[0001] The invention relates to a gluing apparatus and method, in particular for gluing an edge element onto a side of a panel.

[0002] Specifically, but not exclusively, the invention can be used in an operating machine for machining wood, such as, for example, an edgebanding machine.

[0003] These operating machines, which typically perform edgebanding operations on panels, boards, flat elements made of wood or similar material, comprise an apparatus or gluing unit that distributes a layer of adhesive substance onto edge elements such as bands, strips and lists to be applied to perimeter sides of panels or directly to the perimeter sides of said panels.

[0004] Gluing apparatuses of known type comprise, for example, an apparatus like the one illustrated in the European patent EP 1 798 013 in the name of the applicant.

[0005] Such known gluing apparatuses spread a layer of glue on the edge to be applied to the panel, or directly on the perimeter sides of said panel.

[0006] The glue used is generally a thermofusible glue that has to be suitably heated before it is applied 'hot' to the surfaces to be joined. The glue is applied by a rotating gluing roller comprised in the gluing apparatus. The gluing roller has a knurled or rough external surface, that is suitable for retaining and conveying the glue, which is supplied by a tank or reservoir. The tank is provided with a glue-delivery opening through which the glue reaches the gluing roller.

[0007] The glue-delivery opening of the tank has a height that is equal to that of the portion of the gluing roller that is intended to receive the glue.

[0008] Between the tank and the gluing roller, shutter devices are interposed that enable said opening to be opened/closed to enable/prevent the passage of the glue to the gluing roller. Further, known gluing apparatuses may comprise doctor blades that are able to regulate the quantity of glue to be spread on the knurled surface of the gluing roller.

[0009] A drawback of known apparatuses consists of the fact that it is not possible to adjust the height of the portion of roller that is intended to receive the glue.

[0010] As the height of this portion, is, as said, not adjustable, two opposite needs must be considered: on the one hand it must have a height that is sufficient to ensure firm gluing of the edge to the perimeter side of the panel but on the other hand if this height is approximately equal to the thickness of the panel, an edgebanded object of poor aesthetic quality is obtained as part of the distributed glue may be visible to the user and dirty the external layers of the panel.

[0011] Another drawback of known apparatuses consists of the glue losses that occur, especially during the periods when said apparatuses are resting or stationary.

[0012] As the gluing roller has a knurled or at least rough external surface, the doctor blades are not able to

abut on the surface in a hydraulically sealed manner and thus to close the glue tank hermetically.

[0013] During operation of the apparatus, the rotation of the roller in fact achieves a seal of dynamic type between the external surface of the roller and the doctor blades. Nevertheless, during the rest period, due to the lack of dynamic seal, there is a glue leakage that is more or less considerable according to the fluidity of the glue, the pressure inside the tank, the shape and dimensions of the opening, etc.

[0014] The glue leakage is very disadvantageous, both from the economic point of view, as said thermofusible glue is very costly, and because of the problems that it may create, by spreading and solidifying in the work zone.

[0015] Also, a further drawback of known gluing apparatuses consists of the fact that due to the knurled surface of the gluing roller it is not possible to distribute the glue as a uniform film inasmuch as the glue layer will have uneven thickness. This may also lead to a unpleasant visual effect inasmuch as the edge may be glued to the panel unevenly, such that some portions of the glue layer that have a greater thickness may be visible.

[0016] Another drawback of known apparatuses is that they are bulky.

[0017] An object of the present invention is to improve known gluing apparatuses, in particular apparatuses for gluing an edge element to a side of a panel in an operating machine for machining wood, such as, for example, an edgebanding machine.

[0018] Another object is to provide a gluing method for gluing an edge element to a side of a panel by means of a layer of adhesive substance distributed on a surface of edge elements, in particular bands, strips, lists to be applied to perimeter sides of panels, boards, flat elements made of wood or similar material.

[0019] Still another object is to obtain an apparatus that enables the glue to be distributed uniformly and homogeneously on an edge element.

[0020] A further object is to obtain an apparatus devoid of losses and leaks of glue both in an operating condition and in a stationary or rest condition.

[0021] Still another object is to obtain an apparatus that enables the distribution of glue on the surfaces to be glued to be adjusted and controlled simply, rapidly and effectively.

[0022] A still further object is to obtain an apparatus that enables the quantity of glue used to apply the edge element to the panel to be reduced and a more economical apparatus to be thus obtained.

[0023] Another object is to obtain an apparatus that enables an edgebanded panel to be obtained that is of good quality and is provided with a pleasant aesthetic appearance.

[0024] Still another object is to obtain an apparatus that is less bulky than known apparatuses.

[0025] The invention comprises an apparatus and/or a method according to any one of the following claims.

[0026] The invention can be better understood and im-

plemented with reference to the attached drawings that illustrate some embodiments thereof by way of non-limiting example, in which:

Figure 1 is a partial and schematic plan view of an apparatus for distributing glue and of a panel to be edgebanded;

Figure 2 is an elevation view of a glue-dispensing head comprised in the apparatus illustrated in figure 1;

Figure 3 is a perspective top view of the dispensing head illustrated in Figure 2;

Figure 4 is a partial and schematic cross section of a panel to be edgebanded and of an edge element to be glued to said panel, according to a first embodiment;

Figure 5 is a partial and schematic cross section of a panel to be edgebanded and of an edge element to be glued to said panel, shown in a second embodiment.

[0027] With reference to Figure 1, there is shown a panel 100, which is in particular usable for making furniture, shelving, shelves, doors and the like.

[0028] The panel 100, which is generally made of wood or similar materials, comprises a plurality of perimeter sides 200; the number of sides depending on the shape of the panel 100. In the specific case, the panel 100 has a rectangular shape and thus comprises four perimeter sides 200.

[0029] In figure 1, there is further shown an apparatus 1 arranged for distributing a layer of adhesive substance 400 (figures 4 and 5), for example glue, on an edge element 300 to be applied to a respective perimeter side 200 of the panel 100. The edge element 300, which is visible in Figures 1, 3, 4 and 5, can be shaped as a band, a strip or a list.

[0030] The apparatus 1 can be associative with an operating machine for machining wood, such as, for example, an edgebanding machine. The latter generally comprises a plurality of apparatuses, positioned in series in a work zone through which the panel 100 advances. This panel, which advances along an advancement path that is substantially parallel to an advancement direction F, is machined in succession by the aforesaid plurality of apparatuses. The plurality of apparatuses may comprise, in addition to the apparatus 1 according to the invention, a cutting apparatus for cutting a portion of the edge element 300 protruding laterally from the panel 100 being machined, a trimming apparatus for trimming the edge element 300 with respect to the panel 100 by removing the material protruding above and below the panel, and, optionally, scraping apparatuses for eliminating glue residue and finishing the connection between the edge element 300 and the machined panel 100 and an apparatus comprising brushes for cleaning and polishing the edge element 300.

[0031] The apparatus 1 may comprise a dispensing

head 2, which is of known type and is visible in greater detail in figures 2 and 3.

[0032] The dispensing head 2 receives the adhesive substance, which is typically glue, from a tank (which is not shown) and distributes a layer of glue 400 on the edge element 300. In particular, as is visible from figures 1 and 3, the dispensing head 2 is positioned laterally with respect to the edge element 300 (which is advanced in a substantially vertical position) in such a manner as to distribute the layer of glue 400 on a face 301 of the edge element 300 that is intended for coming into contact with a respective perimeter side 200. In other words, the dispensing head 2 is positioned in a gluing zone of the apparatus 1 along a first advancement path of the edge element 300.

[0033] The adhesive substance used is in general a thermofusible glue that is suitably heated before being applied 'hot' to the surface 301. In particular, the adhesive substance can be a polyurethane glue, or a glue of the "EVA" (Ethyl Vinyl Acetate) type. The thermofusible glue is generally heated by electric resistances that are of known type and are not shown.

[0034] Alternatively, the thermofusible glue can be heated by any other type of suitable heating means.

[0035] The dispensing head 2 comprises an opening 3, shaped as an elongated slit, substantially vertical, through which the glue is dispensed.

[0036] In an alternative embodiment, which is not shown, the opening 3 may comprise a plurality of holes, for example aligned along a substantially vertical direction.

[0037] The dispensing head 2 further comprises controlling means 4 arranged for adjusting a width h (visible in Figures 4 and 5) of the layer of glue 400.

[0038] The controlling means 4 may comprise a stem 5, which is movable substantially longitudinally, to which an indicator 6 is fixed. The stem 5 can be moved by an operator using a knob 7.

[0039] In an alternative embodiment of the invention, which is not shown, the stem 5 can be driven automatically and not manually by an operator, for example by a numeric control device having the axis of the stem 5 as the controlled axis. To the stem 5 a shutter element is connected, for example a laminar shutter element, positioned substantially at a portion 8 of the opening 3, inside the dispensing head 2, and which is therefore not visible in the figures.

[0040] The shutter element enables the opening 3 to be closed in an adjustable manner by a desired amount that is decided beforehand by the operator. The latter defines this quantity by suitably positioning (by the knob 7) the indicator 6 on a reading element 9, in particular a graduated scale.

[0041] In this manner the operator can adjust the desired width h of the layer of glue 400 in function of a respective thickness P (i.e. the height of the perimeter side 200) of the panel 100 to be machined.

[0042] The position of the dispensing head 2 can be

further adjusted, in a substantially vertical direction, by an operator who, in a step of setting up the apparatus 1 prior to using the apparatus, fixes the position of a body 10 of the dispensing head 2 with respect to a supporting element 11 by a lever 12; the body 10 being slidably supported by the supporting element 11.

[0043] The apparatus 1 further comprises first rollers 13, a guiding element 14, a contrasting roller 15, and a pressing roller 16, which are visible in figure 1.

[0044] The first rollers 13, which rotate in opposite directions to one another, are arranged for advancing the edge element 300 along the first advancement path in an advancement direction A (indicated by an arrow in figures 1 and 3) to the dispensing head 2 and thus to the panel 100.

[0045] The contrasting roller 15 is positioned at the dispensing head 2 on a side opposite the latter with respect to the edge element 300. In other words, the contrasting roller 15 acts on a further surface 302 of the edge element 300, opposite the surface 301, to contrast a thrust action that the dispensing head 2 exerts on the edge element 300. If the apparatus 1 were devoid of the contrasting roller 15, the edge element 300 would flex. The contrasting roller 15 is movable between an operating position in which it maintains the edge element 300 in contact with the opening 3 of the dispensing head 2, and a non-operating position in which it is spaced away from the edge element 300 and the glue is not dispensed.

[0046] The guiding element 14 is interposed between the first rollers 13 and the dispensing head 2 and is arranged for guiding the edge element 300 along the first advancement path so as to convey the edge element 300 to the dispensing head 2.

[0047] The pressing roller 16, by rotating in the direction shown by the arrow R in figure 1, presses the edge element 300 against the perimeter side 200 of the panel 100 at an edge application zone B (that is visible in figure 1) of the apparatus 1, such as to fix the edge element 300 to the panel 100 once the layer of glue 400 has dried and cooled. With reference to figures 4 and 5, there is shown a schematic cross section of a panel 100 having a thickness P, of an edge element 300 having a height h1 and to the surface 301 of which a layer of glue 400 has been applied that has a width h and thickness S.

[0048] The width h of the layer 400 is less than the height h1 of the edge element 300.

[0049] The thickness S of the layer 400 can be less than 1 mm. In particular, the thickness S can be comprised between 0.05 mm and 0.2 mm.

[0050] With reference to Figure 4 there is shown an embodiment in which the width h of the layer of glue 400 is less than the thickness P of the panel 100. In particular, the width h can be less than the thickness P by a quantity that is approximately equal to 0.2 mm. Alternatively, the width h can be less than the thickness P by a quantity that is even less than 0.2 mm.

[0051] With reference to Figure 5 there is shown another embodiment in which the width h of the layer of

glue 400 is greater than the thickness P of the panel 100. In particular, the width h can be greater than the thickness P by a quantity that is approximately equal to 0.2 mm. Alternatively, the width h can be greater than the thickness P by a quantity that is even less than 0.2 mm.

[0052] In use, once the thickness P of the panel 100 is known to which the edge element 300 has to be glued, the operator, before starting up the operating machine and performing the edgebanding, adjusts a width h of the layer of glue 400 in the manner disclosed above.

[0053] Subsequently, when the operating machine is started, the edge element 300 is advanced by the first rollers 13 on the first advancement path along the advancement direction A, indicated by an arrow in figures 1 and 3.

[0054] Further, almost simultaneously, the panel 100 is advanced on a second advancement path, which is substantially parallel to the advancement direction F indicated by an arrow in figure 1.

[0055] The second advancement path meets the first advancement path at an edge application zone B.

[0056] Whilst the edge element 300 advances, the dispensing head 2 distributes on a surface 301 of the edge element 300 a layer of glue 400 having a thickness S that is substantially constant for the entire length of the edge element 300. In particular, the glue is dispensed through an opening 3, for example an opening 3 shaped as an elongated slot.

[0057] It should be noted that the layer of glue 400 is substantially distributed at a longitudinal central portion of the surface 301 in such a manner as to leave free from the glue two longitudinal side portions arranged on the opposite sides of said longitudinal central portion. Afterwards, the edge element 300 on which the layer of glue 400 has been distributed is pressed against the perimeter side 200 of the panel 100 that is being edgebanded by the pressing roller 16 at the edge application zone B.

[0058] At this point, after the apparatus 1 has distributed a layer of glue 400 on the edge element 300 and applied the latter to the panel 100, the panel can advance through the remaining apparatuses with which is provided the operating machine to which the apparatus 1 is associated.

[0059] These operations can then be repeated for each of the perimeter sides 200 of the panel 100 to which an edge element 300 has to be glued.

[0060] An advantage of the invention is that the apparatus 1 for distributing a layer of glue 400 enables the consumption of glue to be limited by maintaining firm and effective gluing of the edge element 300 to the respective perimeter side 200 of the panel 100. First of all, owing to the fact that the layer 400 is distributed on the edge element 300 and not on the panel 100, the consumption of glue is reduced inasmuch as if the glue were distributed on the side of the panel, part of the glue would be absorbed inwards the panel without thus contributing to gluing.

[0061] Further, owing to the possibility of adjusting the

width h of the layer of glue 400 by the controlling means 4 of the apparatus 1, the quantity of glue consumed is further reduced. This causes a financial saving, inasmuch as the thermofusible glue is generally very expensive.

[0062] Another advantage, which is determined directly by the previous one, is that the apparatus 1 may comprise heating means of dimensions and power that are less than those of known apparatuses, because, as the apparatus 1 consumes a quantity of glue that is less than known apparatuses, the apparatus 1 does not need bulky and powerful heating means. This enables the operating costs of the apparatus 1 to be reduced, which apparatus consumes a smaller quantity of electric energy.

[0063] A further advantage is that the apparatus 1 enables a panel 100 of good quality to be obtained that is provided with a pleasant aesthetic appearance.

[0064] The width h of the layer of glue 400 can be adjusted in such a manner that it is lower than the height of the edge element 300, in particular even lower - although by a small amount - than the thickness P of the panel 100 being machined. Owing to this, once the edge element 300 has been glued to the panel 100, the layer of glue 400 interposed therebetween is hardly visible to a user or can even be completely hidden from the view of the latter.

[0065] Further, as the layer of glue 400 has a substantially constant thickness S for the entire length of the edge element 300, the aesthetic appearance of the edgebanded panel is further improved compared with the panels edgebanded with known apparatuses, in which, due to the knurled surface of the gluing roller, the layer of glue has an irregular and uneven thickness.

[0066] Another advantage is that the apparatus 1 enables the width h of the layer of glue 400 to be adjusted very precisely owing to the reading element 9, in particular a graduated scale, comprised in the controlling means 4.

[0067] This is due to the fact that the controlling means 4 enables the width h to be adjusted in a substantially micrometric manner by adjusting the position of the stem 5. The latter can be moved manually by an operator who acts on the knob 7, or can be driven automatically, for example, by a numeric control device having the axis of the stem 5 as the controlled axis.

[0068] Another advantage is that the apparatus 1 enables the distribution of the glue on the surface 301 of the edge element 300 to be glued to the panel 100 to be adjusted and controlled in a simple, rapid and effective manner.

[0069] Still another advantage of the apparatus 1 is that it is easy for the operator to clean and during operation it keeps itself cleaner than known apparatuses.

[0070] This is due to the fact that the layer of glue 400 is distributed in a central portion of the surface 301 of the edge element 300 and not in two longitudinal side portions near the external layers of the panel 100, and therefore in these longitudinal side portions that are devoid of

the layer of glue 400 guide means can act that guide the edge element 300 without becoming dirty with glue.

[0071] Further, the dispensing head 2 enables dispensing of the glue to be interrupted during rests or stops of the operating machine with which the apparatus 1 is associated, i.e. when the surface 301 of the edge element 300 does not face the opening 3; thus preventing the glue from depositing itself in other zones of the apparatus 1 and dirtying the apparatus 1.

[0072] Another advantage of the apparatus 1 is that of being less bulky than known apparatuses.

[0073] In one version, which is not shown, the dispensing head 2 can be replaced by other dispensing means.

[0074] In a further version, which is not shown, the first rollers 13 can be replaced by other advancement means.

[0075] In another version, which is not shown, the controlling means 4 can be replaced by other suitable controlling means which is suitable for adjusting the width h of the layer of glue 400.

[0076] Variations on and/or additions to what has been disclosed above and/or to what has been shown in the attached drawings are further possible.

Claims

1. Gluing apparatus (1), comprising:

- advancement means (13) for advancing an edge element (300) along a first advancement path in an advancement direction (A);
- dispensing means (2) for dispensing an adhesive substance and arranged along said first advancement path, said dispensing means being suitable for distributing a layer (400) of adhesive substance on an edge element (300) that advances along said first advancement path in said advancement direction (A) for gluing the edge element (300) to a respective side (200) of a panel (100);
- controlling means (4) for controlling said dispensing means (2);

characterised in that said controlling means (4) enables a width (h) of said layer (400) of adhesive substance to be adjusted.

2. Apparatus according to claim 1, wherein said dispensing means (2) comprises an opening (3) from which said layer (400) of adhesive substance exits, and said controlling means (4) comprises shutter means suitable for closing said opening (3) in an adjustable manner.
3. Apparatus according to claim 2, wherein said opening (3) is substantially shaped as an elongated slot.
4. Apparatus according to any preceding claim, wherein said dispensing means comprises a dispensing

head (2).

5. Edgebanding machine, comprising means for advancing a panel (100) along an advancement direction (F) through a work zone, a plurality of apparatuses arranged in series along said work zone and suitable for performing successive machinings on said panel (100), **characterised in that** an apparatus (1) of said plurality of apparatuses is an apparatus (1) according to any preceding claim.

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6. Method for gluing comprising the steps of:

- advancing an edge element (300) along a first advancement path;

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 - advancing a panel (100) along a second advancement path, substantially parallel to an advancement direction (F), that meets said first advancement path in an edge applying zone (B);
 - distributing a layer (400) of an adhesive substance on said edge element (300) in a zone of said first advancement path preceding said edge applying zone (B);

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 - gluing said edge element (300) to a respective side (200) of said panel (100) in said edge applying zone (B);

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characterised in that said layer (400) of adhesive substance has a width (h) less than a height (h1) of said edge element (300).

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7. Method according to claim 6, wherein said width (h) is less than a thickness (P) of said panel (100), in particular said width (h) can be comprised in the interval: $(P - 0.2\text{mm}) < h < P$; P being the thickness of said panel (100) to be edgebanded.

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8. Method according to claim 6, wherein said width (h) is greater than a thickness (P) of said panel (100), in particular said width (h) can be comprised in the interval: $P < h < (P + 0.2\text{mm})$; P being the thickness of said panel (100) to be edgebanded.

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9. Method according to any one of claims 6 to 8, wherein said layer (400) of adhesive substance is distributed on a surface (301) of said edge element (300) and comes into contact with a respective side (200) of said panel (100); said layer (400) having a substantially constant thickness (S) for almost the entire length of said surface (301).

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10. Method according to any one of claims 6 to 9, wherein said layer (400) of adhesive substance is distributed in a longitudinal central portion of said edge element (300) leaving two longitudinal side portions, arranged on opposite sides of said longitudinal central portion, free from the adhesive substance.

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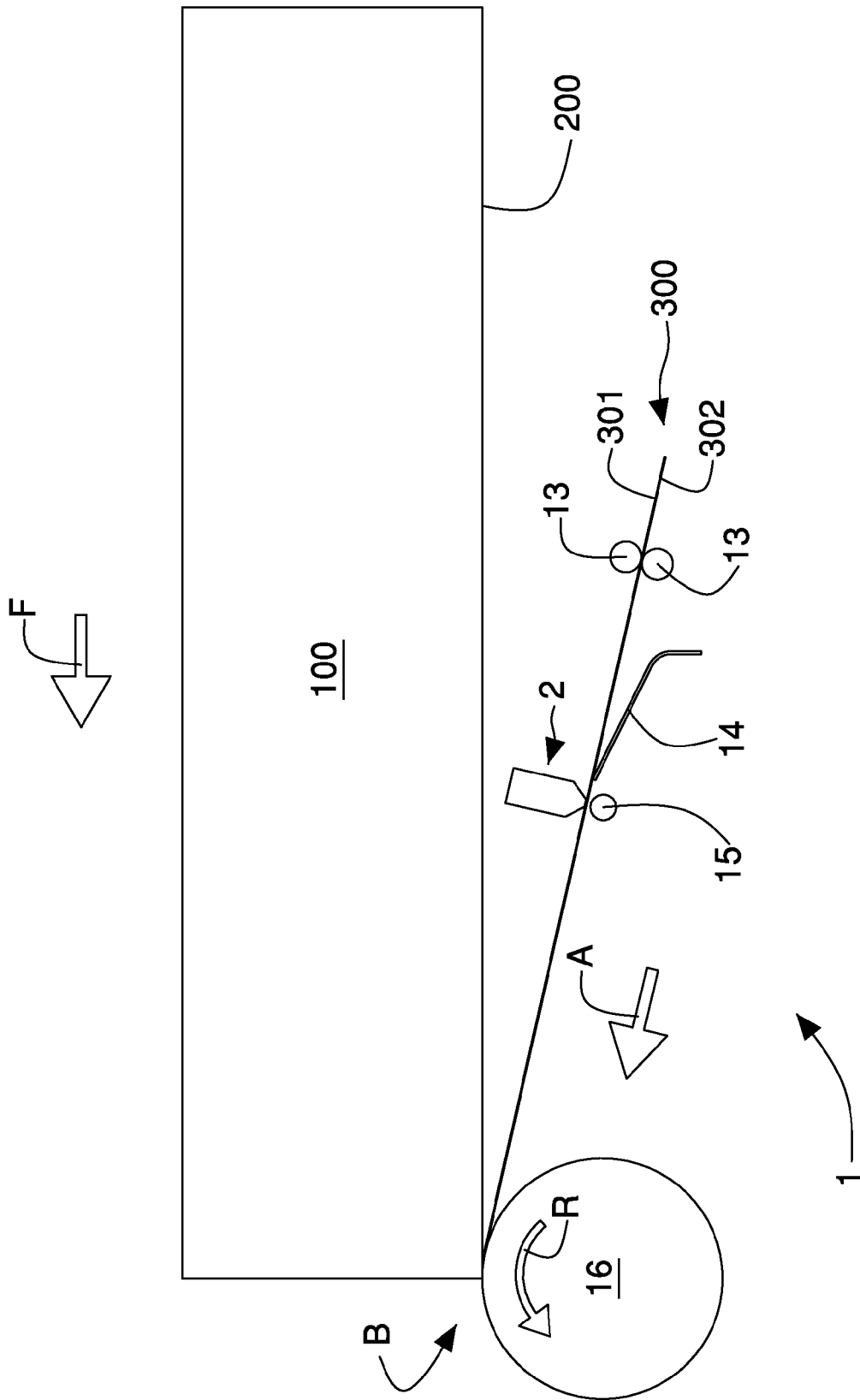


Fig. 1

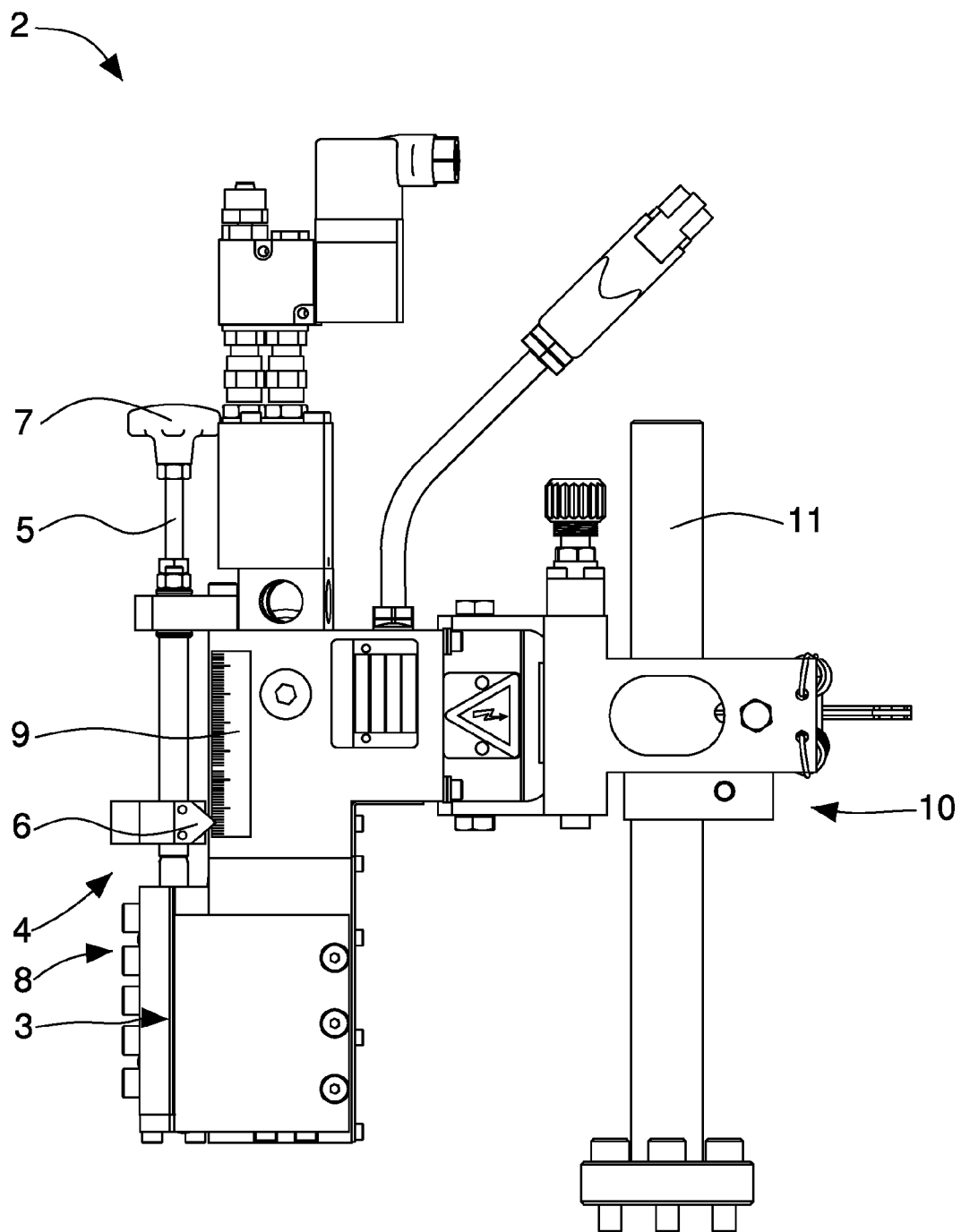


Fig. 2

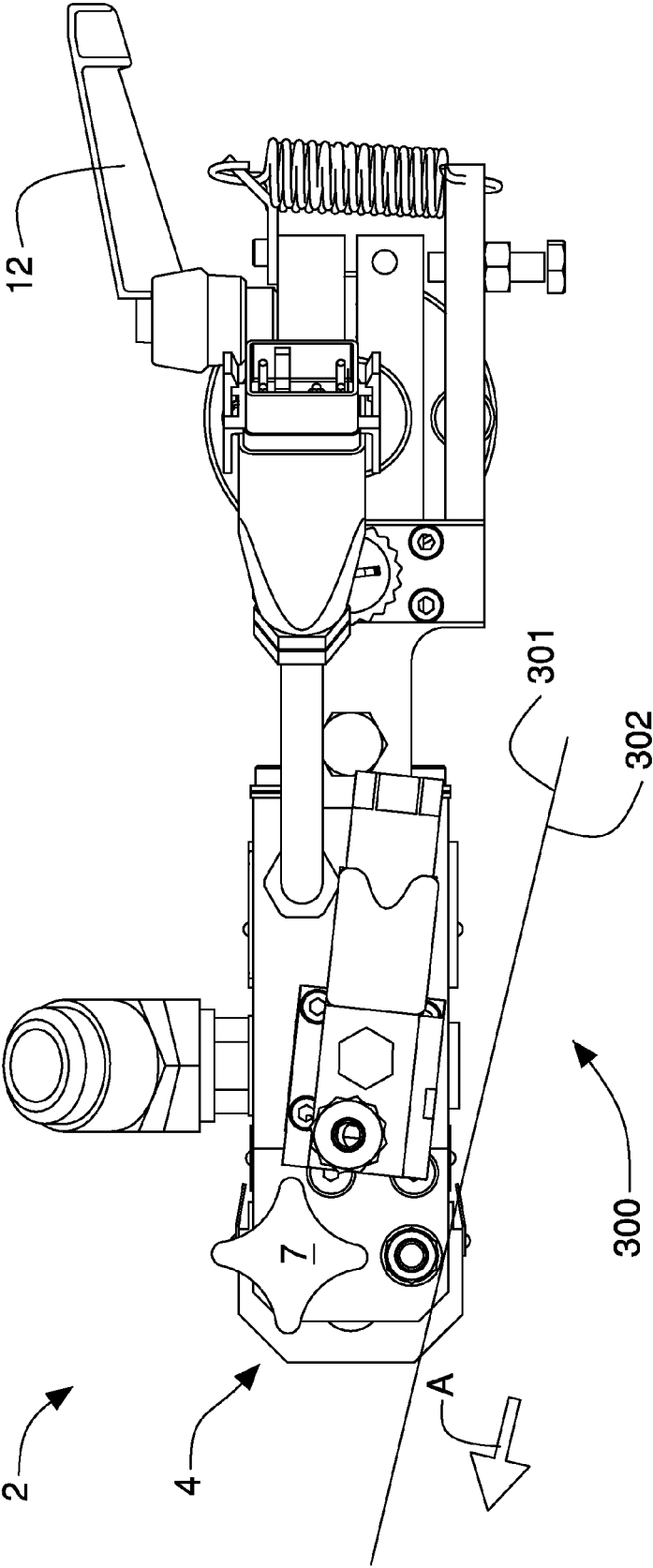


Fig. 3

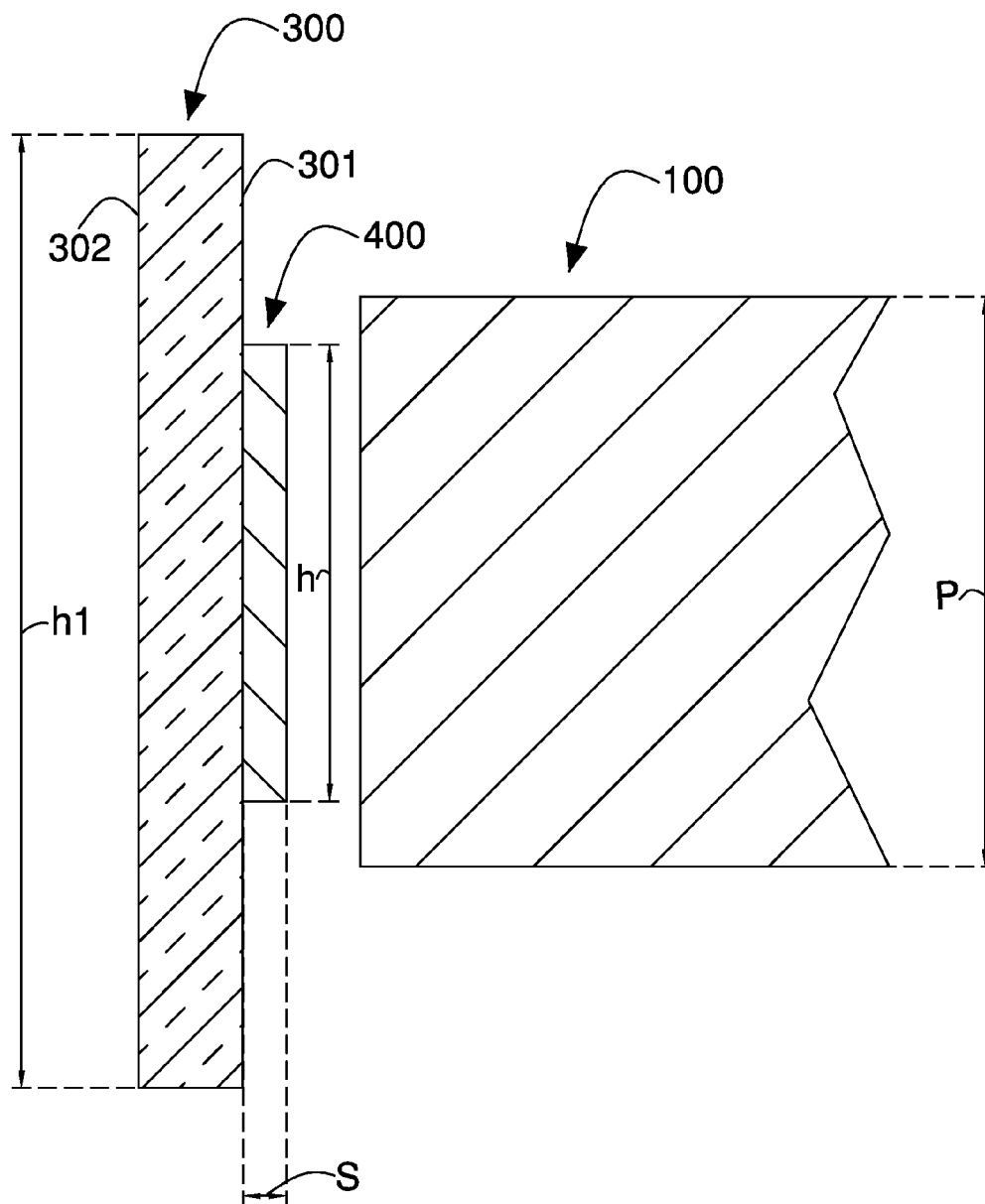


Fig. 4

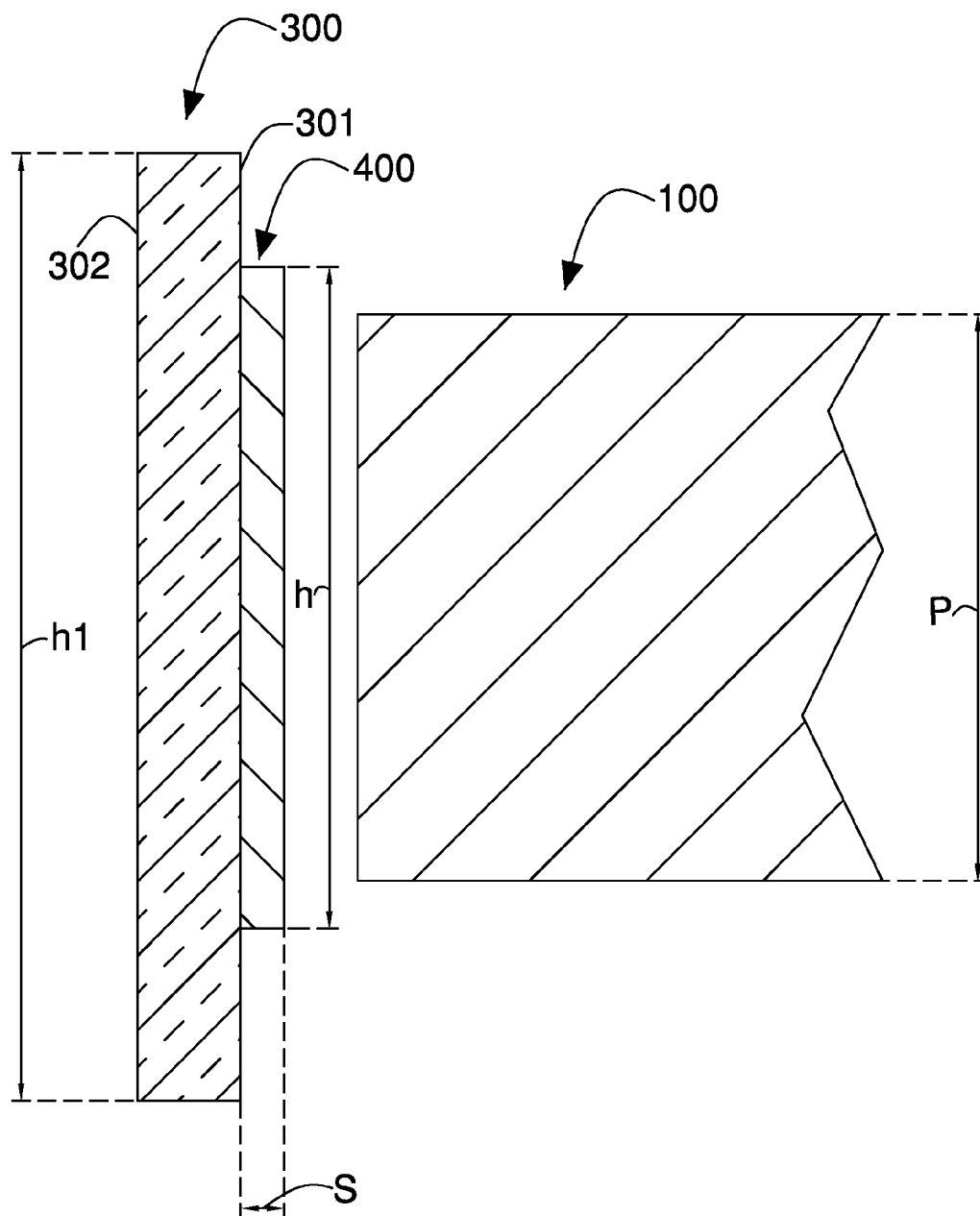


Fig. 5



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Place of search The Hague		Date of completion of the search 15 March 2011	Examiner Huggins, Jonathan	
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>				

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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