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**Berendezés és eljárás rostok enyvezésére**

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## DEVICE AND METHOD FOR GLUING FIBRES

### DESCRIPTION

The invention relates to a device for gluing fibres or similar particles, particularly for the production of wooden composite boards, e.g. fibreboards, having a blow line, by means of which the fibres to be glued are transported, a plurality of nozzles opening into the blow line being connected to the blow line, using which nozzles the fibres that are transported through the blow line can be sprayed with glue, the nozzles being constructed as multi-substance nozzles, e.g. two-substance nozzles for steam atomization and at least one glue supply line and one steam supply line being connected to each nozzle in each case.

In the context of the invention, wooden composite boards in particular means fibreboards, such as e.g. MDF boards or HDF boards or else LDF boards. In principle, however, chipboards and consequently the gluing of chips or similar particles are also included. Gluing means spraying the fibres with a glue or binding agent, such as e.g. isocyanates, melamine urea formaldehyde (resins), urea formaldehyde (resins), melamine resins, phenolic resins or other resins, e.g. based on polyamines or tannins. In the course of the production of wooden composite boards, e.g. fibreboards, a spreading material mat is formed from the glued fibres, which mat is then pressed in a press with the application of pressure and heat to form a wooden composite board or a wooden composite board strand. The press may be a cycle press or a continuously operating press. The gluing of the fibres is particularly important in the context of the production of such wooden composite boards. This is because the properties of the wooden composite board produced, e.g. the transverse tensile strength thereof, depend decisively on the amount of glue used. A considerable glue use is therefore generally necessary in order to produce wooden composite boards with satisfactory transverse tensile strength.

In the context of the invention, the gluing takes place in a blow line. In this technology, the fibres are generally produced from wood chips in a defibrator (refiner) and the fibres are blown out of the refiner into the blow line. There is a relatively high steam pressure in the refiner. At the same time, this steam forms a transport means, using which the fibres are transported through the blow line. The fibres reach a downstream dryer via the blow line. In blow gluing, the spraying of the fibres with glue takes place in the region of the blow line and consequently (directly) downstream of the refiner.

A device for blow gluing is known from e.g. DE 10 2008 059 877 A1 or DE 10 2009 006 704 A1.

It is known in principle that the nozzling of the glue into the blow line has considerable influence on the quality of the gluing. Thus, efforts have been fundamentally made in practice to achieve a nozzling that is as fine as possible, in order to realize relatively small glue droplets. Clumping of the fibres should thereby be prevented and in particular, glue saving should be achieved. For this reason, it has already been suggested not to atomize the glue by means of simple compressed air, but rather using steam. Two-substance nozzles are used for this purpose. Two-substance nozzles of this type are for example known from DE 20 2010 005 280 U1.

EP 2 431 144 A1 describes a method and an apparatus for wet gluing of wood fibres, which have previously been defibrated in a refiner from wood that had been shred to shreds, so that after the wet gluing in a gluing zone, the wood fibres can be dried in a dryer, subsequently scattered in a spreading device to form a fibre cake and pressed in a hot press to form a wooden composite board of the desired thickness. A plurality of gluing nozzles are arranged in the gluing zone.



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Furthermore, one knows a method and a device from US 2008/0271830 A1 for gluing wood fibres using a multiplicity of gluing nozzles, according to the preamble of Claim 1.

In this device, a flow measuring device is integrated into a glue supply, the glue being distributed to the various nozzles by means of a distribution apparatus.

Incidentally, the gluing of flat material, e.g. during the production of multi-layer paper products or the like is described in US 2010/209592, a spray head with a multiplicity of spray nozzles being used. In this case, the flow volumes are controlled taking account of flow measurements. In this case, the spray head extends transversely to the working direction and consequently to the transport direction of the web-shaped material.

Blow line gluing has fundamentally proved itself. However, it is possible to develop it. It has long been a tried and tested method, but the glue use required is relatively high, as before. - This is where the invention comes into play.

The invention is based on the object of creating a device, using which fibres or similar particles can be glued with high quality in an economical manner, so that the glued fibres allow an economical production of wooden composite boards with high quality.

To achieve this object, the invention teaches a device for gluing fibres or similar particles, particularly for producing wooden composite boards, with the features of Claim 1. In this case it is provided that in each case at least one glue valve and one flow measuring device are integrated into each glue supply line and in that the glue valves and the flow measuring device are connected to at least one control and/or regulating device, so that the flow volume for each glue supply line and consequently each nozzle can be controlled or regulated separately using the glue valves.

In this case, the invention proceeds from the fundamentally known discovery that, with the aid of multi-substance nozzles e.g. two-substance nozzles, relatively small glue droplets, which are expedient for economical gluing, can be achieved by means of steam atomization. The invention then allows sensitive adjustment of the spray parameters and therefore sensitive adjustment of the glue droplet size, so that the respectively optimum operating point of the nozzle is set by means of corresponding control or regulation of the flow volumes of the individual valves. In this case, the invention furthermore proceeds from the discovery that it is not necessarily the minimum droplet size which leads to the best results, rather that there is an "optimum" droplet size which may depend on a wide range of properties and parameters. In the context of the invention, sensitive adjustment of the gluing parameters then leads to the achievement of optimum results. To this end, it is possible to dynamically influence the gluing process and to react to the remaining process parameters.

Thus, it is included in the scope of the invention that the glue supply to one or more nozzles can be blocked using the glue valves and that a desired flow volume, e.g. an essentially identical or else different flow volume, can be set in a targeted fashion using the (remaining) glue valves for the remaining nozzles in each case. In this case, the invention proceeds from the discovery that the refiner and the blow line generally do not operate constantly, rather that the material is transported through the blow line in a different quantity with a different pressure in terms of time. According to the invention, the option exists to realize the total quantity of glue to be used per unit time by "switching off" individual or a plurality of nozzles. At the same time, an optimum control

or regulation of the remaining nozzles succeeds, as with the aid of the flow measuring devices and the glue valves, optimum conditions can then be set for the remaining nozzles, so that it is always possible – independently of the number of active nozzles – that the remaining nozzles operate with a certain flow volume. Thus, it may be expedient that all (active) nozzles are operated with essentially the same flow volume. Likewise however, it may also be expedient to set a different glue distribution by means of the nozzles. Thus, the spray quantity can for example increase or decrease along the transport direction of the fibres. The ability to regulate the individual nozzles allows a variable adaptation to conditions and a dynamic optimization of the process.

In this case, preferably at least six, preferably at least ten nozzles are connected to the blow line, which nozzles are distributed along the blow line and/or over the circumference of the blow line. In principle, it may be expedient in the context of the invention to operate with very many nozzles, as the number of active nozzles can be chosen freely and as it is ensured in particular that an identical spray quantity can be set for all nozzles.

The glue supply lines are preferably connected to a common glue distributor, which is loaded with glue, wherein the glue distributor is preferably provided with at least one temperature measuring device, one pressure measuring device and/or one viscosity measuring device.

Steam valves can also be integrated into the steam supply lines. In this case, it is not however necessary that these individual steam supply lines – like the glue supply lines – are provided with regulatable valves, rather in connection with the steam supply, it is generally sufficient to use simple controllable steam valves, which either release or block the steam supply line. Nonetheless, it is also expedient on the "steam side", to influence the gluing process by means of suitable control or regulation. To this end, the steam supply lines are connected to a common steam distributor, which is loaded with steam, wherein the steam supply to the steam distributor is controllable or regulatable, e.g. is regulatable in terms of the flow volume or the pressure. To this end, the steam distributor is preferably connected to a temperature measuring device, a pressure measuring device and/or a flow measuring device. Whilst it is expedient in the case of the glue supply lines to assign a dedicated flow measuring device to each individual glue supply line, it is sufficient in the case of steam supply in the context of the invention to make a flow measuring device superordinate to the steam distributor as a whole. Nonetheless, the steam quantity and/or the pressure can be regulated – as a function of the number of active nozzles – so that the glue atomization can be optimized.

According to a further suggestion of the invention, which is particularly important, the control/regulating device of the gluing device is integrated into a superordinate process computer, which controls the system for producing wooden composite boards, into which system the gluing device is integrated. The measuring devices and/or valves, e.g. glue valves, steam valves or the like, are consequently particularly preferably connected to the superordinate process computer, which controls the entire process in the sense of a superordinate control technology. This superordinate process computer consequently captures not only the parameters of the gluing device, but also the remaining parameters of the pressing plant, particularly the parameters of the spreading-material plant for scattering the pressed-product mat and the parameters of the press itself, using which the spreading-material mats can be pressed with the application of pressure and heat to form wooden composite boards, e.g. fibreboards.

Experiments have shown that using the device according to the invention, solid resin use can be reduced considerably for a predetermined transverse tensile strength, which is to be achieved, of the board to be produced. The invention makes it possible to adapt the parameters of the gluing device sensitively as a function of the remaining process parameters and in this manner to achieve optimum gluing results. The cost effectiveness of fibreboard production is thereby increased to a substantial degree.

In a further preferred embodiment, the invention suggests that water supply lines are connected to the glue supply lines, e.g. via multi-way valves, using which water can optionally be supplied to the nozzles for the purpose of cleaning or rinsing. In this case, the invention proceeds from the discovery that it is expedient to vary the number of nozzles to be used as a function of the process parameters. In order to prevent an inactive nozzle from clogging with glue, the described water supply is provided. As soon as the control switches off the gluing via a nozzle by closing the glue valve, water is automatically supplied via the supply lines, as the water supply lines preferably open into the glue supply lines downstream of the regulating valves, wherein the flow of the water can be measured using the same flow measuring devices which are integrated into the glue supply lines. The water consequently runs through the glue supply line and the nozzle for a predetermined time. The control takes place automatically, preferably likewise by means of the superordinate process computer.

The subject of the invention is also a method for gluing fibres or similar particles using a device of the described type. This method is characterized in that the flow volume of the glue to the individual nozzles is controlled or regulated separately for each nozzle using the glue valves. To this end, if required, the glue supply to one or more nozzles can be interrupted using the glue valves, wherein the flow volume to the remaining nozzles is controlled or regulated using the glue valves. The glue valves, steam valves, water valves, etc. are in this case preferably controlled by a superordinate process computer. The gluing device or the components thereof are consequently controlled or regulated by a superordinate process computer, which also controls or regulates the blow line and a downstream spreading device and a downstream pressing plant. In this case, the invention suggests that the number of active nozzles/glue supply lines, the flow volume of the glue in the individual lines and/or the flow volume of the steam (as a whole) is controlled or regulated depending on the operation of the blow line, e.g. depending on the fibre throughput and/or pressure in the blow line.

Furthermore, it may be expedient to control or to regulate the flow volume of the glue as a function of the viscosity of the glue. To this end, it is expedient to provide a viscosity measuring device e.g. in the region of the glue distributor. As the glue in the context of the plant can be composed of various components with different viscosity, it may likewise be expedient to adapt the viscosity of the glue as a function of the remaining process parameters, so that a dynamic adaptation of the glue properties is possible. In this case, it may furthermore be expedient to set or to regulate the glue pressure as a function of the remaining parameters. To this end, a pressure measuring device is provided e.g. in the region of the glue distributor. Alternatively or additionally, the possibility also exists also to control or to regulate the steam quantity as a function of the viscosity.

In the context of the invention, conventional two-substance nozzles or else multi-substance nozzles can be used, e.g. nozzles as are described in DE 20 2010 005 280 U1.

In the following, the invention is explained in more detail on the basis of a drawing which represents only one exemplary embodiment. In the figures

- Fig. 1a shows a gluing device in a simplified schematic illustration,  
Fig. 1b shows the device according to Fig. 1 in further simplification with only one nozzle illustrated,  
Fig. 2 shows a section from a gluing device in a side view,  
Fig. 3 shows a section from the subject according to Fig. 2 in two different views, and  
Fig. 4 shows a different section from the subject according to Fig. 2 in two different views.

A device is illustrated in the figures for gluing fibres or similar particles for the production of wooden composite boards, e.g. fibreboards. A gluing device of this type is consequently integrated in a plant for producing wooden composite boards.

The fibres are produced in a manner known per se from e.g. wood chips in a defibrator or refiner 1. From the refiner 1, the fibres are blown with the high steam pressure prevailing in the refiner via a fibre supply line 2 into a blow line 3. This blow line has a relatively small diameter of e.g. 50 mm to 200 mm, preferably 80 mm to 120 mm. The blow line 3 can be provided at the input side and output side with one or more pressure sensors, which are not illustrated. A multiplicity of nozzles 4 are connected to the blow line 3, using which nozzles the fibres transported through the blow line can be sprayed with glue. In the exemplary embodiment, these nozzles 4 are constructed as two-substance nozzles for steam atomization. To this end, a glue supply line 5 is connected to each nozzle on one side and a steam supply line 6 is connected to each nozzle on the other side. Ten nozzles 4 are provided in the exemplary embodiment (cf. Fig. 1a). For reasons of clarity, Fig. 1b only shows the schema for one nozzle.

In the glue supply lines 5, glue valves 7 are integrated on one side and flow measuring devices 8 are integrated on the other side, specifically one glue valve 7 and one flow measuring device 8 in each case in each glue supply line 5. The glue supply lines 5 are then connected to a common glue distributor 9 in turn with interposition of the glue valves 7. The glue valves 7 can be regulated individually whilst taking account of the flow volumes, so that the flow volume for each glue supply line 5 can be controlled or regulated separately with the aid of the glue valves. In addition to the glue valves 7, shut-off valves 10 are integrated into each glue supply line 5, which are used e.g. when replacing components. In the exemplary embodiment, the glue distributor is provided with a temperature measuring device 11 and a pressure measuring device 12 and, if appropriate, a viscosity measuring device 32. The glue reaches the glue distributor 9 on both sides from glue preparation 13, which is merely indicated, via a glue feed 14.

Steam valves 15 are integrated into the steam supply lines 6, specifically preferably one steam valve 15 in each case into each steam supply line 6. Using this steam valve, the individual steam supply lines 15 can be opened or blocked automatically. Individual regulation is not provided here. In addition, shut-off valves 16 are also provided here for maintenance purposes. The steam supply lines 6 are connected to a common steam distributor 17. This steam distributor 17 is connected to a temperature measuring device 18 and/or a pressure measuring device 19. One or more of these measuring devices can form a control loop 21 together with a steam supply valve 20 connected upstream of the steam distributor, so that the flow volume or the pressure can be regulated. To this end, a flow measuring device 22 is superordinate to the steam distributor. The steam feed 23 is indicated.

Furthermore, it can be seen in Fig. 1 that one water supply line 24 opens into the individual glue supply lines 5 in each case, wherein the water supply lines are connected to a common water distributor 25. Controllable or regulatable valves 26 and likewise shut-off valves 27 are integrated into the water supply lines 24.

The components indicated schematically in Figs 1a and 1b are to be found to some extent again in Figs 2, 3 and 4.

Fig. 2 particularly shows the blow line with the indicated supply of the wood fibres. In addition, the nozzles connected to the blow line can be seen, ten nozzles in the exemplary embodiment, which are placed onto the blow line one behind the other in a V-shaped manner, as it were. The glue distributor, steam distributor and water distributor can likewise be seen in Fig. 1.

Fig. 3 particularly shows the glue distribution in two different views.

Fig. 4 particularly shows the water distribution in two different views.

The illustrated gluing device is integrated in a superordinate process computer 31. This means that the control or regulation of the gluing device takes place using a superordinate process computer, which also controls the remaining components of the fibreboard plant, e.g. the blow line, the spreading device and the press device. This computer 31 is merely indicated in Fig. 1b.

Thus, the gluing process can be adapted to the remaining process parameters dynamically. Thus, the gluing can be adapted sensitively to the operation of the refiner or the blow line. The possibility exists for example to deactivate individual glue supply lines and therefore also glue nozzles to vary the gluing quantity as a whole, so that the spraying then takes place using individual nozzles. By means of the described flow measuring devices and regulating valves 7 of the gluing apparatus e.g. an essentially identical flow volume or else a different flow volume distribution can be set for the remaining, active nozzles. The gluing process can consequently initially be influenced by sensitive influencing of the flow volume per nozzle by means of the regulating valves 7. In addition, the possibility exists to influence the gluing process dynamically by adjusting the viscosity of the glue. Also, the glue pressure can be changed and in particular analysed. In this case, the differential pressure to the blow line is generally decisive. Finally, a sensitive setting can also take place by means of the steam control or regulation. Here, it is satisfactory if the individual steam supply lines 6 are opened or closed by means of the steam valves 15 as a function of the number of active glue nozzles. Individual regulation of the steam supply lines 6 is not required. However, the regulation of the steam supply as a whole by means of the illustrated control loop 21 is expedient.

By regulating the gluing plant and in particular integrating the regulation into the superordinate process computer 31, the gluing can be optimized considerably, so that fibreboards with the required transverse tensile strength can be produced with considerably reduced glue use in a plant of this type.

The plant is also maintenance-friendly, e.g. due to the provided option of water rinsing. The water rinsing starts automatically for individual nozzles 4 in operating pauses of individual nozzles. This is also ensured by the control, e.g. the superordinate control. In this manner, the possibility exists to carry out the gluing in a variable manner using a different number of nozzles, without there being the risk that the intermediately deactivated nozzles are clogged with glue.

The compressed-air supply for the nozzles or valves is otherwise illustrated in the figures. In addition, a compressed-air distributor 28 is provided, which operates via compressed-air lines 29 on the nozzle needles of the nozzles, which are not illustrated, in order to open and to close the same. Otherwise, the individual valve controls can also be connected to the compressed-air distributor 28.

Furthermore, a further supply line 30 for a hardener is also indicated in Fig. 1.

Overall, in the context of the invention, the wood fibres are blown through the blowing pipe 3 and sprayed with operating materials, e.g. glue, by means of nozzles 4 supported by steam. The nozzles 4 are loaded with glue or water, depending on the process conditions. The supply of glue or water is regulated by valves. The water is used for rinsing the nozzles. Water, steam and glue are supplied to the nozzles via distributors. The hardener is supplied to the last nozzle of the blowing pipe directly via the hardener supply line 30.

In Fig. 3, it is again indicated that the glue is supplied to the individual nozzles via the distributor pipe. The hardener is supplied via a separate connection of the last nozzle. The connection is fastened on the distributor pipe of the glue distribution. The valves regulate the inflow, as explained. The flow meter reports the flow rate to the control. The indicated non-return valve prevents backflow. Shut-off valves are used for replacing components.

Further details can be drawn in a similar manner from Fig. 4, which relates to the water distributor in particular. The water is used for rinsing and is supplied to the individual nozzles via the distributor pipe. All nozzles are rinsed automatically in the case of product interruptions. Only nozzles that are switched off are rinsed during production. Here also, valves regulate the flow. The flow meter reports the flow rate to the control. The non-return valve also prevents backflow here. Shut-off valves are used for replacing components.

#### Berendezés és eljárás rostok enyvezésére



#### Szabadalmi igénypontok

1. Berendezés rostok vagy hasonló részecskék enyvezésére, főként faanyagú lapok, például farostlemezek előállításához,

egy fűvóvezetékkel (3), amelyen keresztül az enyvezendő rostok vannak továbbítva, ahol a fűvóvezetékhez több, a fűvóvezetékbe torkolló fűvóka (4) van csatlakoztatva, amelyekkel a fűvóvezetéken keresztül továbbított rostok enyvvel beszórhatók,

ahol a fűvókák (4) többanyagú fűvókákként, például kétanyagú fűvókákként vannak gőzporlasztáshoz kialakítva és mindegyik fűvókához (4) egyaránt legalább egy enyvbevezető vezeték (5) és egy gőzbevezető vezeték (6) van csatlakoztatva,

*azzal jellemezve,*

hogy mindegyik enyvbevezető vezetékbe (5) egyaránt legalább egy enyvszelep (7) és egy átfolyásmérő (8) van integrálva és hogy az enyvszelepek (7) és az átfolyásmérők (8) legalább egy vezérlő- és/vagy

szabályozóegységgel vannak összekötve, így az enyvszelepekkel (7) az átfolyási mennyiség mindegyik fűvóka (4) számára külön vezérelhető vagy szabályozható.

2. Az 1. igénypont szerinti berendezés, *azzal jellemezve*, hogy az enyvszelepekkel (7) az enyvbevezetés egy vagy több fűvóka felé lezárható és hogy az enyvszelepekkel (7) a többi fűvóka (4) számára egy-egy megadott átfolyási mennyiség, például egy lényegében azonos átfolyási mennyiség beállítható.

3. Az 1. vagy 2. igénypont szerinti berendezés, *azzal jellemezve*, hogy a fűvóvezetékhez (3) legalább hat, előnyösen legalább tíz fűvóka van csatlakoztatva, amelyek a fűvóvezeték mentén és/vagy a fűvóvezeték kerületén vannak elosztva.

4. Az 1-3. igénypontok bármelyike szerinti berendezés, *azzal jellemezve*, hogy az enyvbevezető vezeték (5) egy közös enyvelosztóhoz (9) vannak csatlakoztatva, amely enyvvel van ellátva, ahol az enyvelosztó (9) előnyösen egy hőmérsékletmérő készülékkel (11), egy nyomásmérő készülékkel (12) és/vagy egy viszkozitásmérő készülékkel van ellátva.

5. Az 1-4. igénypontok bármelyike szerinti berendezés, *azzal jellemezve*, hogy a gőzbevezető vezetékbe (6) (vezérelhető) gőzszelepek (15) vannak integrálva.

6. Az 5. igénypont szerinti berendezés, *azzal jellemezve*, hogy a gőzbevezető vezeték (6) egy közös gőzelosztóhoz (17) vannak csatlakoztatva, amely gőzzel van ellátva, ahol a gőzbevezetés a gőzelosztóhoz (17) vezérelhető vagy szabályozható, például az átáramlási mennyiség vagy a nyomás tekintetében szabályozható, ahol a gőzelosztó (17) előnyösen egy hőmérsékletmérő egységgel (18) és/vagy egy nyomásmérő készülékkel (19) és/vagy egy átáramlásmérő készülékkel (22) van ellátva.

7. Az 1-6. igénypontok bármelyike szerinti berendezés, *azzal jellemezve*, hogy az enyvező berendezés vezérlő-és/vagy szabályozóegysége egy fölérendelt folyamatirányító számítógépbe (31) van integrálva, amely egy faanyagú lapok előállítására szolgáló berendezést vezérel, amelybe az enyvező berendezés integrálva van.

8. A 7. igénypont szerinti berendezés, *azzal jellemezve*, hogy a mérőkészülékek (11, 12, 18, 19, 20) és/vagy a szelepek, például az enyvszelepek, gőzszelepek, stb., a fölérendelt folyamatirányító számítógéppel (31) vannak összekötve.

9. Az 1-8. igénypontok bármelyike szerinti berendezés, *azzal jellemezve*, hogy az enyvbevezető vezetékhez (5), például egy többutas szelepen keresztül, vízbevezető vezeték (24) vannak csatlakoztatva, amelyekkel a fűvókákhoz (4) tisztítás céljából opcionálisan víz vezethető hozzá.

10. Eljárás rostok vagy hasonló részecskék enyvezésére, főként faanyagú lapok, például farostlemezek előállítására egy az 1-9. igénypontok bármelyike szerinti berendezéssel, *azzal jellemezve*, hogy az enyv átáramlási mennyiségét az egyes fűvókákhoz az enyvszelepekkel mindegyik fűvóka számára külön vezéreljük vagy szabályozzuk.

11. A 10. igénypont szerinti eljárás, *azzal jellemezve*, hogy az enyvszelepeket, gőzszelepeket, vízszelepeket, stb. egy fölérendelt folyamatirányító számítógéppel vezéreljük vagy szabályozzuk.

12. A 10. vagy 11. igénypont szerinti eljárás, *azzal jellemezve*, hogy az enyvező berendezést, illetve annak összetevőit egy fölérendelt folyamatirányító számítógéppel vezéreljük vagy szabályozzuk, amely vezérli vagy

szabályozza a fűvóvezetékét és/vagy egy utánkapcsolt szóróberendezést és/vagy egy utánkapcsolt préselő berendezést is.

13. A 10-12. igénypontok bármelyike szerinti eljárás, *azzal jellemezve*, hogy az aktív fűvókák/enyvbevezető vezetékek számát és/vagy az enyv átfolyási mennyiségét és/vagy a gőz átáramlási mennyiségét a fűvóvezeték üzemelésétől függően, például a rostátáramlási sebesség és/vagy a fűvóvezetékben uralkodó nyomás függvényében vezéreljük vagy szabályozzuk.

14. A 10-13. igénypontok bármelyike szerinti eljárás, *azzal jellemezve*, hogy az enyv átáramlási mennyiségét és/vagy a gőzmennyiséget az enyv viszkozitásának függvényében vezéreljük vagy szabályozzuk.

15. A 10-14. igénypontok bármelyike szerinti eljárás, *azzal jellemezve*, hogy az enyv viszkozitását a többi folyamatparaméter függvényében igazítjuk a folyamathoz.

16. A 10-15. igénypontok bármelyike szerinti eljárás, *azzal jellemezve*, hogy az enyvnyomást a többi folyamatparaméter függvényében állítjuk be.

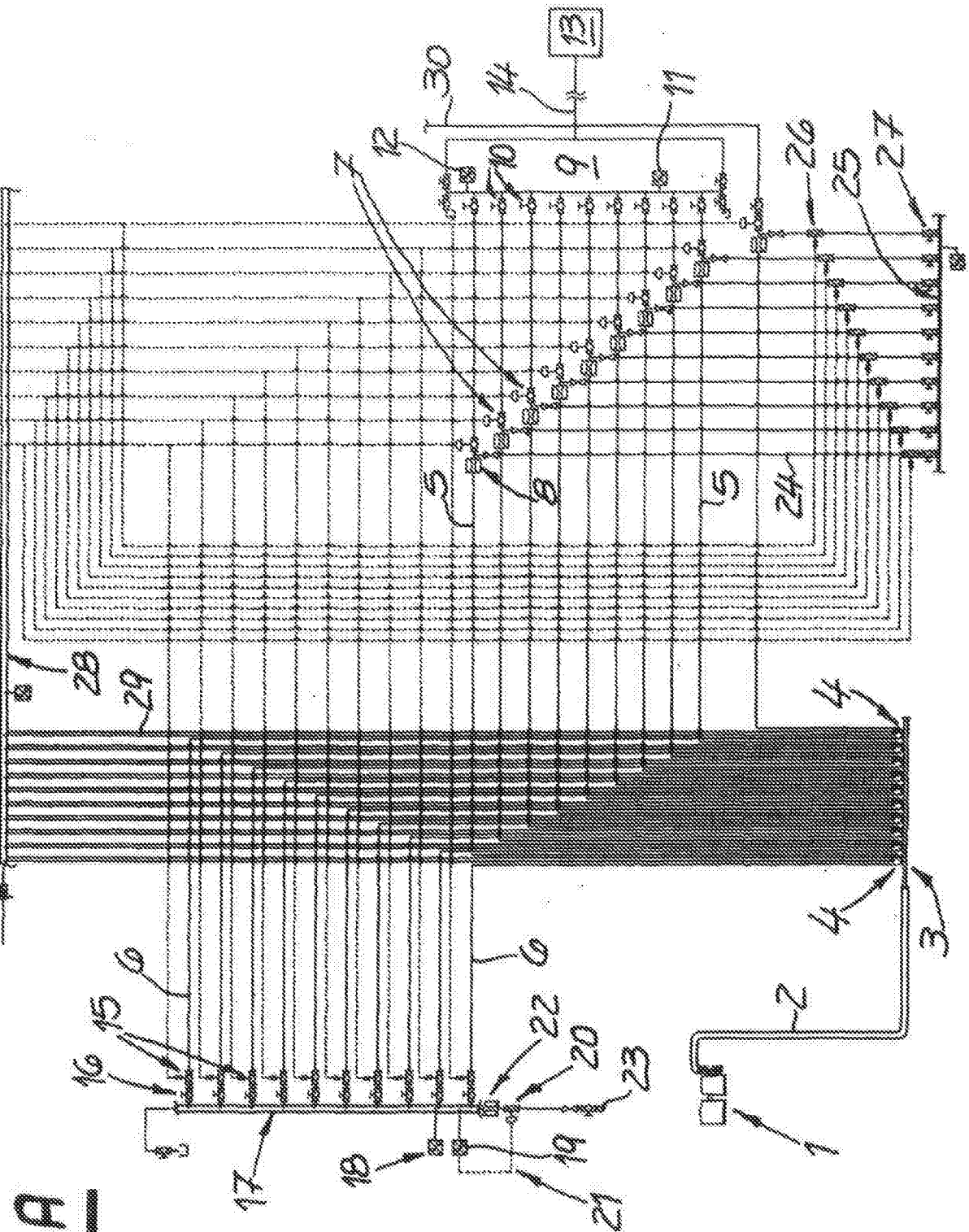
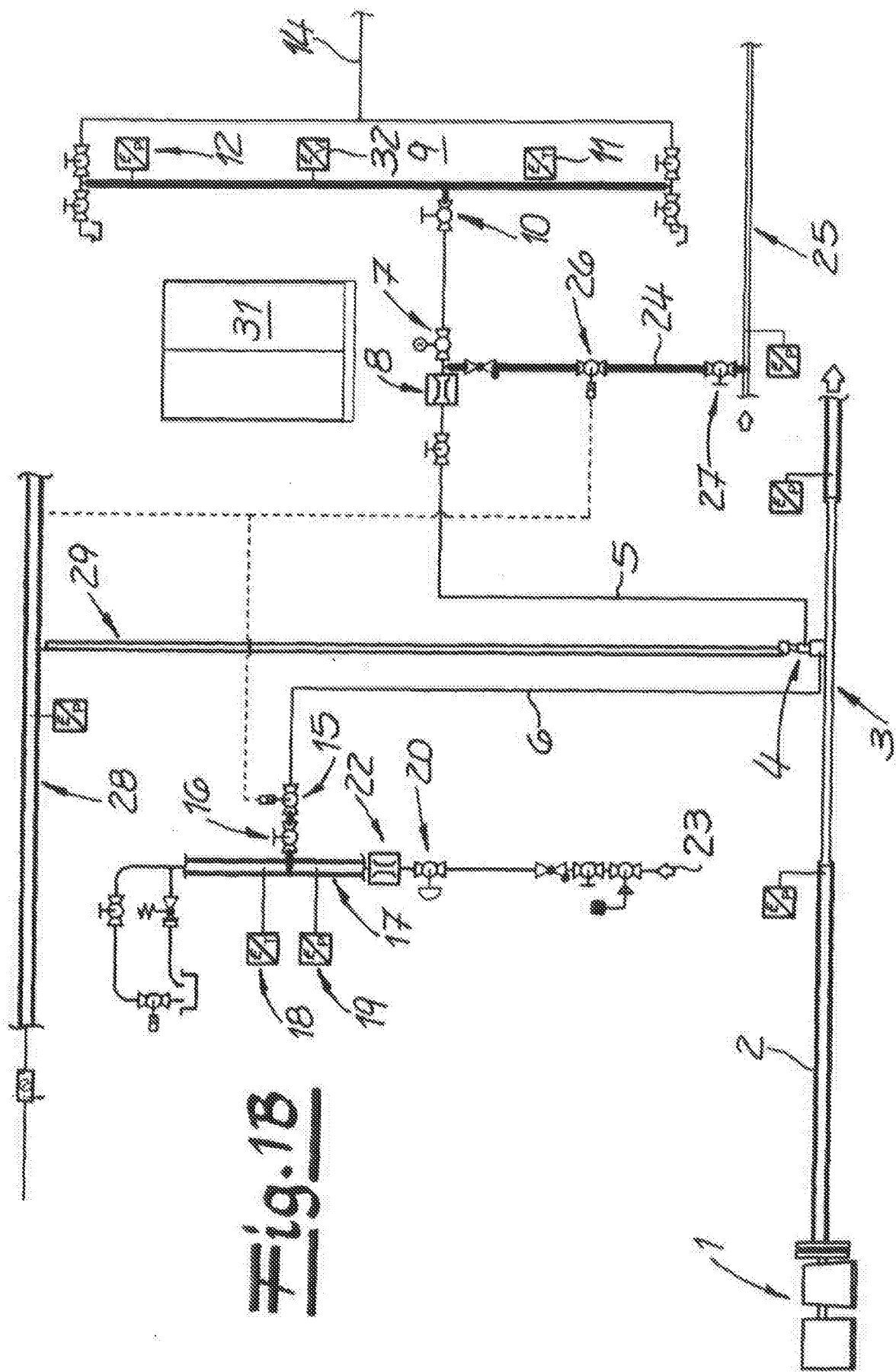


Fig. 1A

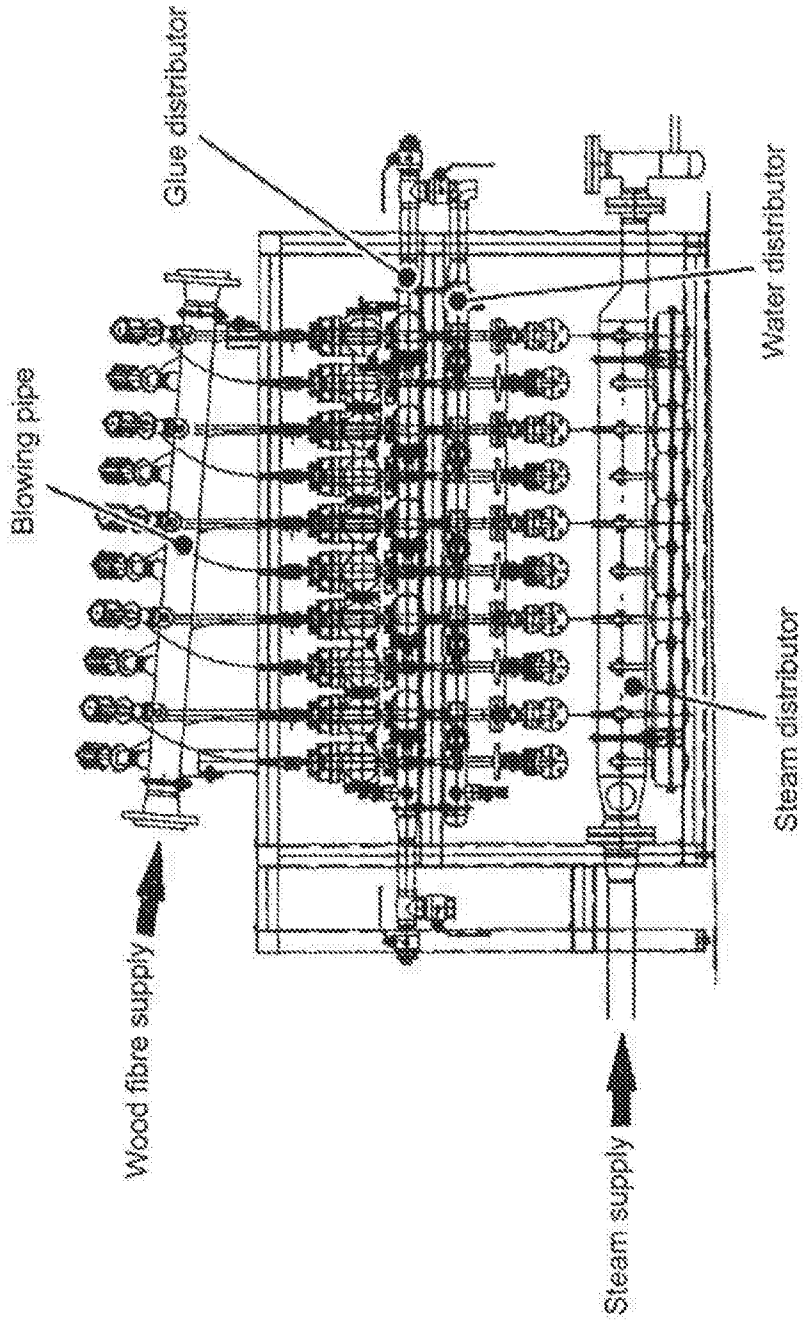


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**Fig. 18**

Fig. 2



**Fig.3**

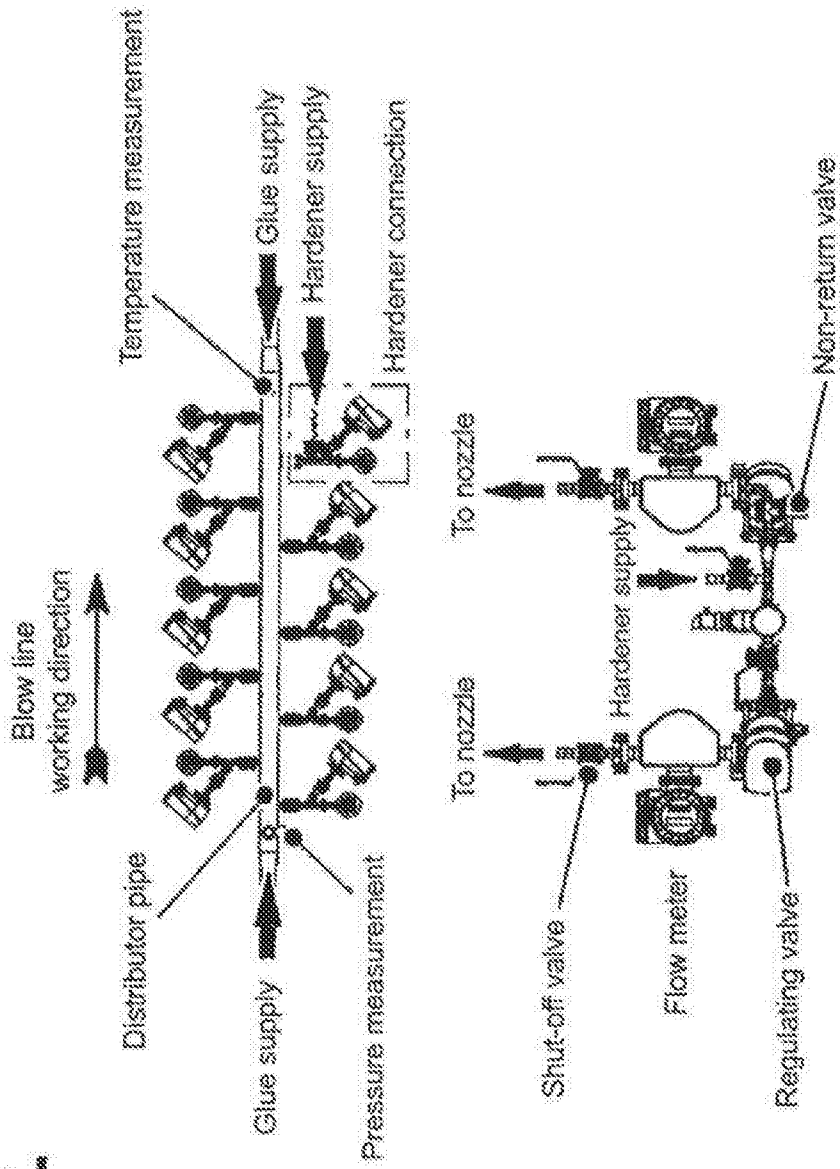


Fig.4

