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(54) Device for wood treatment

(57) A device for wood treatment, in particular for the treatment of components of solid wood or wood by-products (HDF,MDF,etc.) and veneered, for flash period/ drying of cold water paints applied on said components, characterized by the use of electromagnetic radiations produced by magnetron (1,2) in the spectrum of 2.450+/-50MHz.

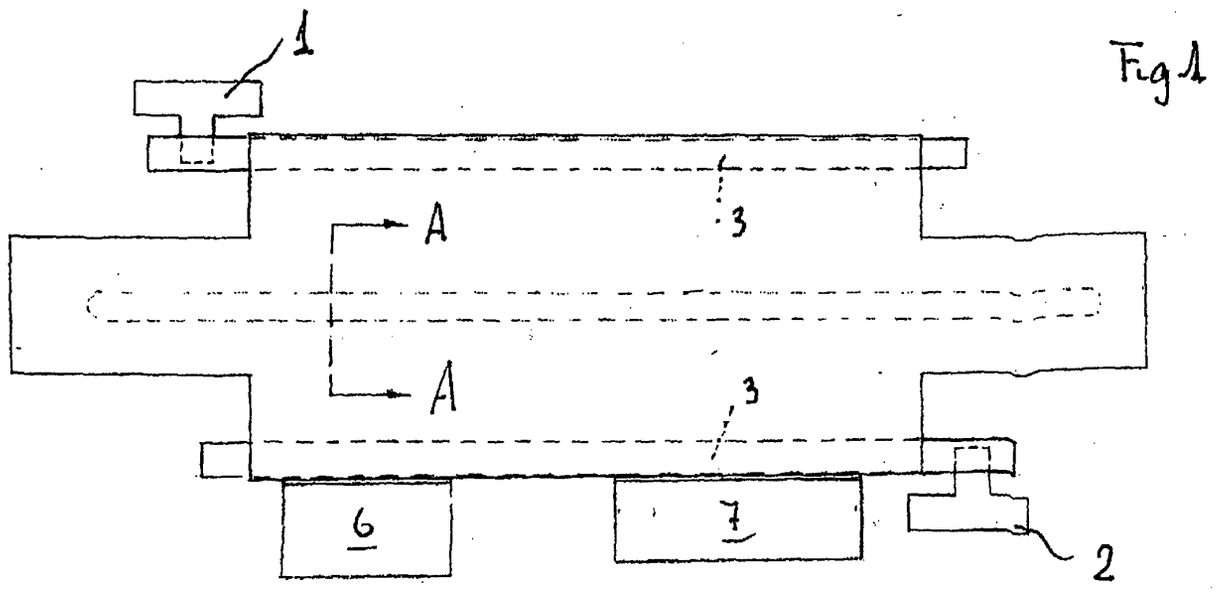

Fig 1

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Description

[0001] The present invention concerns a machine for the working of components on solid wood, fit to be obtained even with its by-products (HDF, MDF, etc.) and veneered, in particular for the flash period/drying of paints applied on these components, which are fit in case to be later assembled, including an environment where these components are placed for the process of the flash period/drying before proceeding to their assembling on furniture, walls and such.

[0002] The wood components destined to be used exactly as they are in the wood industry, or to be assembled on furniture, walls and such, are generally subjected to a painting treatment, articulated in several phases, each of them articulated in one or more passages:

- at first the painting (fit to colour the wood component),
- then the application of the filler paint and
- at last the final coat of the flat paint.

[0003] Till now th paints used on wood components, expected the presence of . chemical solvents, which had the advantage to take short time for . the flash period/drying of the treatment, but polluted both the work and the external environment, because of the fumes and the draining of paint waste.

[0004] To reduce the environmental impact, it was decided to turn to the use of cold-water paints instead of paints with chemical solvents; the first ones do not pollute and are more easily used than the second ones , but present the disadvantage to request a considerably longer time than the paints with chemical solvents for the flash period/drying and therefore a decidedly higher cost to complete the painting process.

[0005] At the moment, for the flash period/drying of wood components treated with cold-water paints, there are furnaces consisting of tunnels, where these components are treated to achieve the flash period/drying of the paint, obtained with hot air currents or with exposure to infrared lamps or U.V. in an environment with controlled humidity.

[0006] The disadvantage of this process is caused by the installation and running expenses of these furnaces, but most of all by the dimensions of the plant and by the time necessary for the treatment.

[0007] The problem the machine wants to solve, according to the invention, is to speed up substantially the time necessary for the flash period/drying of cold-water paints on wood components, to reduce consequently the installation and the working costs of these components and, as far as possible, to simplify the flash period/drying process.

[0008] According to the invention, this problem is solved by the machine, characterized by the use of electromagnetic radiations in the spectrum of 2.450 +/- 50 MHz for the flash period/drying of paint on these wood components, to obtain in this way:

- a substantial reduction of the time employed for the flash period/drying of these paints on these components,
- a substantial reduction of the plant expenses, even because of the small dimensions and because of the substantial elimination of the insulating material;
- a substantially reliable result;
- times are reduced to about a fiftieth of the ones requested from the normal processes of flash period/drying of the treatment on components treated with cold-water paints and, consequently, reduced expenses of working for such process;
- the elimination of additional sources of energy, necessary to air-condition the environment of the flash period/drying of components treated with cold-water paints and,
- finally, in case of wood components are treated with paints base on chemical solvents, a substantial elimination of pollution elements for fumes and industrial waste,
- while, in case of wood components treated with cold-water paints, the flash period/drying of the paint (obtained in tunnels with hot air currents, or with exposure to infrared or U.V. lamps in an environment with controlled humidity) is achieved with plants whose installation and running expenses, as well as the plant sizes and the time necessary for the treatment are substantially reduced.

[0009] These and other characteristics will be clear from the following description and the enclosed drawings where:

Pic. 1 shows a plan view of the machine according to the invention;
Pic.2 shows a lateral view of the same machine;
Pic.3 shows a sectional view according to the lines A-A of Pic. 1;
Pic.4 shows a waveguide of the same machine;
Pic.5 shows a first alternative solution of the waveguide of the machine according to the invention;
Pic.6 shows a second alternative solution of waveguide while
Pic.7 shows a third alternative solution of waveguide of the machine according to the invention.

DESCRIPTION

[0010] According to the invention the machine includes a device for the electromagnetic radiations emission, made up of two instruments 1,2. (Pic. 1,2).

[0011] Such instruments are made up of two magnetrons, the magnetron 1 is positioned below magnetron 2, in that way both of them can cover . all the develop-

ment in height of the painted wood elements to wither/dry.

[0012] It is necessary to underline that, even in the presence of wood components with a substantial longitudinal development, the experience shows that only one magnetron can be sufficient to distribute homogeneously the energy on the components to treat.

[0013] The emission device comprises two waveguides too 3,4 (Pic 2), which are placed inside the machine (Pic. 2) provided with a lot of flans 5, so that they can have the effect to give out homogeneously the energy on the elements deriving from the radiant tubes.

[0014] As it will be possible to see further on, such radiation issued from devices 1,2 are suited to have a spectrum included in a range of 2450 +/-50 MHz., in such a way the wood components introduced in the machine are exposed to an electromagnetic field of multimodal type.

[0015] The described machine is suited to carry out a flash period/drying process on wood elements (Pic 3) having a size included in a range from (10-25) cm., while for the treatment of wood elements of larger sizes (for example boards of various surfaces and thickness), a different machine is expected, provided with an adequate scaling in Kw/mq of the magnetron power and a consequent belt conveyor instead of a chain conveyor.

[0016] To get to this scaling, every time there are tests on a prototype provided with sufficient flexibility to set in this way the optimum Kw/mq of power on surface, necessary to treat the wood elements 5.

[0017] According to the invention the machine includes two electrical gear cases 6,7,: the first 6 (Pic. 1) is suited to power the magnetrons 1,2, while the second 7 is suited to power the electrical users for the machine working (motors for the elements dragging, pumps for the water circulation for shielding and cooling, etc.).

[0018] As everybody knows, the magnetron is placed at one end at of the waveguide, while the other end is closed by a cap, not shown in the drawings. The development of the waveguide, the distance of the magnetron from the cap, as well as the number and the development of the flaws F, are all elements which are determined during the planning of the machine, taking in consideration the performance requested to the machine, even with the purpose to optimize the homogeneity of the electromagnetic flux coming from the flows F. Pic.3 shows a section of the machine according to the invention, where it is schematically pointed out the device of the translation and rotation of the wood element to treat.

[0019] The support and translation device of the elements 5 includes: an environment 9, a chain 10, a gear wheel 11, attached to a rack 12, to transmit to a support 13 of the element 5 a translation and a rotation movement, allowing to the same element to be subjected, in every point to the same strength of electromagnetic waves.

[0020] The support 13 is linked to a bearing 16, linked fixedly to the gear wheel 11.

[0021] The last one is attached to the rack 12 fixed to a wall 17.

[0022] A particular configuration of the machine according to the invention is the so-called "open doors" (Pic.5,6), where the machine planimetry according to the invention can take on respectively a U (Pic.5) or a Ω

[0023] (Pic.6) configuration. In Pic.5 the waveguides and then the resonance cavities are placed in an internal straight section 18 of the machine, preceded and followed by attenuation sections 19 including radio absorbent panels 20, distributed around the resonance cavities, offering the advantage to attenuate progressively the electromagnetic field in the central section of the machine and uniting contemporaneously the advantage to contain the longitudinal dimensions of the machine.

[0024] In Pic. 6 the waveguides and then the resonance cavities are positioned in an internal straight section 18 of the machine, preceded and followed by attenuation segments 21,22, even here provided with radio absorbent panels 23. It is also possible to think (Pic. 7) to a route there A and back R in the same furnace, with separated chains of dragging.

[0025] Inside the machine, according to the invention, there are some PVC tubes (Pic.3) for water circulation of shielding and cooling.

[0026] The dislocation of such tubes concerns particularly critical points for the protection against electromagnet radiation.

[0027] Concerning the machine layout, this can be conceived in a series of modules, in series one compared to the other, each one substantially analogous to the module represented in Pic. 1.

[0028] For example, a first module can concern the flash period/drying treatment after the painting (first painting phase). This first module can be eliminated, given the reduced thickness of such painting and the quickness of the respective flash period/drying process.

[0029] A second module can be conceived for the flash period/drying treatment of priming (second painting phase).

[0030] At the exit of such module, it can be a sanding process and the application of the final coat of flat paint and then the entrance in a third module for the final flash period/drying treatment. Between one module and the other, there is the presence of machinery necessary to set going the various painting phases.

[0031] From what already described, the advantages of the machine come out even in the plurality of versions that make it suitable for different work conditions (dimensions of the wood elements to treat, processes articulations, adaptation of different configurations of the waveguides, etc.).

[0032] Such advantages can be summarized in this way:

- a substantial reduction of the time employed for the flash period/drying of these paints on such components,

- a substantial reduction of the plant cost, even because of its reduced dimensions and of the substantial elimination of the insulating material;
- a substantially reliable result;
- really reduced times to about a fiftieth in comparison to the requested times for the normal flash period/drying processes of the treatment on components treated with cold-water paints and, consequently, reduced costs of working for such process;
- the elimination of additional power sources necessary to air-condition the flash period/drying environment of components treated with cold-water paints,
- in case the wood components are treated with paints made of chemical solvents, there is a substantial elimination of pollution elements for fumes and industrial waste, and at last
- in case of wood components treated with cold-water paints, the flash period/drying of the paint (till now obtained in tunnels with hot air currents, or with exposure to infrared or U.V. lamps in a humidity controlled environment) is now obtained with systems whose installation and running expenses, and also the plant sizes and the requested time for the treatment are substantially reduced.

[0033] It is necessary to underline that the machine, according to the invention, is suitable also to a painting treatment based on the use of powder paints. With such treatment, there is today the use of micro flame or infrared rays systems, for these the duration of the working circle is substantially longer than the expected duration of the machine, according to the invention.

[0034] The advantage to use the machine, according to the invention, instead of micro flame or infrared rays systems, is given from the result of an optimum homogenization and compactness of the powder paint treatment.

Claims

1. Machine for the working of components (5) on solid wood, fit to be obtained even with its by-products (HDF, MDF, etc.) and veneered, in particular for the flash period/drying of paints applied on these components, which are fit in case to be later assembled, including an environment (9) where these components (5) are placed for the process of the flash period/drying before proceeding to their assembling on furniture, walls and such, **characterized by** the use of electromagnetic radiations in the spectrum of 2450 +/-50 MHz for the flash period/drying of paint on these wood components, so that these components are subjected to an electromagnetic field of multimodal type, obtaining:

    - a substantial reduction of the time employed for the flash period/drying of these paints on such components,
    - a substantial reduction of the plant expenses, even because of the small dimensions and because of the substantial eliminations of the insulating material;
    - a substantially reliable result;
    - times are reduced to about a fiftieth of the ones requested from the normal processes of flash period/drying of the treatment on components treated with cold-water paints and, consequently, reduced expenses of working for such process;
    - the elimination of additional sources of energy, necessary to air-condition the environment of the flash period/drying of components treated with cold-water paints,
    - in case wood components are treated with paints based on chemical solvents, a substantial elimination of pollution elements for fumes and industrial waste,
    - finally, in case of wood components treated with cold-water paints, the flash period/drying of the paint (till now obtained in tunnels with hot air currents, or with exposure to infrared or U.V. lamps in an environment with controlled humidity) is achieved with plants whose installation and running expenses, as well as the plant sizes and the time necessary for the treatment are substantially reduced.

2. Machine as in 1, **characterized by** two waveguides (3,4) placed inside the machine and provided a lot of flaws (F), so that they can have the effect to give out homogeneously on the elements to treat, the energy deriving from the radiant tubes.

3. Machine as in 1,2 **characterized** from the treatment of such elements (5) conditioned by the dimensions of the same elements, in the sense that the instruments power (1,2) in Kw/mq of surface power is dimensioned taking in consideration such sizes.

4. Machine as in 2, characterizes from what the development of such waveguides (3,4), the number and the flaws development (F), the distance of the instruments (1,2) from the cap of the waveguides (3,4) all operate for the performances requested by the machine, even for the purpose to optimize the homogeneity of the electromagnetic flux coming out from the flaws (F).

5. Machine as in the precedent claims, **characterized by** a support (9,10,11,12,13,16) of the elements (5) to transmit to such elements a translation and a rotation movement, in order to let the element (5) to be subjected in every point to the same intensity of electromagnetic waves.

6. Machine as in 5, **characterized** from what the support includes: an environment 9, a chain (10) for the elements dragging (5), a gear wheel (11) attached to a rack (12) to transmit to a support (13) of the element (5) a translation and a rotation movement so that the same element is subjected in every point to the same intensity of the electromagnetic waves, and a bearing (16) linked fixedly to the gear wheel (11).

7. Machine as in 1, **characterized** from the so-called "open doors" type of the same machine, where the waveguides (3,4) are suited to take on respectively a "U" or "Ω" configuration in order to undergo a substantially gradual attenuation at the exit of the electromagnetic waves, such "U" configuration is expected so that the waveguides and the resonance cavities are placed in an internal straight section (18) of the machine, preceded and followed by attenuation sections (19) with radio absorbent panels (2), so to progressively attenuate the electromagnetic field in the central part of the machine and in such a way to include substantially the longitudinal dimensions of the machine.

8. Machine as in 7, **characterized** from waveguides and resonance cavities which are placed in a straight section (18) of the machine, preceded and followed by attenuation sections (21,22) provided with radio absorbent panels (23) so to progressively attenuate the electromagnetic field in the central part of the machine and in such a way include substantially the longitudinal dimensions of the machine.

9. Machine as in 1, conceived in a series of modules, in series one compared to the other, a first module concerns the flash period/drying treatment after the painting (first painting phase), this first module can be eliminated, given the reduced thickness of such painting and quickness of the respective flash period/drying process, a second module can be conceived for the flash period/drying treatment of priming (second painting phase), at the exit of this second module there can be a sanding process and the application of the final coat of flat paint and then the entrance in a third module for the application of the final coat of flat paint (third painting phase) for the flash period/drying treatment.

10. Machine as in the precedent claims, characterizes by a plurality of PVC tubes (18) for the water circulation for shielding from electromagnetic guides and of cooling.

11. Machine as in 1, **characterized** from its performance to a painting treatment based on the use of powder paints with a substantial advantage in comparison to micro flame or infrared rays systems, the advantage of a substantially optimum homogenisation and compactness of the result obtained from the treatment of powder paint.

12. Machine as described, shown in the drawings and object of the claims 1-11.

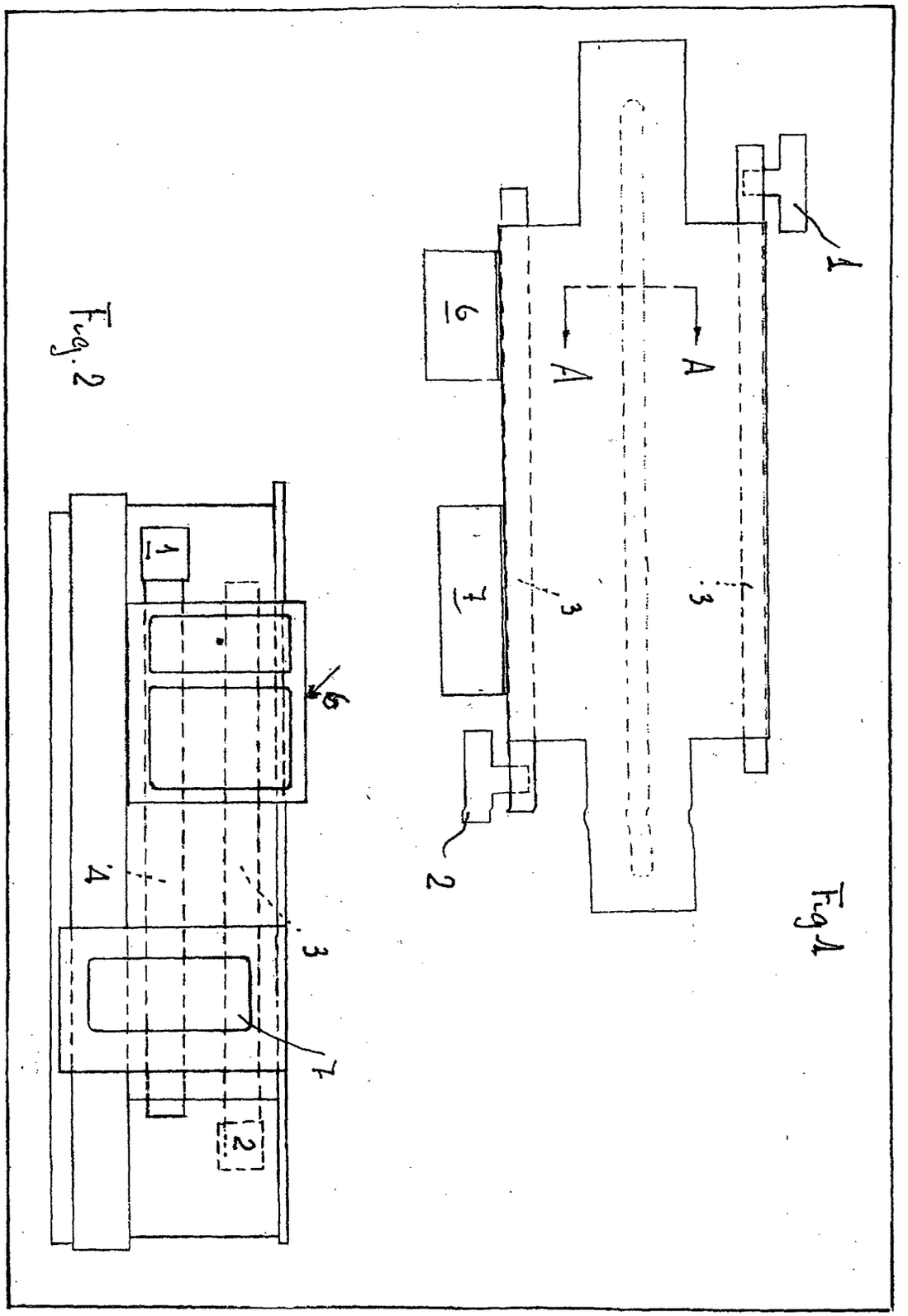

Fig.1

Fig.2

TABLE 1

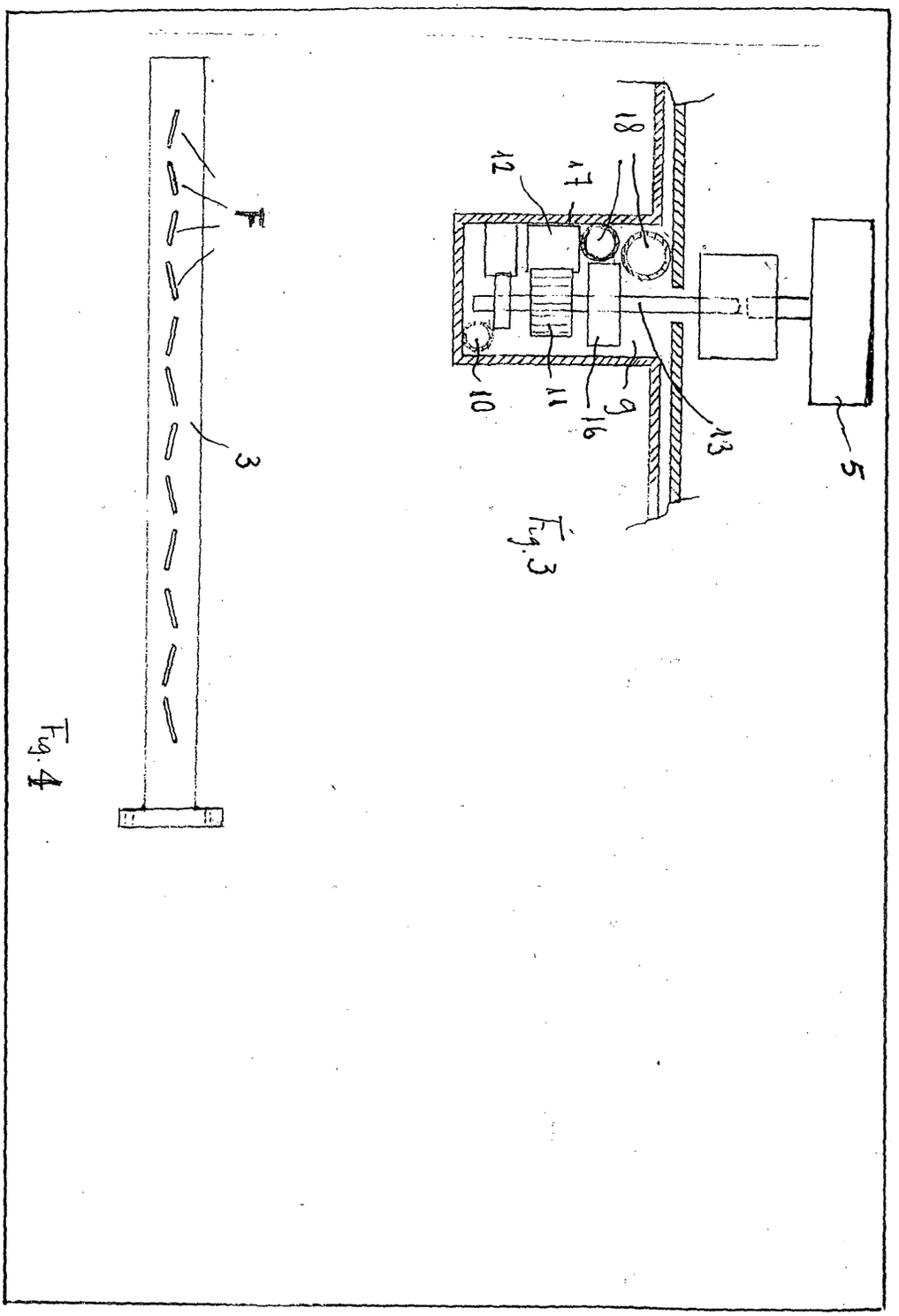

Fig. 3

Fig. 4

TABLE 2

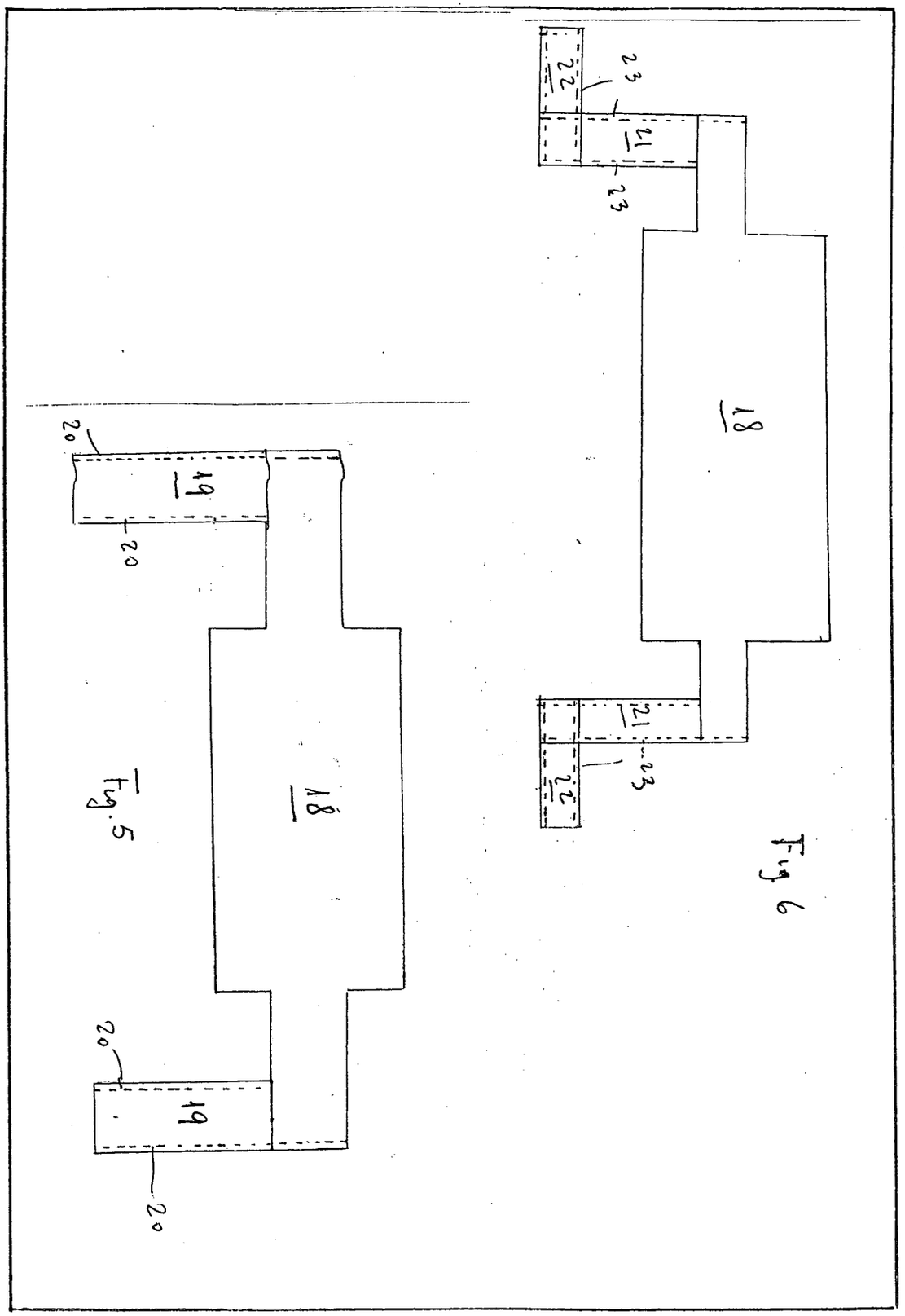

TABLE. 3

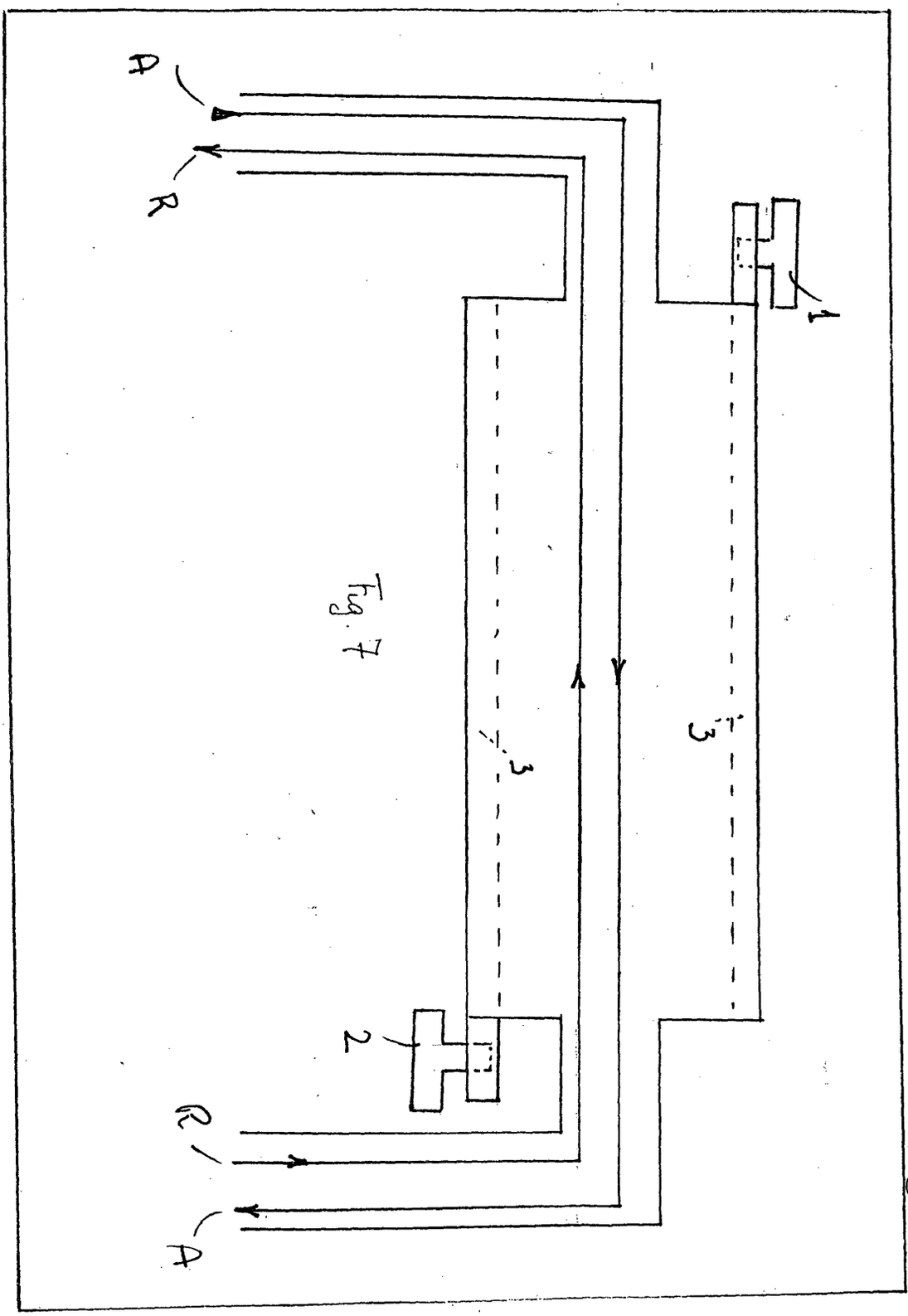

Fig. 1

TABLE 4