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(54) **FLAMING MACHINE FOR PROCESSING PIECES MADE OF A STONE MATERIAL**

(57) The invention relates to a flaming machine (100) for processing pieces made of a stone material, comprising a plurality of rollers (3) fixed to a frame (31) rotatably about its own axis, and placed in a horizontal work surface (1), wherein the pieces are arranged to be moved, a heat source (2) positioned below the work surface (1)

of the rollers (3) and oriented in such a way as to hit the lower, or resting, surface of the pieces on the rollers (3), wherein the rollers (3) have a through cavity (4) which extends in the direction of its own axis, for the circulation of a cooling fluid.

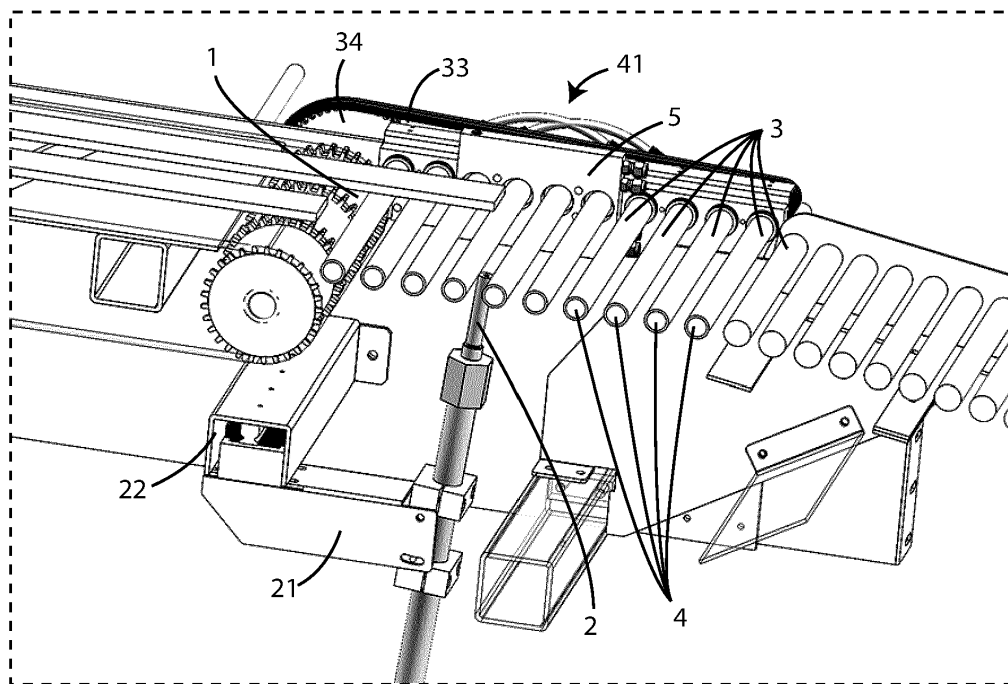


Fig. 5

Description

[0001] The present invention relates to a flaming machine for stone materials.

[0002] Flaming (or splaying) is a processing technique used to change the surface condition of stone materials by altering their appearance and roughness.

[0003] Flaming is performed by subjecting the surface of the piece to a sudden thermal shock, which causes a high temperature gradient to be established in a thin surface layer a few millimeters thick.

[0004] This, together with the differences between the thermal expansion coefficients of different rock components, causes flakes of material to detach from the surface.

[0005] Generally, flaming is performed on the exposed surfaces of stone elements, with the purpose of simulating their natural aging and thus making them pleasing to the eye and to the touch.

[0006] In addition, it can be performed to increase the roughness of a surface and, consequently, adhesion, before the application of a binder.

[0007] A further reason for carrying out this procedure derives from the fact that the raw materials, extracted from the quarries, are sectioned by the use of band saws, diamond wires or discs, with the result that the cut parts are rather smooth and show obvious signs of the passage of the blades.

[0008] Operationally, flaming is done by exposing the surface to be treated to the heat of a flame, such as that of an oxyacetylene torch.

[0009] The surface may optionally be sprayed with water before and after contact with the flame, depending on the type of effect desired and the type of material to be treated.

[0010] In order to achieve adequate and uniform results, the distance of the flame from the surface to be treated must be kept constant during the flaming phase.

[0011] The operation can be performed by hand by an operator, or by automatic machines.

[0012] Such machines usually comprise a horizontal work surface consisting of rotating rollers, on which the pieces of stone material are placed and moved.

[0013] In currently available flaming machines, the surface that is flamed is the surface opposite the surface that rest on the work/resting surface or roller conveyor.

[0014] The piece transits below a station where there are one or more burners, which, positioned at a fixed distance from the surface to be flamed and previously regulated, hit the piece with their flame.

[0015] One of the limitations of current flaming machines is that both the surface opposite the surface to be flamed and which is resting on the work surface, and the surface to be treated, must necessarily be as regular and parallel to each other as possible.

[0016] Otherwise, it cannot be guaranteed that the correct working distance between the surface to be flamed and the burners will remain constant over time, and as a

result, the quality of the finished product will not be good.

[0017] Currently, flaming by automatic machines can only be performed for parts having flat surfaces and constant thickness.

5 **[0018]** As previously specified, the position of the flame, after being regulated, remains fixed with respect to the surface and resting plane, so it cannot be adjusted to changes in part thickness.

10 **[0019]** Consequently, in order to carry out flaming, the pieces must have the resting surface to the work/resting surface and the opposite surface to be flamed as even and parallel as possible.

15 **[0020]** Aim of the present invention is to provide a flaming machine for stone materials capable of treating pieces having irregular and non-flat surfaces, such as in the absence of regularity and parallelism between surfaces, by being able to maintain a constant distance between the flame and the surface to be treated, regardless of the state of the other surfaces of the piece.

20 **[0021]** Another aim of the invention is to provide a machine for effectively performing flaming operations of stone materials having irregular surfaces in a simple and economical manner by virtue of the other advantages achieved.

25 **[0022]** These and other aims are achieved by a flaming machine according to the attached claim 1.

[0023] Further details and advantages of the invention are contained in the appended dependent claims.

30 **[0024]** The present invention will now be described, by way of example and not limitation, according to some of its preferred embodiments, and with the aid of the appended figures, wherein:

- 35 - figure 1 is a front perspective view of the flaming machine according to the invention;
- figure 2 is a detail view of the flaming machine according to figure 1;
- figure 3 is a rear perspective view of the flaming machine according to the invention;
- 40 - figure 4 is a perspective detail view of the flaming machine according to the invention;
- figure 5 is a front perspective sectional view of the flaming machine according to the invention;
- 45 - figure 6 is a cross-sectional view of a construction detail of the flaming machine according to the invention.

50 **[0025]** Referring to figures 1-3, is shown a preferred embodiment of a flaming machine 100 according to the present invention.

[0026] The flaming machine 100 operates by moving the pieces to be processed (not shown) along a main direction of a work surface 1.

55 **[0027]** The work surface 1 can be schematized as a horizontal plane on which the pieces rest and are moved to be processed.

[0028] Referring to figures 3-5, the flaming machine 100 comprises a plurality of rollers 3 that are substantially

contained in the work surface 1.

[0029] Such rollers 3 are cylinders substantially parallel to each other, fixed in correspondence of at least one of their ends and rotatable about their own axis.

[0030] The rollers 3 are arranged close together, so as to support and facilitate, by their concordant rotation, the translation of the pieces placed on them.

[0031] The rollers 3 are rotatably fixed at at least one end thereof, to a frame 31.

[0032] In correspondence of one of their ends, to each roller 3 is externally fixed a toothed crown 32.

[0033] Each toothed crown 32 is intended to gear a chain 33, or other means of transmitting motion, which in turn is driven by a toothed wheel 34 and a motor 35.

[0034] The motion of the rollers can be achieved by any equivalent means, comprising the using of all of the rollers or part of them independently, and/or electrically.

[0035] In detail, the flaming machine 100 exposes the pieces to a heat source, for example, a flame from a torch 2 located below the work surface 1.

[0036] The torch or heat source 2 is fixed to a support 21, placed so in such a way that, when the flaming machine is in use, the flame produced by the torch 2 itself is directed toward the work surface 1.

[0037] In a preferred embodiment, the support 21 is movable slidingly fixed along a guide 22 and is movable along the guide 22 itself.

[0038] The guide 22 is oriented in a direction substantially parallel to the rollers 3 to allow the flame produced by the torch 2 to act on the entire possible resting area for the pieces.

[0039] In each case, the flame produced by torch 2 is oriented so as to hit the bottom surface of the pieces carried by rollers 3.

[0040] In the prior art, the heat source is necessarily positioned above the pieces, and the distance between the stone surface to be treated and the heat source itself must remain nearly constant during heat exposure.

[0041] Accordingly, the rollers 3 are placed according to a predetermined distance from each other, such that the pieces to be treated can be supported and carried, but also such that spaces are provided for the flame produced by the torch 2 to act on the pieces.

[0042] Also the rollers 3, as well as the pieces to be treated, are also exposed to the heat of the flame.

[0043] The rollers are generally produced from metal, such as stainless steel, or more or less alloyed steel, but they can also be produced from much more heat-resistant materials such as ceramics or others.

[0044] As example, the temperature of an oxyacetylene flame can reach and exceed 3000 °C.

[0045] No commercially available material or alloy that can be purchased at a reasonable cost to a company in the industry can withstand such temperatures except for short periods.

[0046] Exposure to such heat is an inconvenience not only for the rollers 3 themselves, but also for all the couplings between the various moving parts, e.g., bushings

and/or bearings.

[0047] Thermal expansion caused by the heat propagated in the various organs would result in seizing of the organs themselves and thus damage to the machine.

[0048] A further problem arises from the fact that the flame is deflected from the surface to be flamed toward the rollers 3, and results in effects such as deformation, melting, or breaking, which may also be irreversible.

[0049] To overcome these drawbacks, with reference to figures 5 and 6, the flaming machine 100 according to the invention provides that the rollers 3 are hollow.

[0050] The cavity 4 of the rollers 3 is through, and runs along the axis direction in each roller from an end to the other.

[0051] Within said cavity 4 is continuously circulated, by means of pumps or similar apparatus (not shown), a suitable cooling fluid, for example, water.

[0052] A pipe 41 is fixed at the ends of each roller 3 for supplying the cooling fluid from a reservoir (or any source), and/or for sending it to a different roller 3.

[0053] In a preferred embodiment of the flaming machine 100, plates 5 are installed in a lateral position relative to the work surface 1, at the frames 31.

[0054] These plates 5 are oriented in a substantially vertical manner, perpendicular to the work surface 1 and the rollers 3 and/or parallel to the direction of advancement of said pieces.

[0055] Plates 5 act as a barrier to protect against flame propagation from the torch 2 below work surface 1.

[0056] These protections can be made of suitable materials to interrupt the heat, and/or they can be hollowed out to allow the circulation of cooling fluids.

[0057] Thus, heat is prevented from directly hitting the elements of the handling apparatus (chain, wheel, etc.) and the pipes 41 connected to each roller 3, which are then safeguarded from possible damage.

[0058] Operationally, the pieces to be processed are loaded onto the flaming machine 100 with the part to be flamed facing the rollers 3, and they advance conveyed by a feed system, such as a conveyor belt or other, until they reach the rollers 3, which rotate and advance the pieces toward the flaming zone.

[0059] Alternatively, if the rollers are idle, an alternative pushing system may be comprised.

[0060] Rollers 3 rotate thanks to the drive apparatus comprising motor 35, gear wheel 34, and chain 33, which is connected with crown 32 of each roller 3.

[0061] The rollers can also rotate independently when driven by independent motors outside or inside the rollers.

[0062] The pieces are supported on the rollers 3 by means of their bottom surface, which is flat and even, so the heat produced by the torch 2 invests the bottom surface itself in a regular and uniform manner.

[0063] Flaming machines according to prior art are not capable of operating such a procedure, since the heat source is necessarily placed above the work surface.

[0064] Wanting to operate the flaming on the flat sur-

face of a piece, it should be placed on the rollers with its irregular surface so that the flame acts on it from above.

[0065] However, since the piece rests on the rollers with its irregular surface, the distance of the top surface from the heat would become variable and unpredictable, producing unacceptable flaming on the pieces.

[0066] Optionally, in the flaming machine 100 according to the invention, the torch 2 is moved cyclically from the support 21 along the guide 22, transversely to the direction of part feed, so that it also operates on pieces positioned anywhere along the entire length of the rollers 3.

[0067] Optionally, the heat source can be arranged to make a cyclic motion, perpendicular to the surface to be flamed of the piece.

[0068] After the heat exposure is over, the rollers can optionally discharge the processed workpieces to a chute 6.

[0069] As mentioned, before and after exposure to flame, the surface to be treated can be subjected to hydration, such as through nozzles or by immersion in dedicated vessels, depending on the requirements of the material and the result to be obtained.

[0070] It is clear that alternative embodiments of the flaming machine may use additional or alternative technically equivalent elements for the performance in the machine of conventional and known functions, for example, inherent in the motor, chain, toothed wheel, torch, or protective side plates, without thereby departing from the scope of protection of the attached claims.

Claims

1. Flaming machine (100) for processing pieces made of a stone material, comprising

a plurality of rollers (3) fixed to a frame (31), each rotatable around its own axis, said rollers (3) being placed along a horizontal work surface (1) and said pieces of a stone material being arranged and moved on said rollers (3),
 a heat source (2) positioned below the work surface (1) of the rollers (3) and oriented in such a way as to hit the lower or resting surface of each of said pieces arranged on the rollers (3),
characterized in that said rollers (3) have a through cavity (4) which extends in the direction of the axis of each roller (3), so that a cooling fluid circulates inside said cavity (4).

2. Flaming machine (100) according to claim 1, **characterized in that** said pieces made of a stone material have at least a first irregular or substantially non-flat surface, and **in that** a flaming operation is performed uniformly on a second surface of each piece, said second surface being opposite to said first surface and corresponding to said lower or rest-

ing surface of each piece arranged on the rollers (3).

3. Flaming machine (100) according to claim 1 or 2, **characterized in that** said machine comprises a motor (35), a toothed wheel (34) connected to the motor (35), a chain (33) connected to the wheel (34) and a plurality of toothed crowns (32) connected to the chain (33), so that each roller (3) comprises a toothed crown (32) or an independent roller movement system, such as a motor system external to said motor (35) or a motor system placed inside said rollers (3).
4. Flaming machine (100) according to any one of claims 1-3, **characterized in that** said heat source (2) is a flame produced by a torch, such as for example an oxyacetylene flame.
5. Flaming machine (100) according to any one of claims 1-4, **characterized in that** the rollers (3) are separated from each other according to a predetermined distance, so as to allow the heat source (2) to hit the lower or resting surface of each piece arranged on the rollers (3).
6. Flaming machine (100) according to any one of claims 1-5, **characterized in that** the heat source (2) is fixed to a support (21) which is movable slidingly along a guide (22) parallel to the rollers (3).
7. Flaming machine (100) according to any one of claims 1-6, **characterized in that** a pipe (41) is connected at the ends of each roller (3) for supplying said cooling fluid, i.e. water, said cooling fluid being derivable from any type of source, even external to the machine, including hydraulic systems or industrial and/or civil refrigerants.
8. Flaming machine (100) according to claim 7, **characterized in that** said flaming machine (100) comprises an apparatus for the recirculation of said cooling fluid inside the rollers (3) and/or inside the pipes (41) connected at the ends of each roller (3).
9. Flaming machine (100) according to any one of claims 1-8, **characterized in that** said flaming machine (100) comprises at least one plate (5) for protecting the heat source, said plate (5) being fixed to the frame (31) and being oriented in a direction substantially perpendicular to the work surface (1) and/or parallel to the direction of advancement of said pieces.

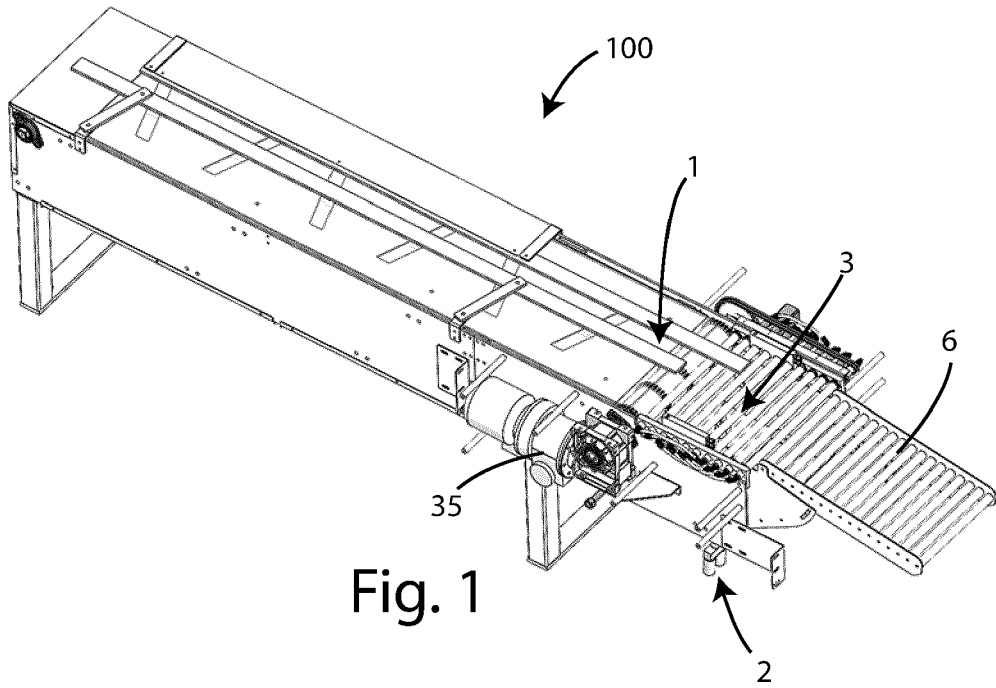


Fig. 1

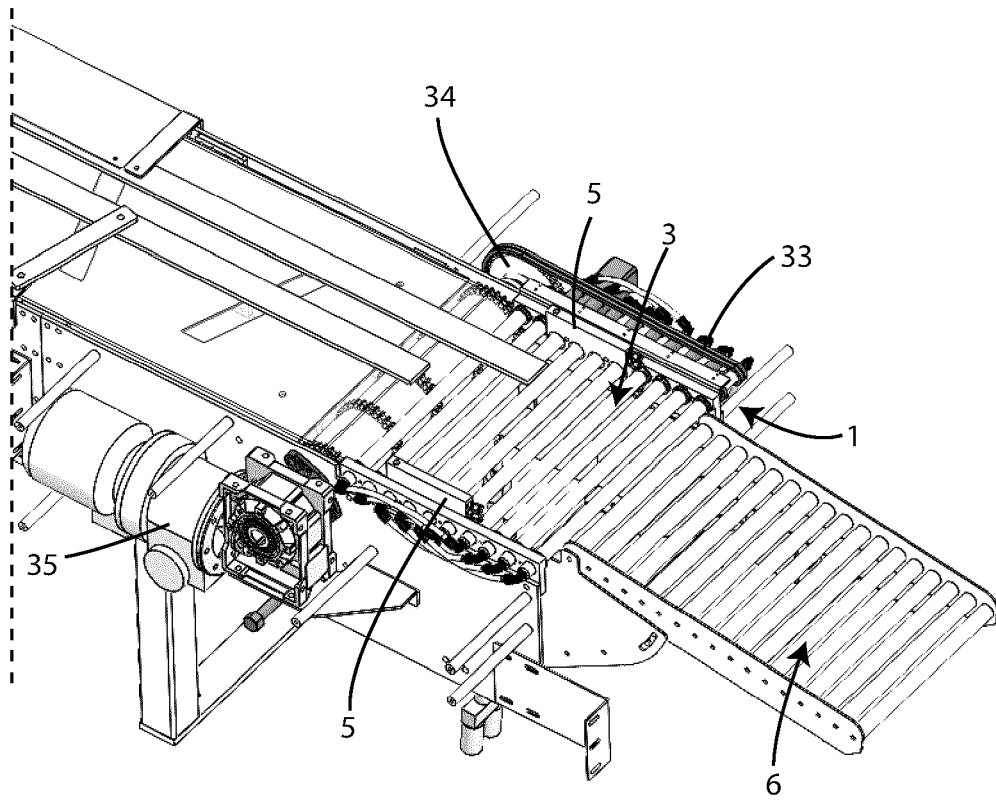


Fig. 2

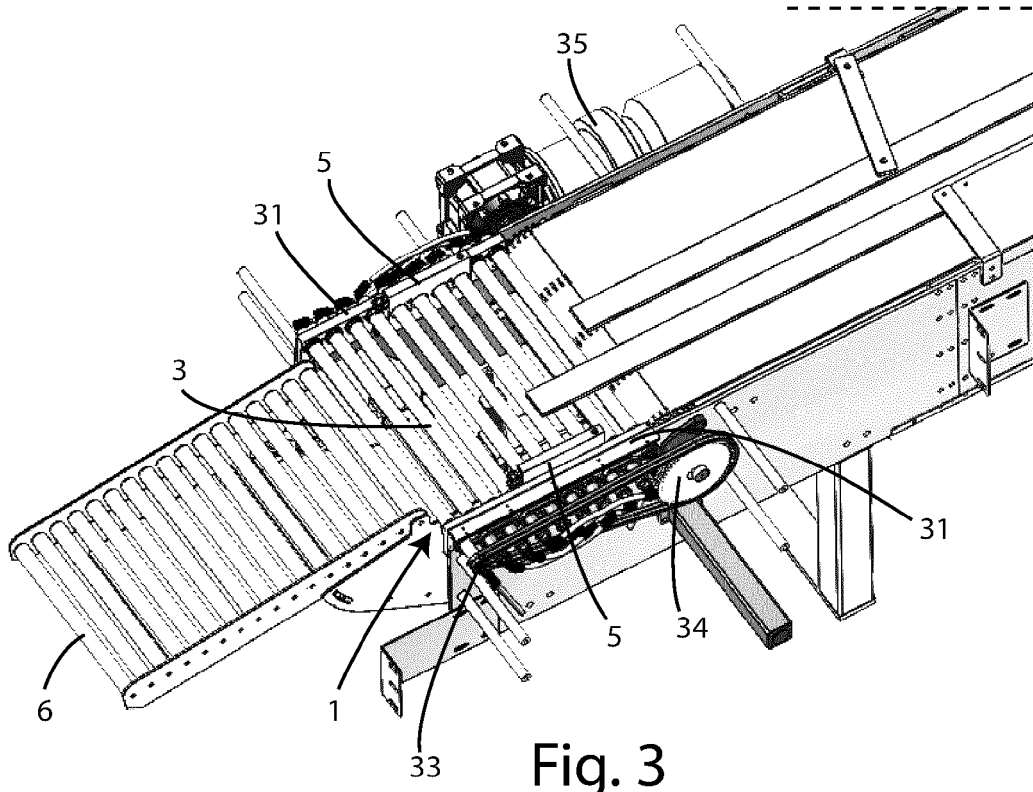


Fig. 3

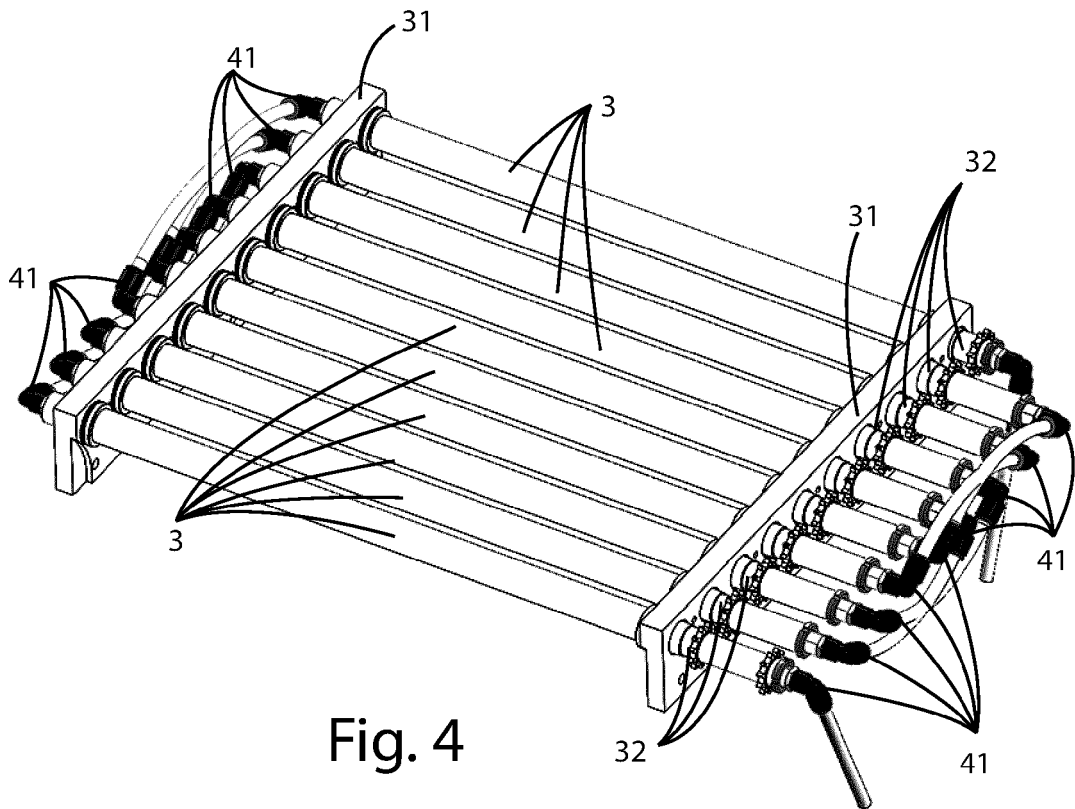


Fig. 4

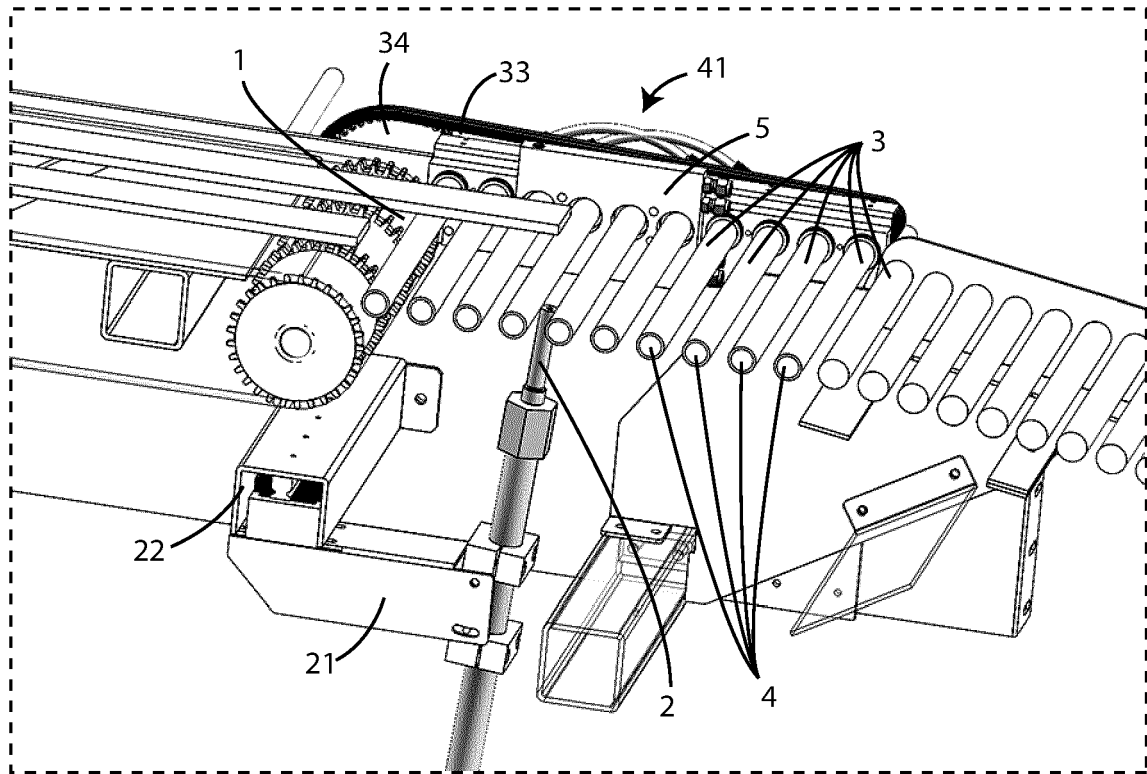


Fig. 5

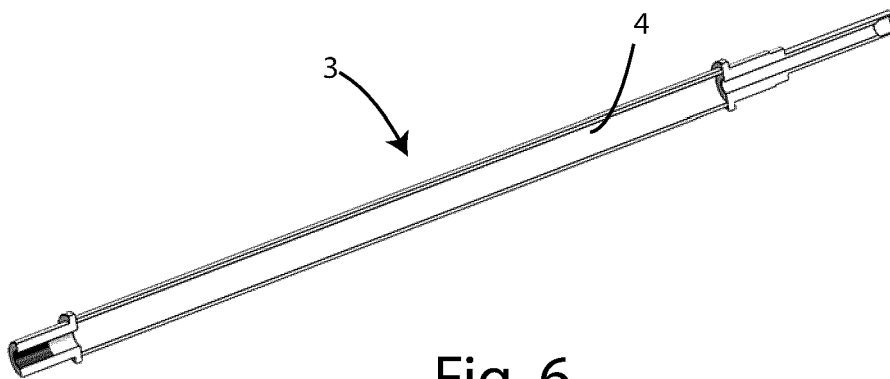


Fig. 6



EUROPEAN SEARCH REPORT

Application Number

EP 23 15 1236

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			TECHNICAL FIELDS SEARCHED (IPC)
			B28D

The present search report has been drawn up for all claims

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Place of search The Hague	Date of completion of the search 1 May 2023	Examiner Chariot, David
CATEGORY OF CITED DOCUMENTS 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		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

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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