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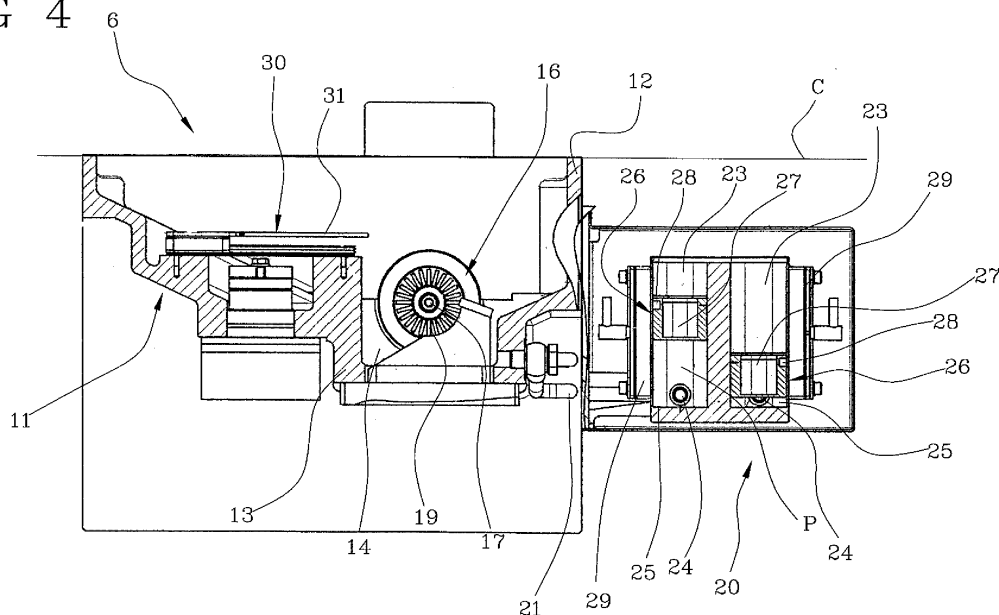
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(54) **A machine manufacturing filters for tobacco products**

(57) In a machine manufacturing filters for tobacco products, two continuous streams (C) of fibrous tow advance parallel along a feed path through a series of processing stations to a garniture section (7) where each is fashioned into a continuous filter rod (B); the rods are then divided into single plugs by a cutter (10). One processing station is a chemical treatment device (6) comprising at least one bath (14) filled with a liquid additive (P) supplied from a reservoir, and a partly immersed revolving brush (16) positioned and set in rotation in such

a way as to project droplets of the liquid additive (P) at the continuous streams (C). The device (6) also incorporates a system (20) for measuring the level of liquid additive (P) in the bath (14); the measuring device, located remotely from the bath and therefore practically unaffected by the wave motion generated when the brushes (16) are in rotation, consists in a channel (23) containing a column of the liquid additive (P), connected at one end to the bottom of the bath (14) and equipped at the other end with a float (27) indicating the height of the column, which is proportional to the level of liquid in the bath.

FIG 4



Description

[0001] The present invention relates to a machine for manufacturing filters applicable to tobacco products, and in particular to cigarettes.

[0002] Conventionally, the manufacture of cigarette filters involves processing a continuous stream of filter material, such as cellulose acetate, known also as filter tow, drawn from a compacted bale.

[0003] The stream is fed along a set path through processing stations, where it is first stretched lengthwise and crosswise and then impregnated with plasticizing additives.

[0004] Customarily, the impregnating step takes place as the stretched material is directed through special devices designed to invest the advancing fibres with a flow of plasticizer, typically triacetin, a substance which at the normal operating temperature and pressure of the devices in question will remain in the liquid state.

[0005] The fibres are thus sprayed with a flow of liquid consisting in particles of predetermined quantity and size, in such a way that a prescribed quantity of the triacetin will be absorbed.

[0006] At a subsequent station, the filter material is gathered by shaping means into a continuous bundle of cylindrical appearance, which is then enveloped by degrees in a continuous strip of paper material at a further wrapping station to form a continuous filter rod. Finally, the continuous rod is divided up into single plugs by a rotary cutter device.

[0007] In prior art filter makers, the aforementioned chemical treatment device comprises a container or bath, located along the path followed by the stream of filter tow and beneath the selfsame stream, holding a predetermined quantity of triacetin supplied from a tank by means of a pump.

[0008] The bath accommodates a revolving brush partly immersed in the triacetin, which when set in rotation at a normal operating speed will project a flow of liquid droplets at the stream of cellulose acetate.

[0009] Given that the filters made in the course of each production cycle must present the same filtration properties, the quantity of triacetin absorbed by each filter must remain verifiably constant over time and within prescribed limits.

[0010] To this end, in conventional machines, the filters turned out are weighed at predetermined intervals of time (every three or four hours).

[0011] Since the weight of the corresponding untreated filters is known, as also is the quantity of triacetin consumed, the average quantity of the chemical absorbed by each filter can be calculated.

[0012] Prior art methods include taking account of the triacetin dispensed by the chemical treatment device but not absorbed by the filter material, using correction coefficients based on previous experience.

[0013] Such a method has not proven reliable, however, or able to guarantee the production of filters with prop-

erties responding to the prescribed limits.

[0014] This being the case, the object of the present invention is to provide a filter maker unaffected by the drawbacks associated with the prior art as described above.

[0015] One object of the invention, in particular, is to provide a filter maker such as will guarantee that the properties of the filters manufactured are in conformance with prescribed limits.

[0016] A further object of the present invention is to provide a filter maker such as will minimize the number of rejects in production, and consequently maximize output efficiency.

[0017] The stated objects are substantially realized according to the present invention in a machine manufacturing filters for tobacco products, as recited in one or more of the claims appended.

[0018] The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

- figure 1 shows a machine according to the present invention, manufacturing filters for tobacco products, illustrated schematically;
- figure 2 shows a detail of the machine in figure 1 viewed in perspective;
- figure 3 shows the detail of figure 2 in a side view;
- figure 4 shows the detail of figure 2 in a section on IV-IV.

[0019] With reference to the accompanying drawings, numeral 1 denotes a machine manufacturing filters for tobacco products, embodied in accordance with the present invention.

[0020] The machine 1 comprises a magazine 2 containing two bales M of filter material, of which one only is indicated in figure 1. A fibrous tow S is drawn from each bale M and advanced by feed means of conventional type toward a station at which the filter material will be processed.

[0021] In the preferred embodiment of the present invention described and illustrated, accordingly, two continuous tows S of filter material are drawn off and processed, as is typical in a twin track, or dual rod type of machine.

[0022] Nonetheless, the present invention is applicable equally to a single track machine.

[0023] In detail, the fibrous tow passes through a processing station comprising means 3 by which it is formed into a continuous stream C of filter material; such means 3 comprise at least one blower device 4 of conventional type, operating in conjunction with rollers 5, by which each tow S is expanded and formed into a continuous stream C of predetermined width.

[0024] In a preferred embodiment, the processing station will comprise three such blower devices 4, placed along feed lines as illustrated in figure 1. The processing station further comprises a device 6 for chemical treat-

ment of the filter material, located downstream of the means 3 forming the continuous stream C, in such a way that the selfsame streams C can be taken up and plasticized by the application of a suitable plasticizer fluid.

[0025] The treated stream C is advanced thereafter toward means 7, consisting of a twisting device 8, by which the strands of fibrous tow are formed into a continuous rope or bundle B and made thus to assume a rod-like shape. The bundle is then caused to advance directly above a web V of paper, gummed previously, and finally enveloped by the web so as to fashion a continuous filter rod F.

[0026] The rod F obtained in this way is fed through a device 9 serving to verify the density of the filter material, and thereafter to a cutter head 10 such as will divide the continuous rod transversely into a succession of plugs (not illustrated).

[0027] Referring in particular to figures 2 and 4, the device 6 for chemical treatment of the filter material comprises a fixed structure 11 presenting a top portion 12 and a bottom portion 13. The top portion 12 of the fixed structure 11 affords guide means on which to support at least one continuous stream C of filter material (or two streams C advancing parallel, as in the preferred embodiment illustrated). In practice, the guide means comprise respective sliding surfaces (not illustrated) disposed preferably horizontal and placed so as to support the continuous streams C of filter material, or might comprise a plurality of rollers affording a rolling surface.

[0028] The bottom portion 13 of the fixed structure 11 serves as a bath 14 containing a liquid additive P that will be transferred to the streams C.

[0029] The function of the liquid additive P, preferably triacetin as mentioned previously, is to plasticize the filter material making up the continuous streams C by compacting and stably drawing together the constituent fibres, thereby improving their filtration properties.

[0030] In the preferred solution of the accompanying drawings, the chemical treatment device 6 comprises two baths 14, separated by a partition wall 15 (illustrated fragmentarily in figure 2), each serving a relative continuous stream C.

[0031] Located internally of each bath 14 is a revolving brush 16, by which the liquid additive is picked up and projected at the stream C of filter material in the form of droplets.

[0032] To this end, each revolving brush 16 is rotatable about an axis X substantially perpendicular to the horizontal feed direction followed by the streams C of filter material.

[0033] The two brushes 16 comprise a common shaft 17 rotatable about the aforementioned axis X, and relative sets of bristles 19 disposed one alongside another and carried by the shaft 17, which is set in rotation by a motor 18.

[0034] The single bristles 19 extend radially from the shaft 17, each presenting a first end anchored to the shaft, and a freely projecting second end. The free sec-

ond ends of the bristles 19 combine to create a substantially cylindrical active surface. In addition, the bristles 19 are fashioned of elastically deformable material, for reasons that will become clear, and therefore flexible.

5 [0035] Each revolving brush 16 is positioned internally of the bath 14, underneath the relative stream C of filter material, and partially immersed in the liquid additive P.

[0036] When the brush 16 set in rotation, accordingly, the bristles 19 are caused repeatedly to dip into the liquid additive P and, on emerging, to project droplets of the liquid at the relative stream C of filter material.

10 [0037] It has been observed by experiment that the size of the single droplets of triacetin projected at the stream C is directly influenced by the speed at which the brush 16 rotates; conversely, this same speed of rotation does not directly influence the quantity of the fluid investing the stream C.

15 [0038] However, a direct relationship does exist between the quantity of liquid additive P projected at the stream C, and the depth to which the brush 16 is immersed.

[0039] Accordingly, there is an optimum value for the speed at which the brush 16 rotates, to guarantee the right size of droplet, and an optimum value for the depth at which the brush 16 is immersed, to guarantee a correct flow of the liquid additive P transferred to the stream C.

20 [0040] To advantage, the machine comprises means 20 by which to measure the level of liquid additive P contained in the at least one bath 14.

25 [0041] In this way, it becomes possible to ensure a steady distribution of the liquid additive P over the stream C, and guarantee that filters are turned out by the machine with precise and repeatable filtration properties.

[0042] More exactly, the machine will also comprise a pump (not illustrated, being of conventional type) interlocked to the measuring means 20 and activated or deactivated according to the level of the liquid additive P registering in the bath.

30 [0043] The aforementioned pump is in fluid communication with the baths 14 and with a reservoir of familiar type (not illustrated) containing a supply of the liquid additive P, so that a head can be generated on demand to draw the liquid from the reservoir and transfer it to the bath 14.

35 [0044] Importantly, the means 20 measuring the level of liquid additive P are placed in fluid communication with each bath 14 by way of pipelines 21, so that the selfsame measuring means 20 and the baths 14 can be separated physically one from another.

40 [0045] Accordingly, and advantageously, the measuring means 20 are influenced only to a marginal degree by the wave motion generated in the baths 14 when the brushes 16 are in rotation.

45 [0046] In practice, the movement induced in the liquid additive P by the rotation of the brushes includes vortical components tending to create a persistent wave motion within the baths 14.

[0047] Advantageously, with the pipelines 21 connect-

ed to the bottom portion of each bath 14 (see figure 3 in particular), and preferably to the base, any pressure fluctuation induced by the aforementioned wave motion in the liquid additive P will be all but negligible, in contrast to the situation that would be created if the pipelines 21 were connected near to the free surface of the liquid additive.

[0048] In the preferred solution illustrated, the measuring means 20 are positioned outside the dimensional envelope of the bath 14, as clearly evident in figures 2 and 4.

[0049] Significantly, the placement of the measuring means 20 and the positioning of the pipelines 21 and the baths 14 relative to one another are such that the quantity of liquid additive P directed by the brushes 16 at the continuous streams C, but not intercepted by the selfsame streams, can also be measured with precision.

[0050] In effect, the liquid additive is projected at the streams C as a result of the brushes 16 being set in rotation; nonetheless, whilst the brushes 16 are embodied and positioned as described above, not all of the liquid projected upward by the bristles can be guaranteed to invest the advancing streams C of filter material.

[0051] To avoid waste, and prevent the liquid additive P from being scattered outside of the machine 1, the chemical treatment device 6 comprises a screen 22 (illustrated only fragmentarily in figure 2 better to reveal other features), extending above the baths 14, filling the empty space between the two parallel streams C advancing across the open top of the baths 14 and forming a labyrinth around the areas to which the liquid additive P is applied.

[0052] Thus, any part of the upwardly projected liquid additive that fails to hit the streams C of filter material will be intercepted by the screen 22 and returned to the baths 14.

[0053] In the preferred embodiment illustrated, the measuring means 20 comprise at least one channel 23 serving each bath 14, placed in fluid communication with the relative bath 14.

[0054] The channel 23 comprises an inlet 24, located in a bottom portion 25 of the selfsame channel, joined to one of the pipelines 21, in that the channel 23 will contain a column of liquid additive P directly proportional to the quantity of liquid contained in the bath 14.

[0055] In particular, the height of the column of liquid present in the channel 23 is directly proportional to the pressure of the additive contained in the bath 14, hence to the average height of the free surface, although the wave motion generated by the brush 16, as mentioned previously, has little or no effect on the pressure of the liquid.

[0056] The height of the column of liquid additive is sensed by means 26 located within the channel 23.

[0057] More exactly, the height of the column of liquid is detected by sensing means 26 that comprise a float 27 (figure 4) slidable freely internally of the channel 23, in such a way that when displaced by Archimedes thrust

generated through the liquid additive occupying the channel 23, it will indicate the height of the column clearly.

[0058] The sensing means 26 also comprise a pickup 28 associated with and serving to detect the position of the float 27.

[0059] Whilst the pickup 28 might be of any given type, namely optical, acoustic or whatever, the preferred pickup will be a magnetic type, associated with at least one sensor 29 capable of distinguishing the magnetic field generated by the pickup 28 and determining its position.

[0060] With this solution, advantageously, the sensor 29 can be located externally of the channel 23, as shown in figure 4, thereby avoiding any situation where it could be splashed or simply brought into contact with the liquid additive P.

[0061] The chemical treatment device 6 further comprises barrier means 30 by which the flight of the liquid additive toward the continuous streams C of filter material can be controllably interrupted.

[0062] In particular, the barrier means 30 comprise at least one movable element 31 such as can be placed in a plurality of operating positions between an open position (illustrated in figures 2 and 4), in which the liquid additive is able to reach the continuous streams C of filter material, and a closed position (not illustrated) in which the flow of liquid additive toward the continuous streams C of filter material is shut off completely.

[0063] Preferably, the barrier means 30 will comprise two movable elements 31, each associated with a respective bath 14.

[0064] As illustrated in figures 2 and 4, each movable element 31 comprises a substantially flat baffle slidable in a direction preferably parallel to the feed direction followed by the continuous streams C of filter material.

[0065] The movable elements 31 occupy an intermediate position between the brushes 16 and the continuous streams C.

[0066] The barrier means 30 are activated during the starting and stopping transients of the machine 1, in order to ensure that the continuous streams C of filter material will not be fouled as a result of the parameters determining the application of the additive being other than optimum: typically, an inappropriate droplet size, due to the rotation of the brush 16 at a unsuitable speed when starting and stopping, and a flow rate of the liquid additive different to the optimum rate specified in design, due to an incorrect level of the liquid additive in the bath 14 when filling and emptying.

[0067] Importantly, the measuring means 20 associated with and monitoring the level of the liquid in each bath 14 are able to identify any losses of liquid caused by leaks from the bath 14, as well as detect a malfunction of the brushes 16, practically in real time.

[0068] In particular, a displacement of the float 27 suggests that the immersion of the brush 16 in the liquid additive is not as it should be, and will activate the pump connected to the reservoir in such a way as to replenish the bath 14 with liquid, or return liquid from the bath to

the reservoir, until the float 27 has returned to its specified position.

[0069] Once a prescribed immersion level has been set for the brushes 16, these operations are piloted automatically by the chemical treatment device 6.

[0070] By contrast, in machines of prior art type, such malfunctions of the treatment device 6 are detected long after they occur, since quality is monitored by sampling portions of the stream C treated with the liquid additive, at given intervals of time.

[0071] Once a malfunction has been detected, in prior art systems, all filters produced from the moment when the malfunction occurred, until the moment of the problem being detected, must be discarded.

[0072] Moreover, adopting the combination of measuring means 20 to monitor the level of the liquid, and barrier means 30 to control the flow of the liquid, the machine 1 can be activated without any loss of filter production whatever, since the optimum level to which the brush 16 is immersed in the bath 14 will be determined by the measuring means 20, and there is no need to produce filters for sampling purposes, during the time taken by the machine to start up, in order to establish when the operating conditions have stabilized at the values specified in design (or selected on a case by case basis).

Claims

1. A machine manufacturing filters for tobacco products, comprising:

- feed means advancing at least one continuous tow of filter material along a predetermined path;
- means (3) by which the filter material is formed into a continuous stream (C);
- means (7) by which to form a continuous filter rod (B);
- cutting means (10) by which the rod (B) is divided into discrete filter plugs,
- a chemical treatment device (6) stationed along the feed path downstream of the means (3) by which the continuous stream (C) is formed, comprising at least one bath (14) containing a liquid additive (P), at least one revolving brush (16) immersed at least partly in the at least one bath (14) and serving to transfer the additive (P) to the continuous stream (C), also a reservoir holding a supply of the additive (P) and connected to the at least one bath (14),

characterized

in that the chemical treatment device (6) comprises means (20) by which to measure the level of the liquid additive (P) contained in the at least one bath (14).

2. A machine as in claim 1, comprising connection pipelines (21) extending between the bath (14) and the

level measuring means (20), wherein the pipelines (21) extend beneath and communicate with a bottom portion of the bath (14), preferably the base of the selfsame bath.

3. A machine as in claim 2, wherein means (20) by which to measure the level of liquid additive (P) are positioned outside the dimensional envelope of the bath (14).
4. A machine as in preceding claims, wherein the liquid additive (P) is directed from the reservoir to the bath (14) by a pump connected operatively to the means (20) for measuring the level of the additive, and activated or deactivated according to the level of additive (P) present in the bath (14), as determined by the selfsame measuring means (20).
5. A machine as in preceding claims, wherein the chemical treatment device (6) comprises a fixed screen (22) creating a labyrinth around the area of application of the liquid additive (P), such as will intercept the liquid not intercepted by the stream (C) and return it to the bath (14).
6. A machine as in claim 2 or 3, wherein means (20) by which to measure the level of liquid additive (P) comprise at least one channel (23) placed in fluid communication with the bath (14) and containing a column of liquid additive directly proportional to the quantity of liquid additive (P) present in the bath (14).
7. A machine as in claim 6, wherein the channel (23) presents an inlet (24) admitting the liquid additive, located in a bottom portion (25) of the channel (23) and preferably in the base of the selfsame channel.
8. A machine as in claim 6 or 7, comprising means (26) by which to sense the height of the column of liquid additive in the channel (23).
9. A machine as in claim 8, wherein means (26) by which to sense the height of the column of liquid additive comprise a float (27) freely slidable within the channel (23).
10. A machine as in claim 9, wherein means (26) by which to sense the height of the column of liquid additive further comprise at least one pickup (28) associated with the float (27), and at least one sensor (29) isolated from the liquid occupying the channel (23) and serving to detect the position of the pickup (28).
11. A machine as in claim 10, wherein the pickup (28) is a magnetic type.
12. A machine as in claims 6 to 11, comprising a channel

(23) for each bath (14).

- 13.** A machine as in preceding claims, comprising barrier means (30) by which the flow of liquid additive directed at the continuous streams (C) of filter material is interrupted in order to isolate the material from the liquid additive during starting and stopping transients of the machine.

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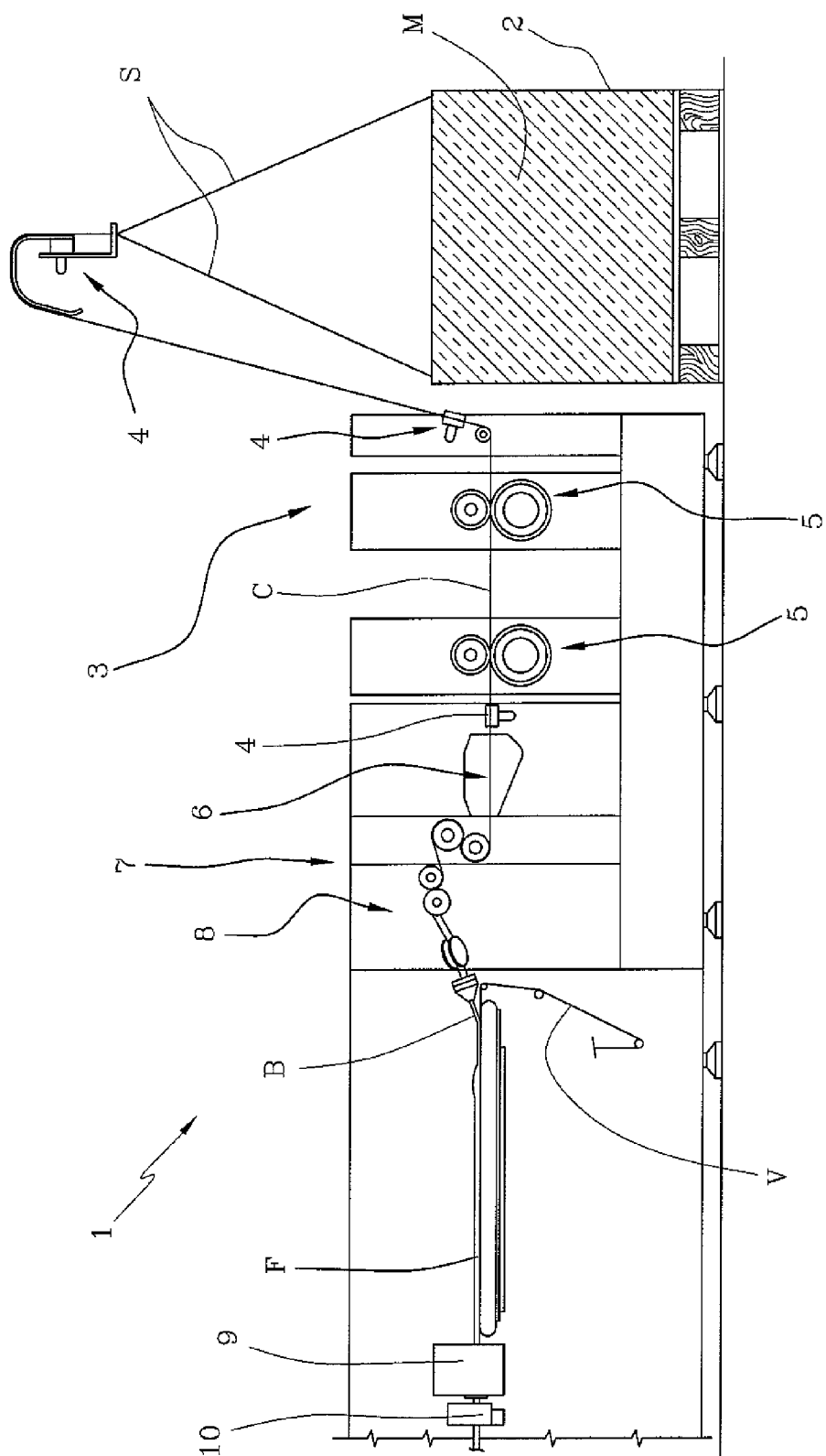


FIG 1

FIG 2

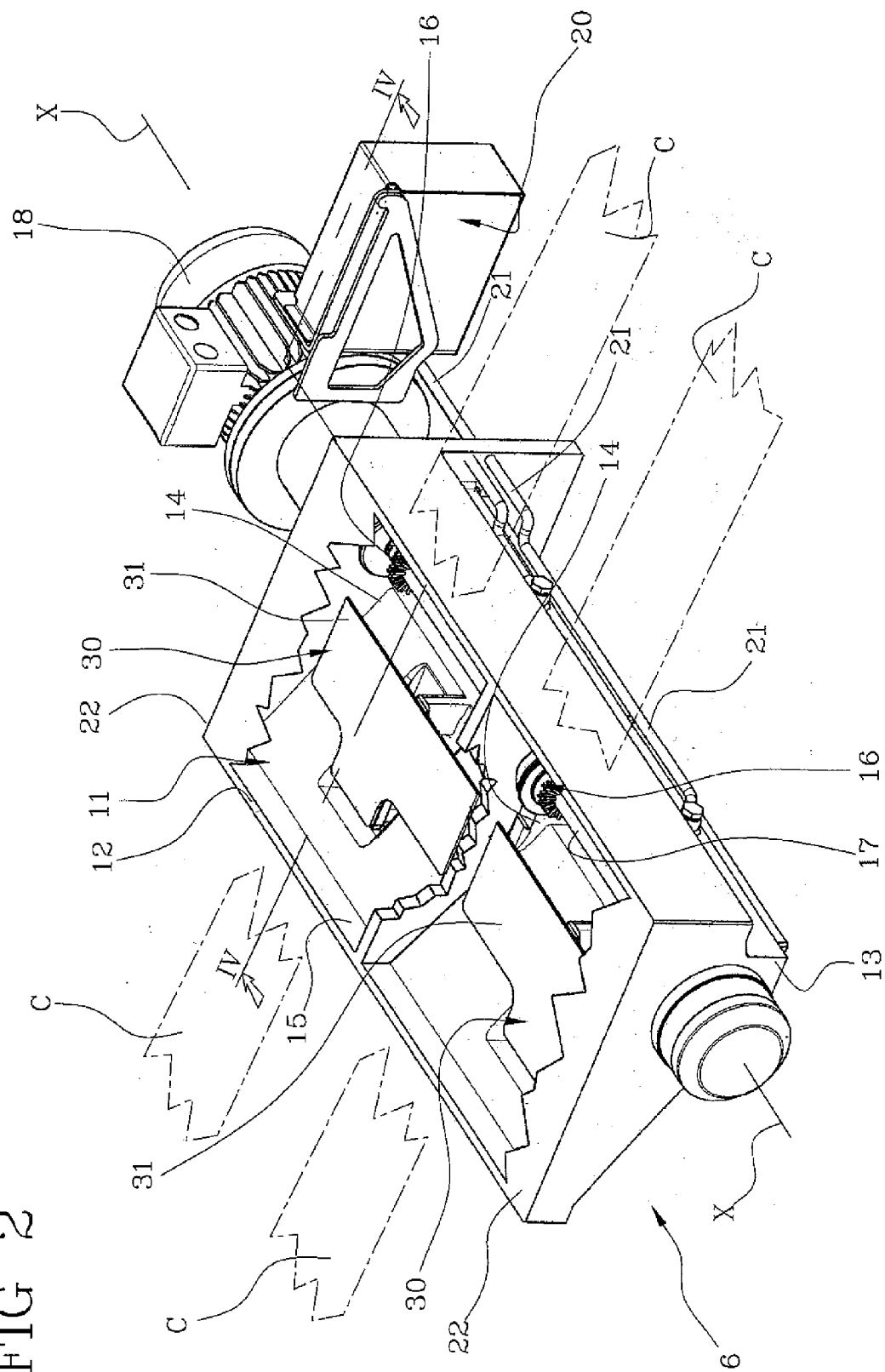


FIG 3

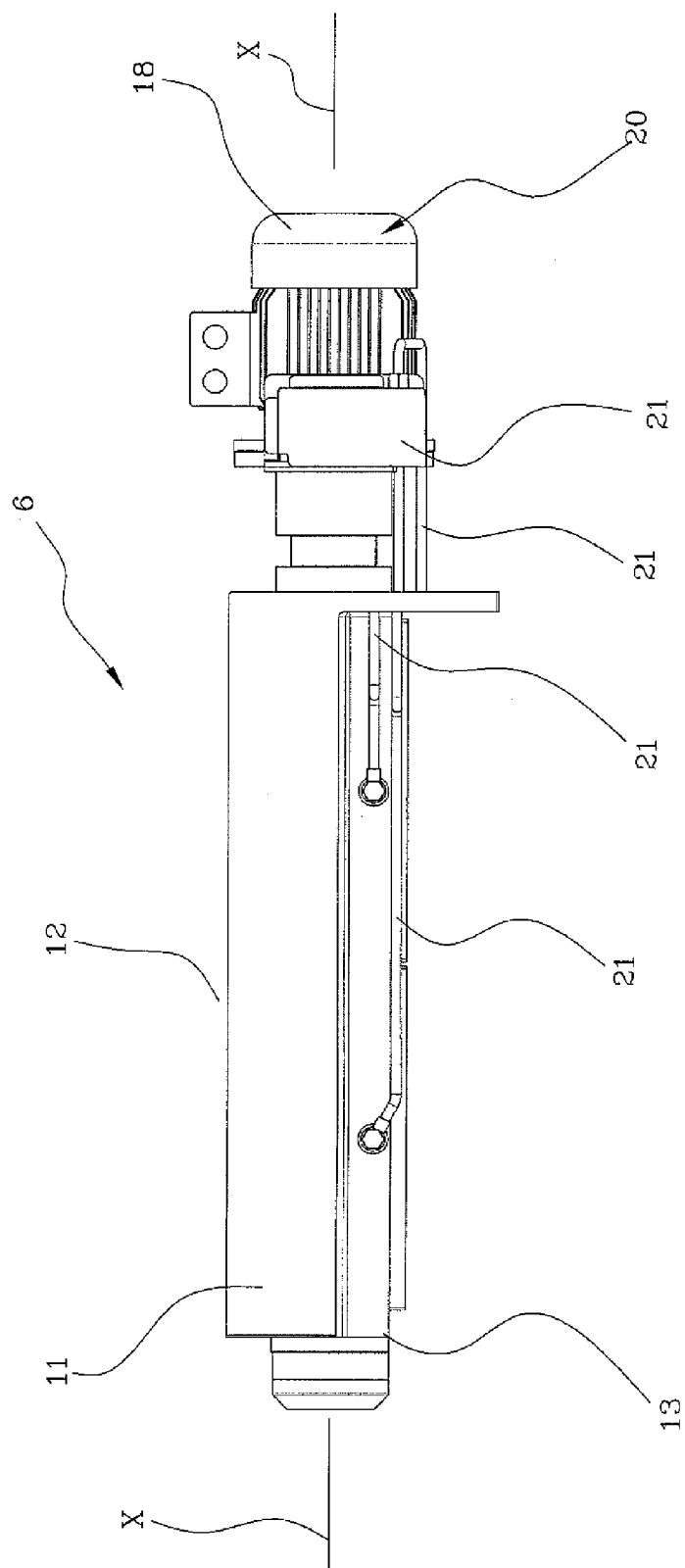
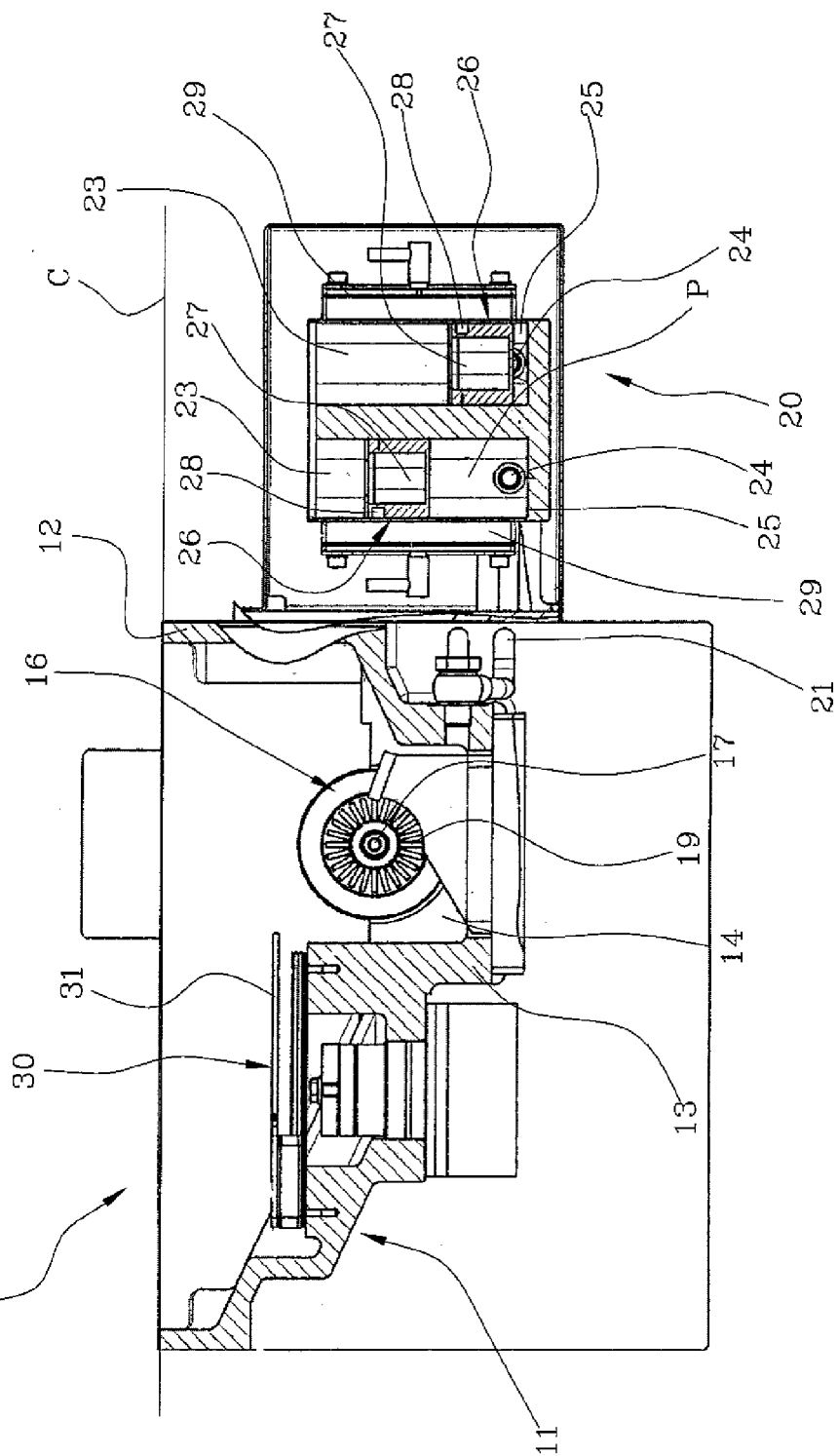


FIG 4





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Application Number
EP 07 12 3907

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