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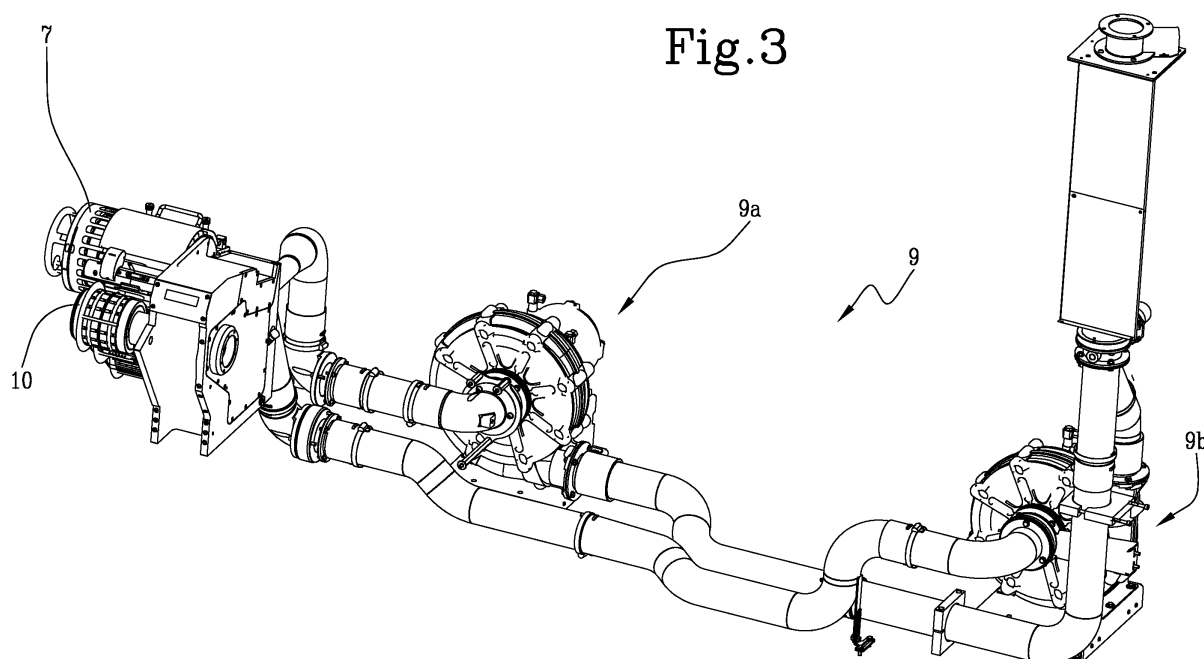
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(54) **MACHINE AND METHOD FOR MAKING CIGARETTE FILTERS**

(57) This invention relates to a machine (1) for making cigarette filters, comprising first suction rollers (7) for transferring and slowing down filter sticks (5) inside respective first perimeter suction flutes (8), each having respective first suction openings connected to a suction device (9) and a second plurality of suction rollers (10) for picking up the sticks (5) from the first transfer and slowing-down suction rollers (7) and designed to feed the sticks (5) to further processing stations, the second

suction rollers (10) being provided with second perimeter suction flutes (11) configured to receive the sticks (5) and provided with respective second suction openings connected to the suction device (9). The suction device (9) comprises a first suction source (9a) connected to the first, transfer and slowing-down suction rollers (7), and a second suction source (9b), independent of the first suction source (9a) and connected to the second suction rollers (10).



Description

[0001] This invention relates to a machine for making cigarette filters and to a related production method.

[0002] As is known, the production of cigarette filters involves processing at least one continuous strip of filter material, for example cellulose acetate, also known by the term of "tow", obtained from a bale of compressed filter material.

[0003] The description which follows refers to a double line machine, that is, one operating on two continuous strips, but is equally applicable to a single or multiple line machine.

[0004] The two strips are made to advance in parallel along predetermined paths through processing stations where each is stretched lengthways, opened out transversely and then impregnated with plasticizing chemical additives.

[0005] At the next station, forming means produce two continuous cylindrical cords of filter material.

[0006] In prior art embodiments, these forming means have the shape of funnels through which the continuous strips are made to pass in such a way that their transverse cross sections are progressively reduced and they become two cords of predetermined diameter. Downstream of the funnel-shaped devices, the cords are channelled into respective forming channels of a garniture tongue where the continuous cords advance in defined, parallel directions in such a way as to form two continuous filter rods which a rotary cutting device then cuts into separate filter sticks.

[0007] Each filter stick may have the length of one or more filter tips, depending on requirements, which will be applied to the cigarettes in the filter tip attachment machine.

[0008] The individual filter sticks are then picked up by acceleration means, consisting for example of two pairs of accelerator rollers, one pair for each stick.

[0009] Each roller of the pair of accelerator rollers is thus disposed on opposite sides of each filter stick in such a way as to withdraw the sticks and propel them forward at a speed higher than that at which the filter rods advance along the two forming channels.

[0010] That way, the sticks are spaced from the respective continuous rods and driven forward in a direction parallel to their longitudinal axes towards respective suction flutes on respective transfer rollers which rotate about axes of rotation parallel to the longitudinal axes of the sticks in order to transfer the sticks to subsequent processing stations.

[0011] The filter sticks are accelerated by the accelerator rollers to allow them to be correctly spaced from the rods and to allow each stick to be inserted precisely and rapidly into the suction flutes of the transfer rollers.

[0012] Insertion of the sticks must be rapid, precise and synchronized with the rotation of the transfer rollers. The high speed at which the sticks are driven along the respective suction flutes prevents the sticks from hitting

against the side walls of the flutes and being damaged.

[0013] To prevent damage to the leading ends of the sticks hitting against the transverse wall of the flutes, the sticks must be slowed down by the suction flutes, allowing each to be precisely positioned in the respective flute.

[0014] Each transfer roller is thus configured to slow down the sticks inside its suction flutes. In effect, the suction flutes are provided with openings, usually made in the bottom of each flute and connected to a suction source capable of generating a negative pressure which slows the sticks down as they enter the suction flutes, propelled by the accelerator rollers at high speed and with high kinetic energy.

[0015] In fact, the speed and related energy of the sticks must be cancelled out by an equal force applied by the suction source connected to the suction flutes, so that the sticks can be correctly positioned and aligned inside the flutes without being damaged. The suction flutes must therefore be calibrated and set with a very high degree of precision.

[0016] Moreover, in the event of changes in the technical specifications of the filter sticks, such as, for example: size, weight and material, it is necessary, each time, to adjust the suction capacity of the flutes, adapting it to the new parameters, so that the flutes remain effective in slowing the sticks.

[0017] Filter making machines known in the prior art comprise a single suction source which serves both the transfer rollers downstream of the garniture tongue and of the accelerator rollers, and the pickup rollers, which are also provided with suction flutes to hold the filter sticks and to which the transfer rollers transfer the sticks.

[0018] Thus, changing the flow rate of the suction flutes of the transfer rollers, which is necessary to adjust the slowing-down force when the technical specifications of the filter sticks are changed, means also changing the suction air flow rate in the pickup and rejection rollers located downstream, which, as a result, might not be able to hold the sticks correctly.

[0019] In effect, if the flow rate of the suction flutes of the transfer rollers were to be increased, for design requirements, in order to improve their slowing capacity, it is evident that with only one suction generator, the flow rate to the other rollers, namely the pickup rollers, located downstream, would diminish accordingly, creating the risk of reducing their ability to effectively hold the filter sticks.

[0020] Thus, guaranteeing a higher slowing down suction force at the transfer rollers necessarily means reducing the suction force at the pickup suction rollers downstream.

[0021] In other words, adjusting the air speed or the suction cross sectional area of one of the rollers served by the suction source inevitably changes the flow rate of the others, with the risk of reducing the effectiveness of the other suction rollers.

[0022] It is clear therefore that filter making machines known up to the present suffer from serious shortcomings

in terms of adjustability, which may negatively affect the flexibility of the filter production process

[0023] In this context, the technical purpose which forms the basis of this invention is to propose a machine and a method for making cigarette filters to overcome the above mentioned drawbacks of the prior art. More specifically, the aim of this invention is to provide a machine and a method for making cigarette filters to improve the efficiency of the production process.

[0024] The technical purpose indicated and the aim specified are substantially achieved by a cigarette filter making machine and method comprising the technical features described in one or more of the accompanying claims.

[0025] The dependent claims, which are incorporated here by reference, correspond to different embodiments of the invention.

[0026] Further features and advantages of this invention are more apparent in the description below, with reference to a preferred, non-limiting embodiment of a machine for making cigarette filters as illustrated in the accompanying drawings, in which:

- Figure 1 shows a functional diagram of a machine for making cigarette filters according to this invention;
- Figure 2 is a schematic view of a portion of the machine according to this invention; and
- Figure 3 is a schematic perspective view of a portion of the machine according to this invention.

[0027] With reference to the accompanying drawings, the numeral 1 denotes in its entirety a machine for making cigarette filters according to the teachings of this invention.

[0028] The term "cigarette" is used to denote a plurality of products or smoking articles including, for example, cigars, cigarillos and the like. With reference to Figure 1, the machine 1 comprises a garniture tongue 2 for forming one or more rods.

[0029] More specifically, there are two continuous filter rods 3 advancing along feed paths.

[0030] Preferably, the garniture tongue 2 comprises two forming channels which are funnel-shaped in order to progressively reduce the cross section size of continuous strips F of filter material fed to the garniture tongue 2 itself. The garniture tongue 2 is also provided with outlet tubes whose transverse cross section is substantially equal in diameter to the filters to be made.

[0031] Preferably, the garniture tongue 2 is also associated with a wrapping device 2a where the continuous strips F of filter material are progressively wrapped in continuous webs C of paper unwound from rolls, thus forming continuous rods 3 of wrapped filter material.

[0032] The machine 1 also comprises a cutting station 4 to which the two continuous rods 3 are fed in order to be cut into respective filter sticks 5 of predetermined length, based on production requirements. The filter

sticks 5 are then made to advance along the parallel feed paths towards the pickup and accelerator units 6 of the machine 1. The pickup and accelerator units 6 for each filter stick 5 are designed to accelerate the cut filter sticks 5 in such a way as to detach them from the respective continuous rod 3 and to increase the speed at which they move along the parallel feed paths.

[0033] Downstream of the pickup and accelerator units 6, the machine 1 comprises first suction rollers 7 for transferring and slowing down the sticks 5 and each configured to receive the sticks 5 from the respective feed path.

[0034] The first suction rollers 7 are provided, on their perimeters, with a plurality of first suction flutes 8 of suitable size to accommodate the filter sticks 5.

[0035] Advantageously, the first perimeter suction flutes 8 have respective first suction openings, not illustrated in the accompanying drawings, connected to a suction device 9 in such a way as to guarantee a suction force capable of slowing down the forward movement of the sticks 5 inside the first perimeter suction flutes 8 themselves.

[0036] That way, the filter sticks 5 which had been accelerated by the pickup and accelerator units 6 are brought to a precise stop inside the perimeter suction flutes 8 of the first suction rollers 7, which rotate about axes of rotation parallel to the longitudinal directions of extension of the filter sticks 5.

[0037] The machine 1 also comprises a second plurality of suction rollers 10 for picking up the filter sticks 5 from the first suction rollers 7 and designed to feed the filter sticks 5 to further processing stations. The second suction rollers 10 rotate about respective axes of rotation parallel to the axes of rotation of the first suction rollers 7 and are tangent to the latter to be able to pick up the filter sticks 5.

[0038] More specifically, the second pickup suction rollers 10 are provided with second perimeter suction flutes 11 configured to receive the sticks 5 and provided with respective second suction openings, not illustrated in the accompanying drawings, connected to the suction device 9 in such a way as to guarantee a suction force capable of retaining the sticks 5 during the rotation of the second pickup suction rollers 10.

[0039] Advantageously, according to the invention, the suction device 9 comprises two suction sources 9a, 9b which are independent of each other: a first suction source 9 is connected to the first, transfer and slowing-down suction rollers 7, and a second suction source 9b is connected to the second suction rollers 10 for picking up the filter sticks 5 from the first, transfer and slowing-down suction rollers 7. Thanks to the presence of the two independent suction sources 9a, 9b, the first suction rollers 7 and the second suction rollers 10 can be adjusted independently of each other so that adjusting the suction air flow rate of one set of rollers does not cause imbalances or unwanted falls in pressure in the other set of rollers.

[0040] More specifically, suction in the first suction roll-

ers 7 is obtained by a first suction flow A1 which serves the first suction openings, whilst suction in the second suction rollers 10 is obtained by a second suction flow A2 which serves the second suction openings. Advantageously the two suction flows A1 and A2 are adjustable independently of each other.

[0041] In other terms, regulating the air flow of the first suction rollers 7, which enables the filter sticks 5 in the first suction flutes to be correctly slowed down, does not change the air flow rate which produces suction in the second suction openings, thus leaving the pressure on the second suction rollers 10 undisturbed and balanced; and vice versa.

[0042] Advantageously, also, if a large number of filter sticks 5 from the first suction rollers 7 are discarded, leaving some of the suction flutes 11 of the second suction rollers 10 empty, thereby causing the pressure to fall in the other second suction flutes 11, the operation of the first suction rollers 7, which are connected to a suction source 9a separate from the suction source 9b of the second suction rollers 10, remains unaffected and it is then possible to simply adjust the flow rate in the second suction rollers 10 without upsetting the flow rate balance in the first suction rollers 7.

[0043] Preferably, as illustrated in Figure 3, the suction sources 9a and 9b are axial fans and the suction air flow rate can be changed by varying the speed of rotation of the fan blades.

[0044] Preferably, the machine 1 comprises a control and drive unit 12 programmed to independently control the adjustment of operating parameters of the respective suction sources 9a, 9b.

[0045] In other terms, the unit 12 is capable of adjusting the operating parameters of the suction sources 9a, 9b, such as, for example, the speed of rotation of the axial fans, in such a way as to increase or decrease the intensity of the suction flows A1, A2 according to requirements.

[0046] Preferably, also, the unit 12 is programmed to independently control the adjustment of operating parameters of the suction sources 9a, 9b as a function of identification parameters of the filter sticks 5. Advantageously, that way, following a variation of the identification parameters of the filter sticks 5 - such as, for example, length, specific weight and size - it is possible to adjust the slowing-down capacity of the first suction rollers 7 by simply adjusting the operating parameters of the first suction source 9a independently of those of the second suction source 9b.

[0047] According to another aspect, this invention provides a method for making cigarette filters, comprising the following steps:

making one or more continuous filter rods 3 and feeding them along parallel feed paths;
cutting the continuous filter rods 3 into respective filter sticks 5; increasing the feed speed of the filter sticks 5 along the feed paths;
placing the filter sticks 5 into respective first perim-

eter suction flutes 8 of first, transfer and slowing-down suction rollers 7 while applying suction to the filter sticks 5 in order to slow down their movement inside the respective first suction flutes 8;

transferring the filter sticks 5 to a plurality of second suction flutes 11 of second pickup suction rollers 10 which retain the filter sticks 5 by suction; and advantageously comprising a first step of adjusting the suction applied to the filter sticks 5 inside the first suction flutes 8 and a second step of adjusting the suction applied to the filter sticks 5 inside the second suction flutes 11, where the first and second adjustment steps are independent of each other.

[0048] This invention achieves the preset aims, overcoming the disadvantages of the prior art, by providing the user with a reliable and versatile machine and method for making cigarette filters, capable of reducing the risks of interrupting the production process and thus improving process efficiency.

Claims

1. A machine (1) for making cigarette filters, comprising:

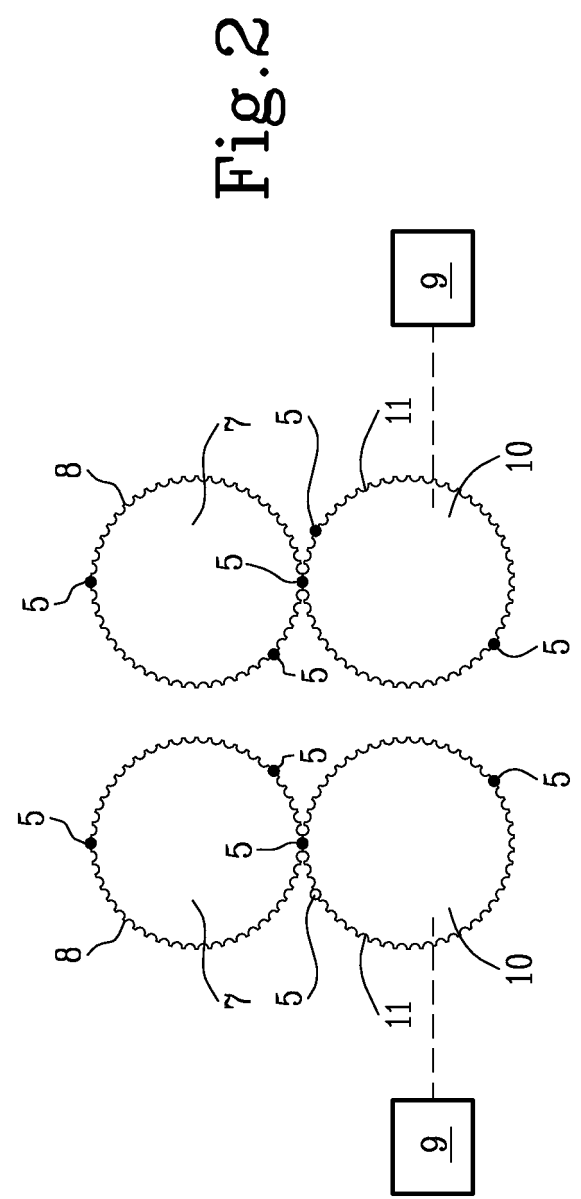
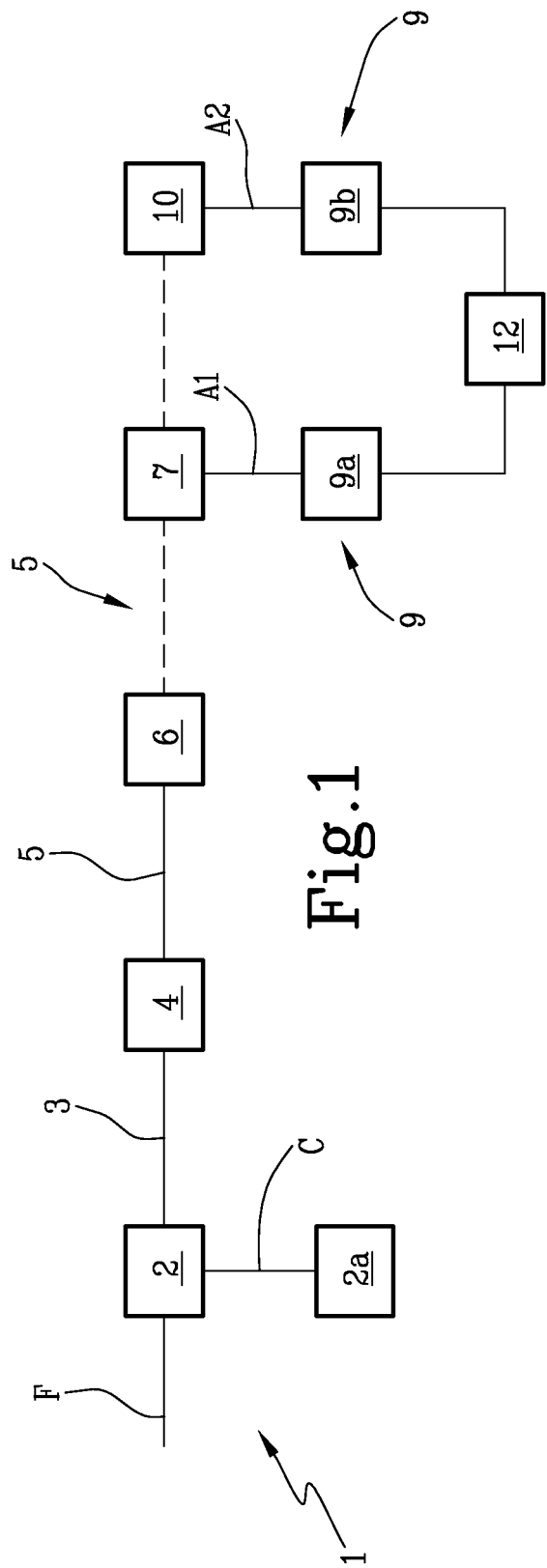
- a garniture tongue (2) for forming one or more continuous filter rods advancing along feed paths,
- a cutting station (4) for cutting one or more continuous filter rods (3) into respective filter sticks (5),
- pickup and accelerator units (6) for each filter stick (5) designed to accelerate the cut filter sticks (5) in such a way as to detach them from the respective continuous rod (3),
- first suction rollers (7) for transferring and slowing down the sticks (5) inside respective first perimeter suction flutes (8), each first suction flute (8) having respective first suction openings connected to a suction device (9) in such a way as to guarantee a suction force capable of slowing down the forward movement of the sticks (5) inside the first suction flutes (8) themselves,
- a second plurality of suction rollers (10) for picking up the sticks (5) from the first transfer and slowing-down suction rollers (7) designed to feed the sticks (5) to further processing stations, the second pickup suction rollers (10) being provided with second perimeter suction flutes (11) configured to receive the sticks (5) and provided with respective second suction openings connected to the suction device (9) in such a way as to guarantee a suction force capable of retaining the sticks (5) during the rotation of the second pickup suction rollers (10);

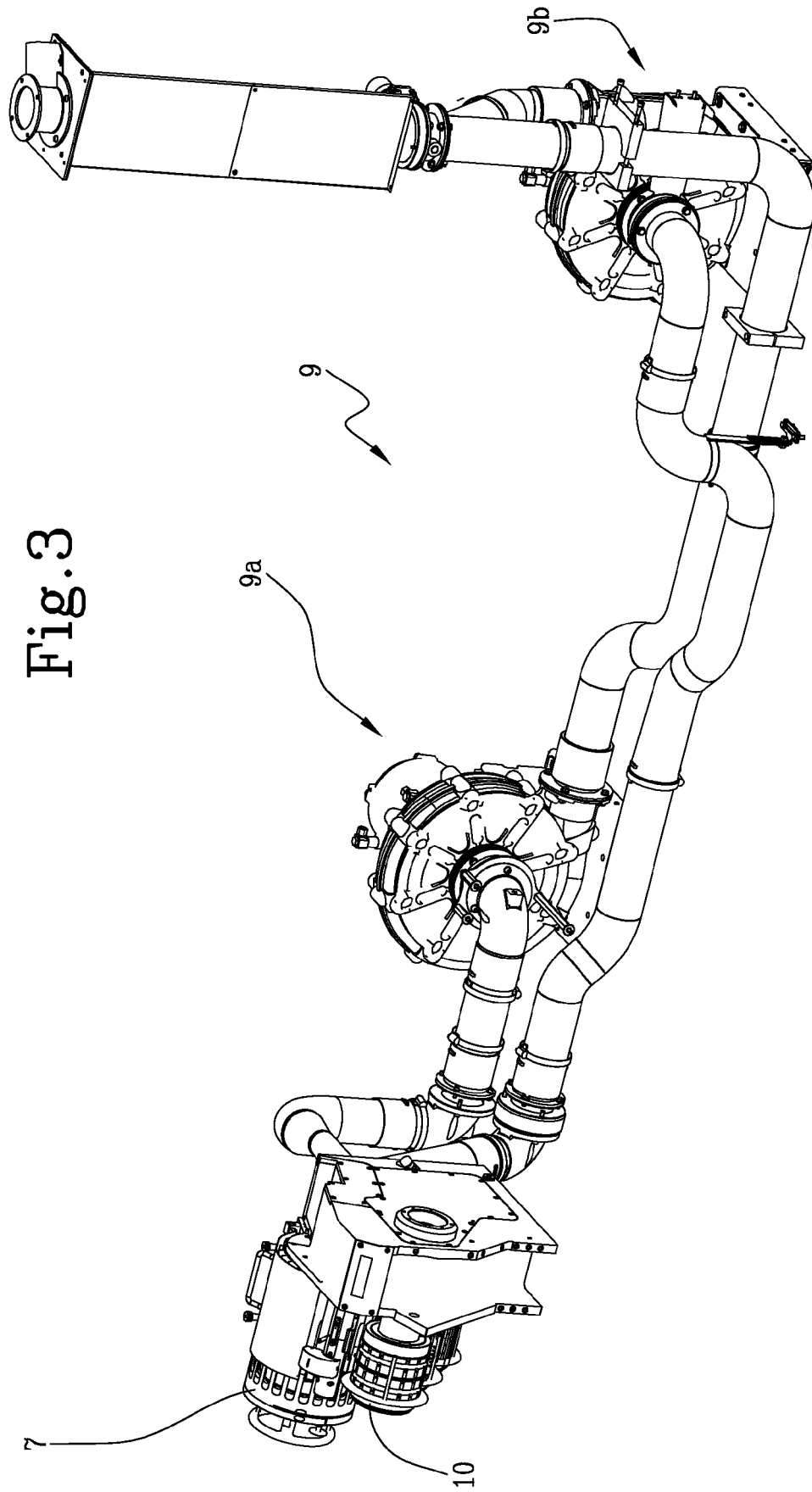
characterized in that the suction device (9) comprises two independent suction sources (9a, 9b), a first suction source (9a) being connected to the first, transfer and slowing-down suction rollers (7), and a second suction source (9b) being connected to the second suction rollers (10) for picking up the sticks (5) from the first, transfer and slowing-down suction rollers (7).

2. The machine (1) according to claim 1, comprising a control and drive unit (12) programmed to independently control at least the adjustment of operating parameters of the suction sources (9a, 9b), preferably as a function of identification parameters of the filter sticks (5).
3. The machine (1) according to one or more of the preceding claims, wherein the suction sources (9a, 9b) are axial fans.
4. A method for making cigarettes, comprising the following steps:
 - making one or more continuous filter rods (3) and feeding them along feed paths;
 - cutting one or more continuous filter rods (3) into respective filter sticks (5);
 - increasing the feed speed of the filter sticks (5) along the feed paths;
 - placing the filter sticks (5) into respective first perimeter suction flutes (8) of first, transfer and slowing-down suction rollers (7) while applying suction to the filter sticks (5) in order to slow down their movement inside the respective first suction flutes (8);
 - transferring the filter sticks (5) to a plurality of second suction flutes (11) of second pickup suction rollers (10) which retain the filter sticks (5) by suction, **characterized in that** it comprises a first step of adjusting the suction applied to the filter sticks (5) inside the first suction flutes (8) and a second step of adjusting the suction applied to the filter sticks (5) inside the second suction flutes (11), the first and second adjustment steps being independent of each other.

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Application Number
EP 17 19 6881

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 November 2017	Examiner Caballero Martínez
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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