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(54) **METHOD FOR REFITTING AN EXISTING CIGARETTE FILTER FORMING MACHINE TO OBTAIN A UNWINDING, SHREDDING, GATHERING, AND ROD FORMING MECHANISM**

VERFAHREN ZUR NACHRÜSTUNG EINER
ZIGARETTENFILTERHERSTELLUNGSVORRICHTUNG IN EINEN ABWICKEL-,
ZERKLEINERUNGS-, BÜNDELUNGS- UND STABBILDUNGSMECHANISMUS

PROCÉDÉ POUR RATTRAPER UN DISPOSITIF DE FABRICATION DE FILTRE DE CIGARETTE
EN UN MÉCANISME DE DÉROULEMENT, DE DÉFIBRAGE, DE COLLECTE ET DE FORMATION
DE TIGE

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Description

BACKGROUND OF THE INVENTION

1. Technical Field

[0001] The present invention relates to tobacco processing machines, and more particularly to a sheet-stripping, strip-gathering, rod-forming mechanism based on a cigarette filter forming machine.

2. Description of Related Art

[0002] Traditionally, tobacco sheet is shredded to have a shape similar to loose tobacco fragments and mixed with loose tobacco fragments before putting into a specialized tobacco rod forming machine to be made into tobacco rods. However, the existing tobacco rod forming machines are not suitable for making continuous, pure, filament-bundle-like, tobacco rods. The existing cigarette filter making machines draw tough acetate fibers or polyacrylic fibers through a strip-guiding horn-shaped mouth and a pipe to bundle the fiber into filters. However, for less tough and fragile rolled tobacco sheet, the existing filter forming machines are not proper processing tools, neither.

[0003] US 4,047,536 A discloses a method of producing a smoking article from an endless web of reconstituted tobacco. US 3,589,373 A discloses a method of making cigarettes from a substantially endless band of tobacco sheet material.

[0004] Recently, a novel form of cigarettes called electric heat-not-burn cigarette have become known in the market. This new type of cigarettes requires its tobacco rod to be made of tobacco strips arranged orderly in a lengthwise direction. Hence, there is a need for refitting an existing cigarette filter forming machine to adapt it to the physical properties of stripped tobacco sheet and thereby making it effective in on-line stripping and gathering tobacco strips into rods with maximized convenience and minimized costs.

SUMMARY OF THE INVENTION

[0005] The technical issue to be addressed by present invention is to provide a sheet-stripping, strip-gathering, rod-forming mechanism based on a cigarette filter forming machine, which is simple in structure and only requires moderate additional costs, while being particularly suitable for on-line stripping of tobacco sheet roll that is less tough and fragile, and effective in gathering and forming the strips into tobacco rods.

[0006] The present invention addresses the foregoing issue by in the following technical solution: a set of active roll release device for tobacco sheet roll is additionally installed behind releasing rollers of the filter forming machine, which has a linear velocity matching a rod-forming linear velocity of the mechanism; a pair of releasing roll-

ers near a pipe is replaced by stripping rollers with interrupted roller pattern along respective circumference; and a strip-guiding horn-shaped mouth is replaced by a tapered and collapsed horn-shaped mouth with an inlet diameter of 80-120mm.

[0007] The sheet-stripping, strip-gathering, rod-forming mechanism based on a cigarette filter forming machine of claim 1, wherein the active roll release device includes a servo motor installed on a rotating shaft of the tobacco sheet roll, and an ultrasonic detector arranged at an edge of a sheet of sheet roll, in which ports of a single chip microcontroller in a power control cabinet of the filter forming machine are connected to the servo motor, the ultrasonic detector and a tobacco rod detector of the filter forming machine, respectively, so that the single chip microcontroller adjusts an angular velocity of the servo motor, to make the linear velocity of the edge of the sheet match the real-time linear velocity of rod-forming; the interrupted roller pattern of the stripping rollers is arranged at a surface of an upper roller, and the interrupted roller pattern and an axis of the stripping roller include an angle of 90-45°, while a lower roller is a shallow groove or a smooth roller.

[0008] The interrupted roller pattern of the upper roller of the stripping rollers has smooth segments close to its shaft ends, and the upper roller is equipped with a separate driving device, the upper roller is equipped with a gear at inner edge of one end, a rotating shaft of the lower roller is equipped with a vertical lifting mechanism, and the lower roller is equipped with a gear that matches the upper roller at inner edge. When the lower roller is lifted, its gear is engaged with the gear of the upper roller and is driven to roll together.

[0009] A buffer area for sheet hanging is located below the sheet of sheet roll, and a photoelectric sensor is installed in the buffer area, which is connected to the port of the single chip microcontroller in the power control cabinet, and further feeds back to a servo motor control system of the single chip microcontroller, thereby forming closed-loop control for correcting a cumulative deviation during roll release operation of the servo motor.

[0010] The vertical lifting mechanism of the lower roller of the stripping roller is a hydraulic cylinder or a screw structure.

[0011] The strip-guiding horn-shaped mouth is provided with a compressed air inlet, so as to remove tobacco dust while guiding strips.

[0012] The rotating shaft for the paper sheet roll is an air shaft. When the sheet roll is mounted in position, the shaft is fixed by air inflation to secure the roll from loosening.

[0013] The present invention is advantageous for at least the following reasons. On the basis of existing tobacco filter rod forming, with minor component replacement and improvement, the machine could adapt to producing tobacco rod of electric heat-not-burn cigarettes with tobacco sheet rolls; according to physical properties of tobacco sheet, active roll release by servo motor is

adopted, in combination with a single chip microcontroller to control the roll release rate, avoiding breaking of tobacco sheet strips and ensuring continuity of tobacco sheet strips; the stripping rollers with special shapes serve to convey the tobacco sheet roll and at the same time strip the roll into continuous strips, while ensuring certain continuity between tobacco sheet strip bundles, thereby preventing fragile tobacco sheet from breakage. The resulting tobacco strips are in order and easy to be gathered orderly, thereby ensuring continuous production.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is a schematic drawing of a sheet-stripping, strip-gathering, rod-forming mechanism based on a cigarette filter forming machine of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0015] Referring to FIG. 1 for the disclosed mechanism. Therein, an active roll release device for tobacco sheet roll 1 is additionally installed behind releasing rollers of the filter forming machine, which has a linear velocity matching a rod-forming linear velocity of the mechanism. A pair of releasing rollers near a pipe is replaced by stripping rollers with interrupted roller pattern along respective circumference. When drawn together, the two rollers cut the tobacco sheet into strips while conveying the stripped tobacco sheet forward. A strip-guiding horn-shaped mouth 14 is replaced by a tapered and collapsed horn-shaped mouth with an inlet diameter of 80-120mm. The active roll release device of the present mechanism includes a servo motor installed on a rotating shaft 2 of the tobacco sheet roll 1, and an ultrasonic detector 3 arranged at an edge of a sheet of sheet roll, in which ports of a single chip microcontroller in a power control cabinet of the filter forming machine are connected to the servo motor, the ultrasonic detector 3 and a tobacco rod detector of the filter forming machine, respectively, so that the single chip microcontroller adjusts an angular velocity of the servo motor, to make the linear velocity of the edge of the sheet match the real-time linear velocity of rod-forming; the interrupted roller pattern 4 of the stripping rollers is arranged at a surface of an upper roller 5, and the interrupted roller pattern 4 and an axis of the stripping roller include an angle of 90-45°. When the angle is 90°, the direction of the tobacco strip bundle is parallel with the moving direction. When the angle is smaller than 90°, the tobacco strip bundle is inclined. The lower roller 6 is a shallow groove or a smooth roller, so as to ensure the tobacco sheet is cut through. The upper stripping roller 5 is almost fully covered by the interrupted roller pattern 4 in its axial direction except that the ends close to shaft are smooth segments 7, which ensures the parts of the tobacco sheet in the segments are not cut, thereby preventing tangles and broken ends at the edges of the sheet. The upper roller 5 is equipped with a sep-

arate driving device. One end of the upper roller 5 is provided with a gear 8 at inner edge, working as a driving wheel. The lower roller 6 has its rotating shaft equipped with a hydraulic cylinder 10 acting as a lifting mechanism for allowing vertical adjustment. The lower roller 6 is equipped with a gear 9 that matches the gear 8 of the upper roller 5 at inner edge. When the lower roller 6 is lifted, the gear 9 engages with the gear 8 of the upper roller 5 and is driven to roll together. A buffer area 11 for sheet hanging is located below the sheet of sheet roll, and a photoelectric sensor 12 is installed in the buffer area 11, which is connected to the port of the single chip microcontroller in the power control cabinet, and further feeds back to a servo motor control system of the single chip microcontroller, thereby forming closed-loop control for correcting a cumulative deviation during roll release operation of the servo motor. The strip-guiding horn-shaped mouth 14 is provided with a compressed air inlet 13, so as to remove tobacco dust while guiding strips when then mechanism is in operation. The rotating shaft 2 for the paper sheet roll 1 of the present mechanism is an air shaft. When the sheet roll is mounted in position, the shaft is fixed by air inflation to secure the roll from loosening.

Claims

1. A method for refitting an existing cigarette filter forming machine to obtain a sheet-stripping, strip-gathering, rod-forming tobacco processing mechanism, being **characterized in that**: a set of active roll release device for tobacco sheet roll (1) is additionally installed behind releasing rollers of the filter forming machine, which has a linear velocity matching a rod-forming linear velocity of the mechanism; a pair of releasing rollers near a pipe is replaced by stripping rollers (5, 6), with interrupted roller pattern (4) along respective circumference; and a strip-guiding horn-shaped mouth is replaced by a tapered and collapsed horn-shaped mouth (14) with an inlet diameter of 80-120mm.
2. The method of claim 1, wherein the active roll release device includes a servo motor installed on a rotating shaft (2) of the tobacco sheet roll (1), and an ultrasonic detector (3) arranged at an edge of a sheet of sheet roll (1), in which ports of a single chip microcontroller in a power control cabinet of the filter forming machine are connected to the servo motor, the ultrasonic detector (3) and a tobacco rod detector of the filter forming machine, respectively, so that the single chip microcontroller adjusts an angular velocity of the servo motor, to make the linear velocity of the edge of the sheet match the real-time linear velocity of rod-forming; the interrupted roller pattern (4) of the stripping rollers is arranged at a surface of an upper roller (5), and the interrupted roller pattern (4)

and an axis of the stripping roller include an angle of 90-45°, while a lower roller (6) is a shallow groove or a smooth roller.

3. The method of claim 2, wherein the interrupted roller pattern (4) of the upper roller (5) of the stripping rollers has smooth segments (7) close to its shaft ends, and the upper roller (5) is equipped with a separate driving device, the upper roller (5) is equipped with a gear (8) at inner edge of one end, a rotating shaft of the lower roller (6) is equipped with a vertical lifting mechanism, and the lower roller (6) is equipped with a gear (9) that matches the upper roller at inner edge. 5
4. The method of claim 2, wherein a buffer area (11) for sheet hanging is located below the sheet of sheet roll (1), and a photoelectric sensor (12) is installed in the buffer area (11), which is connected to the port of the single chip microcontroller in the power control cabinet, and further feeds back to a servo motor control system of the single chip microcontroller, thereby forming closed-loop control for correcting a cumulative deviation during roll release operation of the servo motor. 10
5. The method of claim 3 or 4, wherein the vertical lifting mechanism of the lower roller (6) of the stripping roller is a hydraulic cylinder (10) or a screw structure. 15
6. The method of claim 3 or 4, wherein the strip-guiding horn-shaped mouth (14) is provided with a compressed air inlet (13). 20
7. The method of claim 3 or 4, wherein the rotating shaft (2) of the tobacco sheet roll (1) is an air shaft. 25

Patentansprüche

1. Ein Verfahren zum Nachrüsten einer vorhandenen Zigarettenfilter-Formungsmaschine, um einen Blattstreifen formenden, Streifen aufnehmenden und Stangen formenden Tabakverarbeitungsmechanismus zu erhalten, **dadurch gekennzeichnet, dass:** ein Satz aktiver Rollenfreigabevorrichtungen für Tabakblattrollen (1) zusätzlich hinter den Freigabewalzen der Filterformungsmaschine installiert ist, deren lineare Geschwindigkeit mit der linearen Stangenbildungsgeschwindigkeit des Mechanismus übereinstimmt; ein Paar Freigabewalzen in der Nähe eines Rohrs durch Abstreifwalzen (5, 6) mit einem unterbrochenen Walzenmuster (4) entlang des jeweiligen Umfangs ersetzt wird; und eine Streifen leitende hornförmige Öffnung durch eine sich verjüngende und zusammengezogene hornförmige Öffnung (14) mit einem Einlassdurchmesser von 80-120 mm ersetzt wird. 40

2. Verfahren nach Anspruch 1, wobei die aktive Rollenfreigabevorrichtung einen Servomotor, der auf einer rotierenden Welle (2) der Tabakblattrolle (1) installiert ist, und einen Ultraschalldetektor (3), der an einer Kante eines Blattes der Blattrolle (1) angeordnet ist, einschließt, wobei Anschlüsse eines Einchip-Mikrocontrollers in einem Leistungssteuerschrank der Filterformungsmaschine jeweils mit dem Servomotor, dem Ultraschalldetektor (3) und einem Tabakstangendetektor der Filterformungsmaschine verbunden sind, so dass der Einchip-Mikrocontroller eine Winkelgeschwindigkeit des Servomotors einstellt, um die lineare Geschwindigkeit der Kante des Blattes mit der linearen Echtzeitgeschwindigkeit der Stangenformung in Übereinstimmung zu bringen; das unterbrochene Walzenmuster (4) der Abstreifwalzen ist an einer Oberfläche einer oberen Walze (5) angeordnet, und das unterbrochene Walzenmuster (4) und eine Achse der Abstreifwalze schließen einen Winkel von 90-45° ein, während eine untere Walze (6) eine flache Rille oder eine glatte Walze ist. 5
3. Verfahren nach Anspruch 2, wobei das unterbrochene Walzenmuster (4) der oberen Walze (5) der Abstreifwalzen glatte Segmente (7) in der Nähe ihrer Wellenenden aufweist und die obere Walze (5) mit einer separaten Antriebsvorrichtung ausgestattet ist, die obere Walze (5) mit einem Zahnrad (8) an der Innenkante eines Endes ausgestattet ist, eine Rotationswelle der unteren Walze (6) mit einem vertikalen Hebemechanismus ausgestattet ist und die untere Walze (6) mit einem Zahnrad (9) ausgestattet ist, das mit der oberen Walze an der Innenkante zusammenpasst. 10
4. Verfahren nach Anspruch 2, wobei ein Pufferbereich (11) zum Durchhängen von Blättern unter dem Blatt der Blattrolle (1) angeordnet ist und ein photoelektrischer Sensor (12) in dem Pufferbereich (11) installiert ist, der mit dem Anschluss des Einchip-Mikrocontrollers in dem Leistungssteuerungsschrank verbunden ist und ferner zu einem Servomotor-Steuerungssystem des Einchip-Mikrocontrollers zurückmeldet, wodurch eine Regelschleife zur Korrektur einer kumulativen Abweichung während des Rollenfreigabebetriebs des Servomotors gebildet wird. 15
5. Verfahren nach Anspruch 3 oder 4, wobei der vertikale Hebemechanismus der unteren Walze (6) der Abstreifwalze ein Hydraulikzylinder (10) oder eine Schraubenstruktur ist. 20
6. Verfahren nach Anspruch 3 oder 4, wobei die Streifen leitende hornförmige Öffnung (14) mit einem Drucklufteinlass (13) versehen ist. 25
7. Verfahren nach Anspruch 3 oder 4, wobei die Rota- 30

tionswelle (2) der Tabakblattrolle (1) eine Luftwelle ist.

correspond au rouleau supérieur au niveau du bord intérieur.

Revendications

1. Procédé pour remettre en état une machine de formation de filtre de cigarette existante afin d'obtenir un mécanisme déroulement de feuilles, de collecte de bandelettes, de traitement du tabac pour la formation de bâtonnets, étant **caractérisé en ce que** : un ensemble de dispositif de libération de bobine actif pour rouleaux de feuille de tabac (1) est en outre installé derrière des rouleaux de libération de la machine de formation de filtre, qui a une vitesse linéaire correspondant à une vitesse linéaire de formation de bâtonnets du mécanisme ; une paire de rouleaux de libération près d'un tuyau est remplacée par des rouleaux de déroulement (5, 6), avec un motif de rouleau interrompu (4) le long de la circonférence respective ; et une embouchure en forme de corne de guidage de bandelette est remplacée par une embouchure en forme de corne effilée et repliée (14) avec un diamètre d'entrée de 80 à 120 mm.

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2. Procédé selon la revendication 1, dans lequel le dispositif de libération de bobine actif comprend un servomoteur installé sur un arbre rotatif (2) de la bobine de feuille de tabac (1), et un détecteur à ultrasons (3) agencé au niveau d'un bord d'une feuille de bobine de feuille (1), dans lequel des orifices d'un microcontrôleur à puce unique dans une armoire de commande de puissance de la machine de formation de filtre sont connectés au servomoteur, au détecteur à ultrasons (3) et à un détecteur de bâtonnet de tabac de la machine de formation de filtre, respectivement, de sorte que le microcontrôleur à puce unique ajuste une vitesse angulaire du servomoteur, pour faire correspondre la vitesse linéaire du bord de la feuille à la vitesse linéaire en temps réel de formation de bâtonnets ; le motif de rouleau interrompu (4) des rouleaux de déroulement est agencé au niveau d'une surface d'un rouleau supérieur (5), et le motif de rouleau interrompu (4) et un axe du rouleau de déroulement comprennent un angle de 90 à 45°, tandis qu'un rouleau inférieur (6) est une cannelure peu profonde ou un rouleau lisse.

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3. Procédé selon la revendication 2, dans lequel le motif de rouleau interrompu (4) du rouleau supérieur (5) des rouleaux de déroulement a des segments lisses (7) à proximité de ses extrémités d'arbre, et le rouleau supérieur (5) est équipé d'un dispositif d'entraînement séparé, le rouleau supérieur (5) est équipé d'un engrenage (8) au niveau du bord intérieur d'une extrémité, un arbre rotatif du rouleau inférieur (6) est équipé d'un mécanisme de levage vertical, et le rouleau inférieur (6) est équipé d'un engrenage (9) qui

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4. Procédé selon la revendication 2, dans lequel une zone tampon (11) pour la suspension de feuille est située sous la feuille de la bobine de feuille (1), et un capteur photoélectrique (12) est installé dans la zone tampon (11), qui est connectée à l'orifice du microcontrôleur à puce unique dans l'armoire de commande de puissance, et alimente en outre par effet de retour un système de contrôle de servomoteur du microcontrôleur à puce unique, formant ainsi une commande en boucle fermée pour corriger une déviation cumulative pendant l'opération de libération de rouleau du servomoteur.

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5. Procédé selon la revendication 3 ou 4, dans lequel le mécanisme de levage vertical du rouleau inférieur (6) du rouleau de déroulement est un cylindre hydraulique (10) ou une structure à vis.

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6. Procédé selon la revendication 3 ou 4, dans lequel l'embouchure en forme de corne de guidage de bandelette (14) est pourvue d'une entrée d'air comprimé (13).

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7. Procédé selon la revendication 3 ou 4, dans lequel l'arbre rotatif (2) de la bobine de feuille de tabac (1) est une cheminée d'air.

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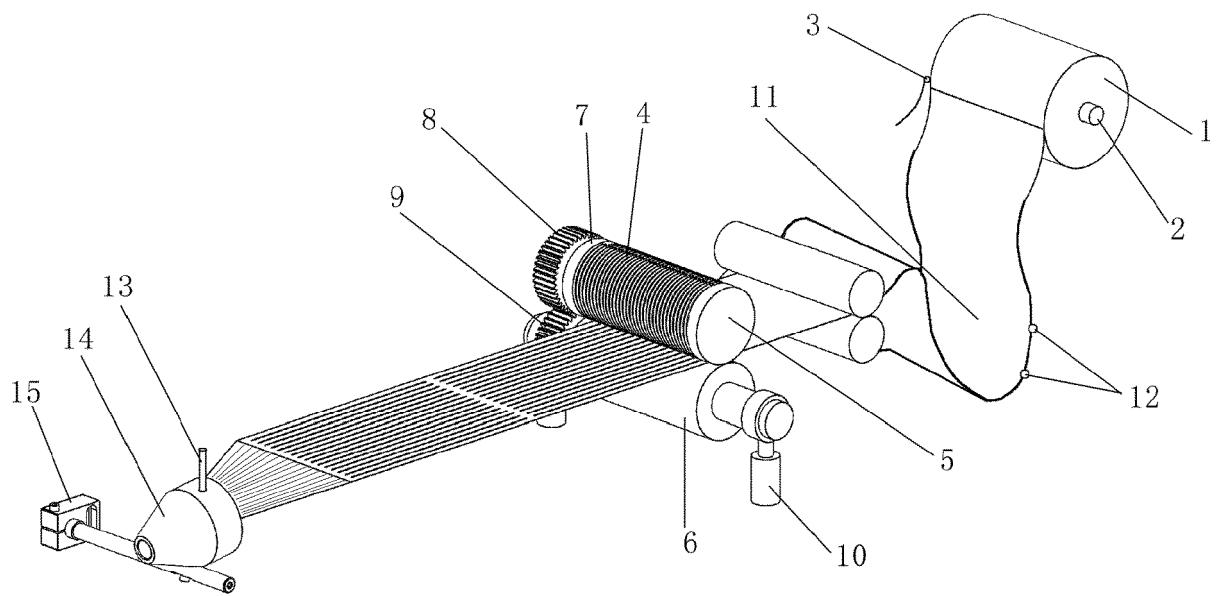


FIG. 1

REFERENCES CITED IN THE DESCRIPTION

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