(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 725 168 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
21.10.2020 Bulletin 2020/43

(21) Application number: **18888293.0**

(22) Date of filing: **12.12.2018**

(51) Int Cl.:
A24B 7/04 *(2006.01)* ***A24C 5/18*** *(2006.01)*
A24B 7/14 *(2006.01)*

(86) International application number:
PCT/CN2018/120454

(87) International publication number:
WO 2019/114727 (20.06.2019 Gazette 2019/25)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **13.12.2017 CN 201711332027**

(71) Applicant: **Hongta Tobacco (Group) Co., Ltd**
Yuxi, Yunnan 653100 (CN)

(72) Inventors:
- **QIN, Zhihong**
  Yuxi, Yunnan 653100 (CN)
- **YANG, Chengbo**
  Yuxi, Yunnan 653100 (CN)
- **ZHANG, Shufang**
  Yuxi, Yunnan 653100 (CN)
- **LIANG, Yuan**
  Yuxi, Yunnan 653100 (CN)
- **TANG, Shunliang**
  Yuxi, Yunnan 653100 (CN)
- **CHEN, Yongkuan**
  Yuxi, Yunnan 653100 (CN)
- **FANG, Xin**
  Yuxi, Yunnan 653100 (CN)
- **LI, Yue**
  Yuxi, Yunnan 653100 (CN)
- **YANG, Yuheng**
  Yuxi, Yunnan 653100 (CN)
- **HAN, Jingjiang**
  Yuxi, Yunnan 653100 (CN)
- **ZHANG, Yisong**
  Yuxi, Yunnan 653100 (CN)
- **ZENG, Xu**
  Yuxi, Yunnan 653100 (CN)
- **LEI, Ping**
  Yuxi, Yunnan 653100 (CN)
- **ZHENG, Mao**
  Yuxi, Yunnan 653100 (CN)
- **WANG, Yueqiong**
  Yuxi, Yunnan 653100 (CN)

(74) Representative: **karo IP**
karo IP Patentanwälte
Kahlhöfer Rößler Kreuels PartG mbB
Platz der Ideen 2
40476 Düsseldorf (DE)

(54) **UNWINDING, SHREDDING, GATHERING, AND ROD FORMING MECHANISM BASED ON CIGARETTE FILTER MAKING DEVICE**

(57) A sheet-striping, strip-gathering, rod-forming mechanism based on a cigarette filter forming machine is disclosed. The present invention relates to tobacco processing machines, and more particularly to a sheet-striping, strip-gathering, rod-forming mechanism based on a cigarette filter forming machine. The mechanism has a set of active roll release device for tobacco sheet roll additionally installed behind releasing rollers of the filter forming machine, which has a linear velocity of the released paper sheet matching a rod-forming linear velocity of the mechanism; a pair of releasing rollers near a pipe is replaced by stripping rollers replacing, 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. The mechanism is simple in structure and only requires moderate additional costs, while being suited for on-line stripping of tobacco sheet roll that is less tough and fragile, and effective in gathering and forming the strips.

EP 3 725 168 A1

(Cont. next page)

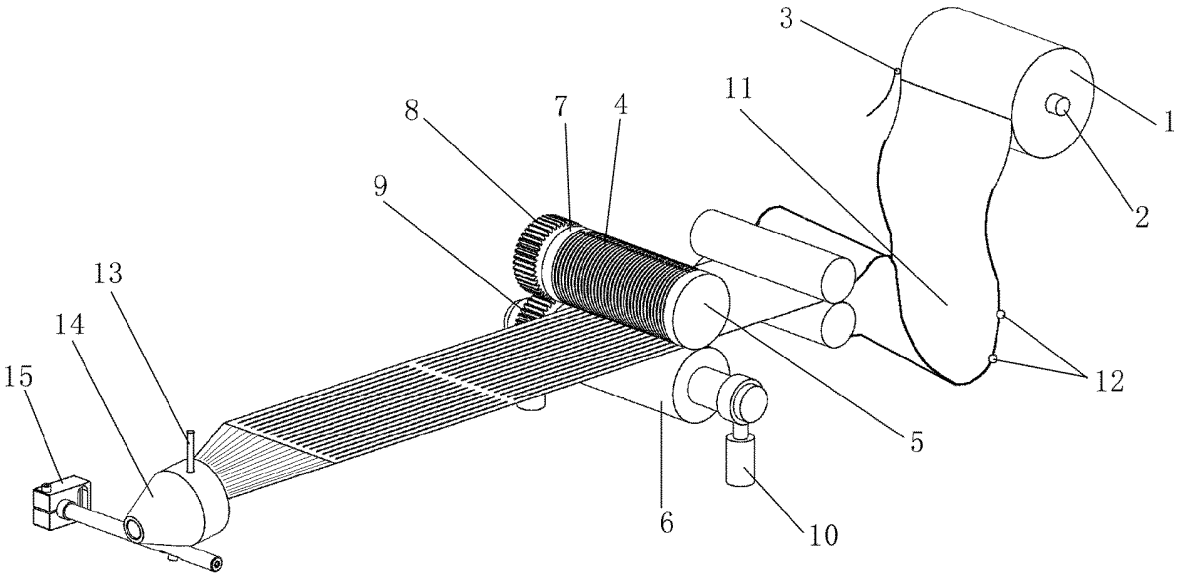

FIG. 1

Description

BACKGROUND OF THE INVENTION

1. Technical Field

[0001] The present invention relates to tobacco processing machines, and more particularly to a sheet-striping, 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] 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

[0004] The technical issue to be addressed by present invention is to provide a sheet-striping, 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.

[0005] 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 rollers 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.

[0006] The sheet-striping, 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.

[0007] 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.

[0008] 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.

[0009] The vertical lifting mechanism of the lower roller of the stripping roller is a hydraulic cylinder or a screw structure.

[0010] The strip-guiding horn-shaped mouth is provided with a compressed air inlet, so as to remove tobacco dust while guiding strips.

[0011] 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.

[0012] 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 rode 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

[0013] FIG. 1 is a schematic drawing of a sheet-striping, strip-gathering, rod-forming mechanism based on a cigarette filter forming machine of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0014] 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 separate 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 sheet-striping, strip-gathering, rod-forming mechanism based on a cigarette filter forming machine, being **characterized in that**: 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 rollers 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.

2. The sheet-striping, 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.

3. The sheet-striping, strip-gathering, rod-forming mechanism based on a cigarette filter forming ma-

chine of claim 2, wherein 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.

4. The sheet-striping, strip-gathering, rod-forming mechanism based on a cigarette filter forming machine of claim 2, wherein 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.

5. The sheet-striping, strip-gathering, rod-forming mechanism based on a cigarette filter forming machine of claim 3 or 4, wherein the vertical lifting mechanism of the lower roller of the stripping roller is a hydraulic cylinder or a screw structure.

6. The sheet-striping, strip-gathering, rod-forming mechanism based on a cigarette filter making machine of claim 3 or 4, wherein the strip-guiding horn-shaped mouth is provided with a compressed air inlet.

7. The sheet-striping, strip-gathering, rod-forming mechanism based on a cigarette filter making machine of claim 3 or 4, wherein the rotating shaft of the tobacco sheet roll is an air shaft.

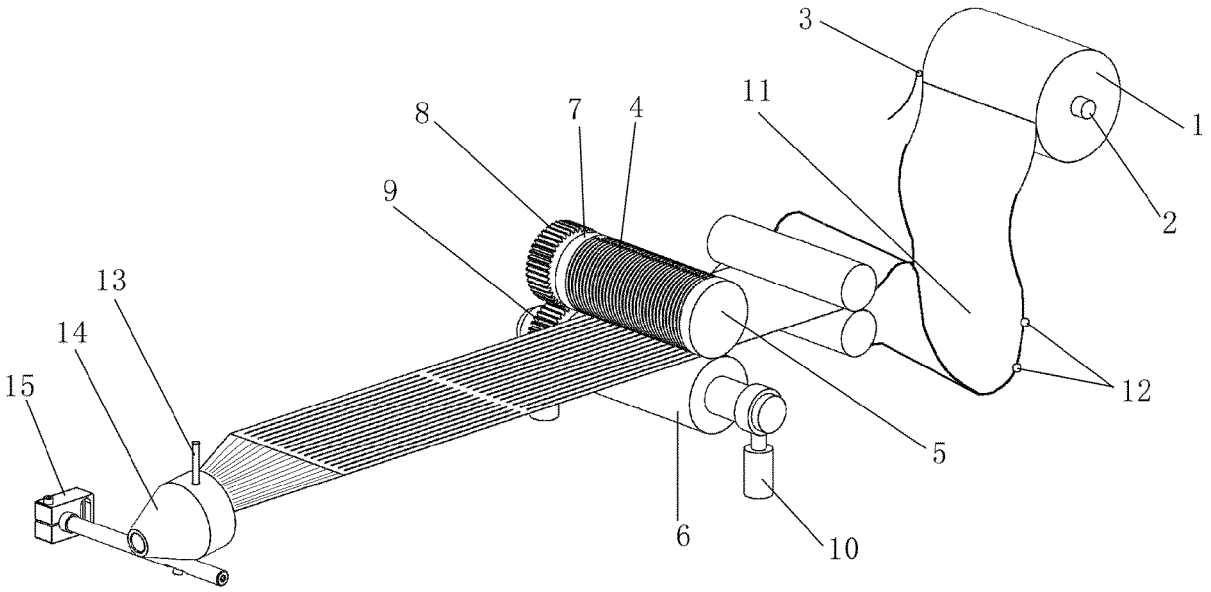

FIG. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2018/120454

A. CLASSIFICATION OF SUBJECT MATTER

A24B 7/04(2006.01)i; A24C 5/18(2006.01)i; A24B 7/14(2006.01)n

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24B; A24C; A24D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS; CNTXT; VEN; USTXT; WOTXT; EPTXT; CNKI: 红塔, 薄片, 重组烟叶, 再造烟叶, 电加热不燃烧, 烟枪, 开松, 辊, 切丝, 聚拢, 喇叭, 漏斗, 滤棒成型, sheet, reconstitute, tobacco, cone, funnel, cut+, slit+, filler

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 107981410 A (HONGTA TOBACCO (GROUP) CO., LTD.) 04 May 2018 (2018-05-04) claims 1-7	1-7
X	US 4168712 A (MOLINS LTD.) 25 September 1979 (1979-09-25) description, column 2, lines 5-68, and figures 1-6	1-7
Y	EP 2062484 A1 (REEMTSMA CIGAREETTENFABRIKEN GMBH) 27 May 2009 (2009-05-27) description, paragraph [0012], and figure 1	1-7
Y	CN 107048469 A (GUANGDONG GOLDEN LEAF TECHNOLOGY DEVELOPMENT CO., LTD.) 18 August 2017 (2017-08-18) description, paragraphs [0042]-[0060]	1-7
A	CN 201602124 U (HUBEI CHINA TOBACCO INDUSTRIAL LLC.) 13 October 2010 (2010-10-13) entire document	1-7
A	US 4047536 A (EMIL S. ASFOUR) 13 September 1977 (1977-09-13) entire document	1-7

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 January 2019	**11 February 2019**
Name and mailing address of the ISA/CN **National Intellectual Property Administration, PRC (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088** **China**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2018/120454

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	107981410	A	04 May 2018	CN	207626532	U	20 July 2018
US	4168712	A	25 September 1979	FR	2316887	B1	06 March 1981
				CH	610735	A5	15 May 1979
				IT	1067113	B	12 March 1985
				BR	7604435	A	31 January 1978
				ZA	7603818	B	25 May 1977
				GB	1531463	A	08 November 1978
				JP	S5210500	A	26 January 1977
				DE	2630614	A1	20 January 1977
				ZA	7603818	A	25 May 1977
				FR	2316887	A1	04 February 1977
				SE	7607769	A	09 January 1977
				SU	664533	A3	25 May 1979
EP	2062484	A1	27 May 2009	WO	2009065459	A1	28 May 2009
				EP	2062484	B1	06 April 2011
				DK	2062484	T3	18 July 2011
				AT	504218	T	15 April 2011
				ES	2361944	T3	24 June 2011
				PT	2062484	E	11 July 2011
				US	2011036364	A1	17 February 2011
				SI	2062484	T1	31 August 2011
				DE	602007013776	D1	19 May 2011
CN	107048469	A	18 August 2017	EP	3417724	A1	26 December 2018
CN	201602124	U	13 October 2010	None			
US	4047536	A	13 September 1977	IT	1045184	B	10 May 1980
				DE	2526850	A1	08 January 1976
				FR	2275160	B1	19 May 1978
				NL	7507320	A	23 December 1975
				JP	S521999	B2	19 January 1977
				JP	S5112999	A	31 January 1976
				GB	1509018	A	26 April 1978
				CH	576753	A5	30 June 1976
				CH	600807	A5	30 June 1978
				BE	830393	A1	18 December 1975
				FR	2275160	A1	16 January 1976

Form PCT/ISA/210 (patent family annex) (January 2015)