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(54) **HEAT-NOT-BURN TOBACCO BASE FOR PREVENTING TOBACCO FROM FALLING OUT, AND USE THEREFOR**

(57) The present invention provides a heat-not-burn tobacco matrix for preventing cut tobacco from falling and an application thereof. The tobacco matrix is formed by disorderly mixing expanded cut tobacco, formula leaf group cut tobacco and/or a tobacco sheet and rolling, and a density of the tobacco matrix is 0.25 g/cm³ to 0.70 g/cm³. According to the heat-not-burn cigarette of the present invention, the expanded cut tobacco is disorderly mixed and intertwined with other tobacco constituents, so that a good supporting effect is achieved on the tobacco matrix, an overall stability of the whole tobacco

matrix is ensured, and a cut tobacco adjusting rate is effectively reduced; by controlling the density of the tobacco matrix, on one hand, a structure stability is guaranteed, and on the other hand, a filling rate of the whole tobacco matrix is adjusted, a smoothness of an air channel is guaranteed, and circulation of aerogel formed by heating and heat transfer are facilitated; and a smoothness of the air channel and a good sucking sensory property of the tobacco matrix are ensured by compatibility and performance cooperation of the constituents.

EP 3 799 747 A1

Description**TECHNICAL FIELD**

5 **[0001]** The present invention relates to the field of novel tobacco products, and more particularly, to a heat-not-burn tobacco matrix for preventing cut tobacco from falling and an application thereof.

BACKGROUND

10 **[0002]** The research and development of heat-not-burn cigarette products is a hot spot in the tobacco industry at present. Different from traditional cigarettes, the heat-not-burn cigarettes designed with an idea of "heat-not-burn" can heat tobacco leaves or tobacco materials just enough to release flavor, without igniting the tobacco leaves or the tobacco materials. In general, under normal circumstances, a sucking temperature of the traditional cigarette is as high as 900°C, and a plurality of potentially harmful substances (HPHCs) are produced by burning, pyrolysis and thermal synthesis of
 15 the tobacco leaves or the tobacco materials under high temperature conditions, while a sucking temperature of the heat-not-burn cigarette is below 400°C, which can reduce the production of HPHCs during burning. According to the heat-not-burn cigarette, compositions of a tobacco matrix are heated by heat of a heating device mainly through the cooperation of the tobacco matrix and the heating device, to generate aerosol for sucking. When the tobacco matrix and the heating device are cooperated for use, the tobacco matrix needs to be inserted into a heating cavity of the heating device, and
 20 the tobacco matrix needs to be separated from the heating device after the tobacco matrix is heated and sucked. Plugging and unplugging of the heating device often lead to cut tobacco falling and remaining in a heater, which is not conducive to cleaning and subsequent use of the heater, and also affects environmental sanitation. At present, a metal mesh cover is wrapped outside cigarette paper to prevent cigarette ash of the traditional cigarette from falling, but this operation is not suitable for low-temperature not-burn cigarettes. Wrapping the mesh cover outside the cigarette paper cannot prevent
 25 the cut tobacco from falling when the heating device is plugged into and out from the tobacco matrix, and the metal mesh cover can also cause friction damage between the tobacco matrix and the heating device. To prevent the tobacco matrix from falling during plugging and unplugging, CN107205494A discloses a patent technology of extractor to prevent tobacco from falling into a heating cavity, but it is troublesome to operate the extractor and then take out cut tobacco each time after the extractor is used, and it is also necessary to clean up residual cut tobacco falling into the extractor.
 30 What is expected in the art is to solve the problem that the cut tobacco falls in the process of plugging and unplugging by improving the tobacco matrix itself.

SUMMARY

35 **[0003]** The present invention aims to overcome the defect of cut tobacco falling in the prior art, and provide a heat-not-burn tobacco matrix for preventing the cut tobacco from falling.
 [0004] An objective of the present invention is to provide a heat-not-burn cigarette which contains the heat-not-burn tobacco matrix for preventing cut tobacco from falling.
 [0005] Another objective of the present invention is to provide an application method of the heat-not-burn cigarette.
 40 **[0006]** The above-mentioned objectives of the present invention are achieved by the following technical solutions.
 [0007] A heat-not-burn tobacco matrix for preventing cut tobacco from falling, wherein the tobacco matrix is formed by disorderly mixing expanded tobacco, formula leaf group cut tobacco and/or a tobacco sheet and rolling, and a density of the tobacco matrix is 0.25 g/cm³ to 0.65 g/cm³.
 [0008] The expanded cut tobacco is added to the tobacco matrix as a filler, and a disorder intertwining degree of the
 45 expanded tobacco matrix is increased through the disorderly mixing of the expanded tobacco and other tobacco constituents, so that the whole tobacco matrix can maintain an overall stability during plugging and unplugging processes of a heater, which plays a good supporting role for the tobacco matrix, and effectively reduces a fall-out rate of the cut tobacco during plugging and unplugging. Moreover, the addition of the expanded tobacco can also adjust a filling rate of the whole tobacco matrix, ensure a smoothness of an air channel, and facilitate circulation and heat transfer of an
 50 aerogel formed by heating.
 [0009] The density or the filling value directly shows a tightness of the cut tobacco. If the density is too high, the tobacco matrix will increase in mass and be too dense, which will easily lead to problems of "head bursting" of the cigarette, unsmooth air flow and large resistance during sucking. If the density is too low, an interaction force between the constituents is not enough, which will easily lead to cut tobacco falling.
 55 **[0010]** For an appropriate density, it also needs to consider a stable internal structure when a heating element is inserted into the cut tobacco, and the cut tobacco is ensured to contact with the heating element as much as possible through the extrusion of the heating element, so as to improve a heat transfer efficiency. Meanwhile, the extrusion of the heating element enables the tobacco matrix to provide a proper air flow path and ventilation, and the structure of

the tobacco can still maintain a stable shape after heating and baking.

[0011] Preferably, a moisture mass percentage of the tobacco matrix is 5.0% to 12.5%.

[0012] In a specific tobacco matrix, the tobacco matrix may have a density of 0.25 g/cm³ and a moisture mass percentage of 10.5%, a density of 0.45 g/cm³ and a moisture mass percentage of 11.5%, or a density of 0.65 g/cm³ and a moisture mass percentage of 9.5%.

[0013] The moisture of the cut tobacco has an important influence on sensory characteristics, brittleness and elasticity of the cut tobacco, and more importantly, on a processing performance thereof, and a moisture of a certain constituent is controlled to a level of 11.5% to 12.5% lower than that of a traditional cigarette.

[0014] Preferably, at least one of the three constituents of the tobacco matrix is controlled at 5.0% to 11.0%, which not only regulates the overall moisture of the tobacco matrix, but also adjusts overall physical characteristics of the tobacco matrix, thus facilitating machine processing. The moisture and processing performance will not be significantly affected. Moreover, the brittleness is increased and a structure stability of the disordered tobacco is ensured.

[0015] Preferably, a mass of the expanded tobacco is 5% to 40% of a total mass of the tobacco matrix.

[0016] Preferably, the mass of the expanded tobacco is 15% to 30% of the total mass of the tobacco matrix.

[0017] Due to the large losses of aroma components in the preparation process of the expanded cut tobacco and thus taste while sucking is bland, the inventors found through continuous exploration that a sucking sense of the tobacco matrix can be fully guaranteed, and an effect of preventing the cut tobacco from falling can also be well achieved when an addition amount of the expanded cut tobacco is 15% to 30%.

[0018] Preferably, a filling value of the expanded tobacco is 4.5 cm³/g to 7.5 cm³/g, and a whole cut rate of the expanded cut tobacco is 70% to 90%. For example, the filling value may be 7.12 cm³/g, 4.88 cm³/g, 6.21 cm³/g or 6.07 cm³/g; and the whole cut rate may be 70%, 75%, 80%, 83%, 85% or 87%.

[0019] The filling value of the expanded tobacco is an important index of an expansion effect, and a high filling rate can directly improve an overall filling rate of the tobacco matrix; the whole cut rate is a main index of the expanded tobacco structure, which can effectively guarantee a supporting stiffness of the expanded tobacco to the tobacco substrate. A certain whole cut rate is also beneficial to the improvement of an intertwining degree between the expanded tobacco and the tobacco sheet, and can well reduce a fall-out rate of the cut tobacco.

[0020] Preferably, the filling value of the expanded cut tobacco is 6.5 cm³/g to 7.5 cm³/g, and the whole cut rate of the expanded cut tobacco is 83% to 90%.

[0021] Preferably, a size of the expanded tobacco is greater than or equal to 1.0 mm. The expanded tobacco is broken cut tobacco when the size of the expanded tobacco is less than 1.0 mm. The broken cut tobacco cannot support the tobacco matrix well, and will affect the smoothness of the air channel of the whole tobacco matrix and increase a sucking resistance.

[0022] The length of the cut tobacco affects a bending degree and smooth processing. If the cut tobacco is too long, the density of the cut tobacco will be uneven, and "loose-end" or "bamboo joint cigarette" will appear. An appropriate length has great influence on the processing performance of the tobacco matrix. This constituent with appropriate length may be any one or two of the formula leaf group cut tobacco and the tobacco sheet. Considering that the manufacturing methods and physical properties of each constituent are quite different, constituents with large elasticity and overlength are not suitable for the heat-not-burn tobacco matrix, and the length needs to be selected with reference to other physical indexes.

[0023] For various constituents of the tobacco, the length herein also refers to a size at the largest or widest point.

[0024] Preferably, the expanded tobacco is expanded cut tobacco and/or expanded cut stem.

[0025] Preferably, the expanded tobacco is the expanded cut tobacco. The expanded cut tobacco is superior to the expanded cut stem in aroma and sucking quality, and a whole cut rate and an expansion size of the expanded cut tobacco are also greater than that of the expanded cut stem; meanwhile, the expanded cut tobacco is superior to ordinary cut tobacco in space filling rate, coke reduction and harm reduction, which can further improve a sucking sensory performance of the tobacco matrix. Therefore, the expanded cut tobacco is preferred.

[0026] Preferably, a mass of the formula leaf group cut tobacco is 0% to 95% of a total mass of the tobacco matrix.

[0027] Preferably, a mass of the tobacco sheet is 0% to 95% of a total mass of the tobacco matrix.

[0028] Preferably, a size of the tobacco sheet is 0.1 mm to 0.3 mm in thickness, 2 mm to 30 mm in length, and 1 mm to 2 mm in width.

[0029] The tobacco sheet may be prepared by a dry process, a rolling process and a paper-making process, wherein a two-step approach is employed in the paper-making process to prepare the tobacco sheet, in which tobacco raw materials are extracted first, then the paper-making process is employed to prepare a solid phase into a tobacco sheet, a liquid phase is concentrated and coated on the tobacco sheet, and then the obtained tobacco sheet is shredded into the final tobacco sheet. Controlling a length and a width of the tobacco sheet is beneficial to intertwining between the tobacco sheet and the expanded cut tobacco, and further improves a stiffness and a spatial stability, which is not only beneficial to increase an air flow channel, but also can reduce a fall-out rate of the cut tobacco.

[0030] Preferably, a tobacco extract, an atomizing agent and an aroma component are loaded on the formula leaf

group cut tobacco and/or the tobacco sheet and/or the expanded tobacco.

[0031] The present invention further protects a heat-not-burn cigarette which contains the heat-not-burn tobacco matrix. The heat-not-burn cigarette includes a mouth contact section, a cooling section and a heat-not-burn tobacco matrix section, wherein the heat-not-burn tobacco matrix section is the heat-not-burn tobacco matrix according to the present invention.

[0032] The present invention further protects an application method of the heat-not-burn cigarette, which includes the following steps: inserting the heat-not-burn cigarette into a heating element for fixed heating, sucking, rotating for at least 30 degrees after sucking, and pulling out the heat-not-burn cigarette.

[0033] The heat-not-burn cigarette according to the present invention is preferably used in cooperation with a corresponding heater, and the heater specifically include a heating element and a fixing seat for the heating element, a sleeve, a control element and a housing, as well as a cigarette insertion opening, a vent hole and a power switch on the housing, wherein the sleeve, the heating element and the cigarette insertion opening form a heating cavity of the tobacco matrix. The air flow enters the heater and the cigarette through the vent holes, the cigarette is inserted into the sleeve through the cigarette insertion opening and receives heat from the heating element, and the sleeve is provided with a positioning piece, so that the heat-not-burn tobacco matrix can receive the heat of the heating element to the maximum extent.

[0034] The specific operation during use is as follows:

(1) inserting the heat-not-burn cigarette into the heating cavity through the cigarette insertion opening and contacting with the positioning piece;

(2) pressing the power switch to start heating, so that the heat of the heating element heats the heat-not-burn tobacco matrix for people to suck; and

(3) rotating for at least 30 degrees after sucking, and pulling out the heat-not-burn cigarette.

[0035] The root cause why the cut tobacco does not fall off lies in stable structure and moderate strength thereof. Even if a heating rod is inserted, the structure can be guaranteed to be stable, and an extrusion effect of the heating rod can make an internal shape not change obviously after heating.

[0036] Compared with the prior art, the present invention has the following beneficial effects.

(1) According to the heat-not-burn cigarette of the present invention, the expanded tobacco is disorderly mixed and intertwined with other tobacco constituents, so that a good supporting effect is achieved on the tobacco matrix, an overall stability of the whole tobacco matrix is ensured, and a cut tobacco adjusting rate is effectively reduced.

(2) According to the heat-not-burn cigarette of the present invention, by controlling the density of the tobacco matrix, on one hand, a structure stability is guaranteed, and on the other hand, a filling rate of the whole tobacco matrix is adjusted, a smoothness of an air channel is guaranteed, and circulation of an aerogel formed by heating and heat transfer are facilitated.

(3) According to the heat-not-burn cigarette of the present invention, a smoothness of the air channel and a good sucking sensory property of the tobacco matrix are ensured by compatibility and performance cooperation of the constituents.

DETAILED DESCRIPTION

[0037] The present invention will be further described below with reference to the specific embodiments, but the embodiments are not intended to limit the present invention in any form. Unless otherwise indicated, the reagents, methods, and devices employed in the present invention are routine reagents, methods, and devices in the art.

[0038] The reagents and materials used in the present invention are commercially available unless otherwise stated.

Embodiment 1

[0039] A heat-not-burn tobacco matrix for preventing cut tobacco from falling, wherein the tobacco matrix was formed by disorderly mixing expanded tobacco, formula leaf group cut tobacco and/or tobacco sheet and rolling, a density of the tobacco matrix was 0.25 g/cm^3 , and a moisture content of the tobacco matrix was 10.5%

Embodiment 2

[0040] A heat-not-burn tobacco matrix for preventing cut tobacco from falling, wherein the tobacco matrix was formed by disorderly mixing expanded tobacco, formula leaf group cut tobacco and/or tobacco sheet and rolling, a density of the tobacco matrix was 0.65 g/cm^3 , and a moisture content of the tobacco matrix was 9.5%

Embodiments 3 to 9

[0041] A heat-not-burn tobacco matrix for preventing cut tobacco from falling, wherein the tobacco matrix was formed by disorderly mixing expanded tobacco, formula leaf group cut tobacco and/or tobacco sheet and rolling, a density of the tobacco matrix was 0.45 g/cm³, a moisture content of the tobacco matrix was 8%, a mass of the tobacco sheet was 50% of a total mass of the tobacco matrix, and a size of the expanded tobacco was greater than or equal to 1.0 mm.

[0042] See Table 1 for specific parameters of the tobacco sheet and the expanded cut tobacco.

Table 1

Serial number	Expanded cut tobacco				Tobacco sheet		
	Filling value cm ³ /g	Whole cut rate %	Mass fraction%	Category	Thickness mm	Length mm	Width mm
Embodiment 3	7.12	83	15	Expanded cut tobacco	0.1	2	1
Embodiment 4	7.12	85	30	Expanded cut tobacco	0.3	15	2
Embodiment 5	4.88	87	15	Expanded cut stem	0.1	2	1
Embodiment 6	4.88	87	30	Expanded cut stem	0.3	15	2
Embodiment 7	6.21	70	15	Ordinary cut tobacco	0.1	2	1
Embodiment 8	6.07	75	30	Ordinary cut tobacco	0.3	15	2
Embodiment 9	7.12	80	20	Expanded cut tobacco	0.2	20	1.5
Embodiment 10	4.88	87	5	Expanded cut stem	0.1	2	1
Embodiment 11	4.88	87	40	Expanded cut stem	0.1	2	1

Result detection

[0043] 400 tobacco matrixes mentioned above were prepared, and a sucking experiment was carried out with the cooperation of a heater.

[0044] A specific sucking experiment was as follows:

(1) inserting the heat-not-burn cigarette into the heating cavity through the cigarette insertion opening and contacting with the positioning piece;

(2) pressing a power switch to start heating, so that the heat of the heating element heated the heat-not-burn tobacco matrix for people to suck; and

(3) rotating for at least 30 degrees after sucking, and pulling out the heat-not-burn cigarette.

[0045] A fall-out rate of the cut tobacco after heating and sucking was evaluated, wherein a score of 5 referred to that no cut tobacco fell out basically; a score of 4 referred to that a small amount of cut tobacco fell out; a score of 3 referred to that part of the cut tobacco fell out obviously; a score of 2 referred to a large number of cut tobacco fell out; and a score of 1 referred to that all the cut tobacco fell out basically.

Table 2

Serial number	Evaluation of fall-out of cut tobacco	Sensory evaluation
Embodiment 1	4.5	8
Embodiment 2	5	8
Embodiment 3	5	9
Embodiment 4	5	9.5
Embodiment 5	5	9
Embodiment 6	4	8.5
Embodiment 7	4	8
Embodiment 8	4	8.5
Embodiment 9	4	8
Embodiment 10	4.5	8
Embodiment 11	4	8

[0046] A method in ISO standard 6565:2002 was used to measure the sucking resistance. It should be noted that, when testing the sucking resistance, measurement results of cigarettes inserted into the heating cavity of the heater are as shown in Table 3.

Table 3

Serial number	Sucking resistance/kPa
Embodiment 1	0.251
Embodiment 2	0.445
Embodiment 3	0.321
Embodiment 4	0.283
Embodiment 5	0.246
Embodiment 6	0.346
Embodiment 7	0.575
Embodiment 8	0.484
Embodiment 9	0.535
Embodiment 10	0.433
Embodiment 11	0.258

Comparative Example 1

[0047] A heat-not-burn tobacco matrix was formed by disorderly rolling tobacco sheet, wherein the tobacco sheet were the same as those in Embodiment 1, with a thickness of 0.1 mm, a length of 2 mm and a width of 1 mm. A score of a fall-out rate of the cut tobacco after sucking was 4, and a sucking resistance was 0.935 kPa.

Comparative Example 2

[0048] A heat-not-burn tobacco matrix was formed by disorderly mixing tobacco sheet and expanded cut tobacco and rolling, wherein the tobacco sheet were the same as those in Embodiment 1, with a thickness of 0.1 mm, a length of 2 mm and a width of 1 mm. A fill-rate of the expanded cut tobacco was 7.12 cm³/g, a whole cut rate of the expanded cut tobacco was 83%, and a mass fraction of the expanded cut tobacco was 5%. A score of a fall-out rate of the cut tobacco after sucking was 3, and a sucking resistance was 0.845 kPa.

Comparative Example 3

[0049] A heat-not-burn tobacco matrix was formed by disorderly mixing tobacco sheet and expanded cut tobacco and rolling, wherein the tobacco sheet were the same as those in Embodiment 1, with a thickness of 0.1 mm, a length of 2 mm and a width of 1 mm. A fill-rate of the expanded cut tobacco was 7.12 cm³/g, a whole cut rate of the expanded cut tobacco was 83%, and a mass fraction of the expanded cut tobacco was 50%. A score of a fall-out rate of the cut tobacco after heating and sucking was 5, and a sucking resistance was 0.445 kPa, but the heat-not-burn tobacco matrix had a very poor sucking taste and bland aroma.

[0050] From the foregoing embodiments and comparative examples, it can be seen that the tobacco matrix formed by rolling the tobacco sheet without the expanded cut tobacco in Comparative Example 1 is easy to fall out after heating and sucking, which is obviously inferior to the embodiments; the content of the expanded cut tobacco added in Comparative Example 2 is too low, and the phenomenon of the cut tobacco falling out after heating and sucking of the obtained tobacco matrix is also obvious, which is not as good as that of the embodiments; and the addition amount of the expanded cut tobacco in Comparative Example 3 is too large, which can control the fall-out rate of the cut tobacco well, but excessive addition of the expanded cut tobacco will damage overall aroma and overall sensory evaluation of the tobacco matrix.

[0051] Obviously, the above-mentioned embodiments of the present invention are merely examples for clearly illustrating the present invention, but are not intended to limit the implementations of the present invention. For those of ordinary skills in the art, other different forms of changes or variations can be made on the basis of the above description. It is not necessary or possible to exhaust all the implementations here. Any modifications, equivalent substitutions, and improvements made within the spirit and principle of the present invention shall all fall within the scope of protection claimed by the present invention.

Claims

1. A heat-not-burn tobacco matrix for preventing cut tobacco from falling, **characterized in that**, the tobacco matrix is formed by disorderly mixing expanded tobacco, formula leaf group cut tobacco and/or a tobacco sheet and rolling, and a density of the tobacco matrix is 0.25 g/cm³ to 0.70 g/cm³.
2. The heat-not-burn tobacco matrix according to claim 1, **characterized in that**, a moisture mass percentage of the tobacco matrix is 5.0% to 12.5%.
3. The heat-not-burn tobacco matrix according to claim 2, **characterized in that**, a moisture mass percentage of at least one constituent of the tobacco matrix is 5.0% to 11.0%.
4. The heat-not-burn tobacco matrix according to claim 1, **characterized in that**, a mass of the expanded tobacco is 5% to 40% of a total mass of the tobacco matrix.
5. The heat-not-burn tobacco matrix according to claim 4, **characterized in that**, a filling value of the expanded tobacco is 4.5 cm³/g to 7.5 cm³/g, and a whole cut rate of the expanded cut tobacco is 70% to 90%.
6. The heat-not-burn tobacco matrix according to claim 5, **characterized in that**, a size of the expanded tobacco is greater than or equal to 1.0 mm.
7. The heat-not-burn tobacco matrix according to claim 6, **characterized in that**, the expanded tobacco is expanded cut tobacco and/or expanded cut stem.
8. The heat-not-burn tobacco matrix according to claim 1, **characterized in that**, a mass of the formula leaf group cut tobacco is 0% to 95% of a total mass of the tobacco matrix.
9. The heat-not-burn tobacco matrix according to claim 1, **characterized in that**, a mass of the tobacco sheet is 0% to 95% of a total mass of the tobacco matrix.
10. The heat-not-burn tobacco matrix according to claim 9, **characterized in that**, a size of the tobacco sheet is 0.1 mm to 0.3 mm in thickness, 2 mm to 30 mm in length, and 1 mm to 2 mm in width.
11. The heat-not-burn tobacco matrix according to claim 1, **characterized in that**, a tobacco extract, an atomizing agent and an aroma component are loaded on the formula leaf group cut tobacco and/or the tobacco sheet and/or the

expanded tobacco.

12. A heat-not-burn cigarette, **characterized in that**, the heat-not-burn cigarette comprises the heat-not-burn tobacco matrix according to any one of claims 1 to 11.

13. An application method of the heat-not-burn cigarette according to claim 12, **characterized in that**, the application method comprises the following steps: inserting the heat-not-burn cigarette into a heating element for fixed heating, sucking, rotating for at least 30 degrees after sucking, and pulling out the heat-not-burn cigarette.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/095704

A. CLASSIFICATION OF SUBJECT MATTER A24F 47/00(2020.01)i 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) A24F 47/- 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) 中国期刊全文数据库; CJFD; 万方学术数据库; China Science Periodical Database of WANFANG; ISI web of science; 万方学位论文; China Dissertation Database of WANFANG; CNABS; DWPI; CNTXT; WOTXT: 广东中烟工业有限责任公司, 赵瑞峰, 李峰, 胡静, 刘熙, 刘义波, 卢志菁, 单婧, 防止烟丝掉落, 加热不燃烧烟草基体, 膨丝, 配方叶组丝, 烟草薄片, 无序混合, heated noncombustible tobacco substrate, randomly mixing, expanded silk, formulated leaf tissue, tobacco sheet, prevent tobacco from falling		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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Date of the actual completion of the international search 28 February 2020	Date of mailing of the international search report 30 March 2020	
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451	Authorized officer Telephone No.	

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INTERNATIONAL SEARCH REPORT

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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