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(54) Title: A FEEDING DEVICE FOR FEEDING A CONTINUOUS THREAD INTO A CONTINUOUS FIBROUS BAND IN A TOBACCO INDUSTRY MACHINE FOR MANUFACTURING ROD-LIKE ELEMENTS AND A MACHINE FOR MANUFACTURING ROD-LIKE ELEMENTS

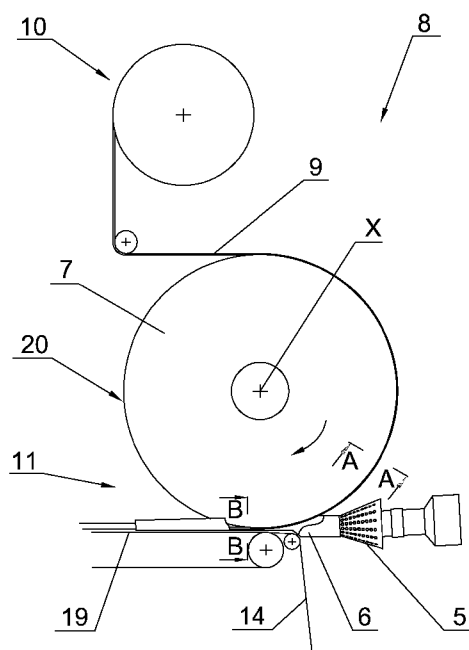


Fig. 2

(57) Abstract: A feeding device (8, 8', 8'', 8''') for feeding a continuous thread (9) into a continuous fibrous band, in a tobacco industry machine for manufacturing rod-like elements, wherein the fibrous band is formed to a form of a continuous rod (CR) comprising the continuous thread (9) surrounded by the continuous fibrous band, the feeding device (8, 8', 8'', 8''') comprising: a thread supply unit (10) for feeding the continuous thread (9); a thread feeding unit (11) for feeding the continuous thread (9) into the continuous fibrous band wherein the continuous thread (9) is fed into the middle of the continuous fibrous band; wherein the feeding device (8, 8', 8'', 8''') is configured such that the thread feeding unit (11) is located between a fibrous band preparation unit (4) and a garniture unit (15) for forming the continuous rod. The feeding device (8, 8', 8'', 8''') further comprises at least one feeding wheel (7), having at least one circumferential groove (21) for guiding at least one continuous thread (9).

Declarations under Rule 4.17:

- *as to the identity of the inventor (Rule 4.17(i))*
- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*
- *of inventorship (Rule 4.17(iv))*

Published:

- *with international search report (Art. 21(3))*
- *with amended claims and statement (Art. 19(1))*

A FEEDING DEVICE FOR FEEDING A CONTINUOUS THREAD INTO A
CONTINUOUS FIBROUS BAND IN A TOBACCO INDUSTRY MACHINE FOR
MANUFACTURING ROD-LIKE ELEMENTS AND A MACHINE FOR
MANUFACTURING ROD-LIKE ELEMENTS

TECHNICAL FIELD

The present invention relates to a feeding device for feeding a continuous thread into a continuous fibrous band in a tobacco industry machine for manufacturing rod-like elements and a machine for manufacturing rod-like elements.

BACKGROUND

Tobacco industry plants manufacture various kinds of smoking products, among others cigarettes. The cigarettes usually comprise filters to filter tobacco smoke and eliminate harmful substances. Typically, acetate fibers are used as a filtering material. The acetate fibers are usually fed in a form of a continuous band. Nowadays, cigarettes often have multi-segment filters, which may comprise different kinds of rod-like segments for filtering tobacco smoke, as well as segments for providing other functions. For example, aromatizing segments may be provided, the aromatizing segments having scent capsules, scent threads or strips, which are usually located in a central portion of segments. The threads or strips may also serve a decorative function, since they are visible at the front surface of the filter. Therefore, manufacturers have a need for a device for feeding a continuous thread into a continuous fibrous band.

US patents US7074170 and US7691043 disclose a device for feeding a continuous strip saturated with an aromatic substance, into a continuous filtering material, to form a filter rod which is then cut to single filter rods.

Machines for manufacturing filter rod-like elements, known from the prior art, are typically provided with feeding units which do not guarantee uniform positioning of the fed continuous material. The present invention aims to provide an improved device for feeding a continuous thread for use in machines for manufacturing rod-like elements.

SUMMARY

There is disclosed a feeding device for feeding a continuous thread into a continuous fibrous band, in a tobacco industry machine for manufacturing rod-like elements, wherein the fibrous band is formed to a form of a continuous rod comprising the continuous thread surrounded by the continuous fibrous band. The feeding device comprises: a thread supply unit for feeding the continuous thread; a thread feeding unit for feeding the continuous thread into the continuous fibrous band wherein the continuous thread is fed into the middle of the continuous fibrous band. The feeding device is configured such that the thread feeding unit is located between a fibrous band preparation unit and a garniture unit for forming the continuous rod. The feeding device further comprises at least one feeding wheel, having at least one circumferential groove for guiding at least one continuous thread.

The feeding wheel may comprise two circumferential grooves for guiding two threads.

The circumferential grooves may have different diameters.

The feeding wheel may comprise three circumferential grooves for guiding three threads.

The circumferential grooves may have different diameters.

The device may comprise two feeding wheels.

The feeding wheels may have different diameters.

The device may comprise three feeding wheels.

The feeding wheels may have different diameters.

There is also disclosed a machine for manufacturing rod-like elements, the machine comprising: a fibrous band supply unit for feeding a continuous fibrous band; a fibrous band preparation unit for preparing the fibrous band; a feeding device for feeding a continuous thread; a wrapper feeding unit for feeding a wrapper; a garniture unit for forming a continuous rod, wherein the continuous rod comprises the fibrous band and the continuous thread and is wrapped by the wrapper; a cutting head for cutting the continuous rod into the rod-like elements, wherein the feeding device is the feeding device as described herein.

The device according to the invention allows positioning a continuous thread in a continuous fibrous band without slipping, wherein the thread is fed synchronically into the fibrous band, i.e. with the speed of transfer of the fibrous band. The device according to the invention allows manufacturing of rod-like elements in which a

distance between the threads is reproducible during manufacturing, providing high quality of products. The device according to the invention allows various arrangements of one or more threads in a section of a continuous rod.

BRIEF DESCRIPTION OF FIGURES

The system is shown by means of example embodiments in a drawing, in which:

Fig. 1 shows a machine for manufacturing filter rods;

Fig. 2 shows a feeding device according to the invention in a first embodiment;

Fig. 3 shows a cross-section of a feeding wheel for feeding the thread of the feeding device of Fig. 2;

Fig. 4 shows a cross-section of the feeding wheel of the feeding device of Fig. 2 at a point wherein the thread is placed into the fibrous band;

Fig. 5 shows the feeding device according to the invention in a second embodiment;

Figs. 6-9 show a cross-section of the feeding wheel for feeding the thread of the feeding device of Fig. 5;

Fig. 10 shows the feeding device according to the invention in a third embodiment;

Figs. 11-12, 11a-12a show a cross-section of the feeding wheel for feeding the thread of the feeding device of Fig. 10;

Fig. 13 shows the feeding device according to the invention in a fourth embodiment;

Figs. 14-17 show a cross-section of the feeding wheel for feeding the thread of the feeding device of Fig. 13;

Fig. 18 shows a machine for manufacturing tobacco rods.

Fig. 1 shows schematically a machine 1 for manufacturing filter rods R. Fibers of a filtering material, for example acetate fibers in a form of a band that forms the filtering material 2, may be fed by a fibrous band supply unit 17 from a container in a form of a bale 3. The fibers of the filtering material may be compressed in the bale 3. The fibers of the filtering material band 2 are stretched and loosened by means of compressed air and cylinders of a fibrous band preparation unit 4 for preparing a filtering material band. As a result of stretching and loosening, the fibers of the filtering band 2 detach from each other and may accommodate more air in between. In the preparation unit 4, the fibers may be soaked with a softening fluid (for example, triacetin). The machine 1 for manufacturing filter rods R has an inserting element 5 in a form of a funnel, through which the band of the filtering material 2 is passed from the

preparation unit 4. While the band of the filtering material 2 passes through the inserting element 5, the fibers are initially compacted. The inserting element 5 may have openings, which facilitate discharging the excess of air from between the fibers of the filtering material band 2. The inserting element 5 is followed by a guiding element 6 for guiding the filtering material band 2, wherein the band is initially formed. The guiding element 6 is configured to cooperate with a feeding wheel 7 of a feeding device 8 for feeding a continuous thread 9 by a thread feeding unit 11, wherein the continuous thread 9 is fed from a thread supply unit 10.

The feeding device 8, in a direction of the filtering material band 2, is followed by a glue feeding unit 12 and a forming unit 13 for winding the band 2 into a wrapper 14. The glue feeding unit 12 and the forming unit 13, which are components of a garniture unit 15, have guides for guiding the wrapper 14. The wrapper 14 is fed by a wrapper feeding unit 18. The machine 1 further comprises a rotary cutting head 16 for cutting a continuous filter rod CR to single filter rods R.

The continuous thread 9 is a material of a cross-section having a width close to its height and preferably, the width is equal to the height. For example, the thread 9 may have a cross-section in a form of a circle, an equilateral triangle or a square. The thread may have a cross-section of a circle or an oval and may be hollow i.e. may have a form of a pipe.

Fig. 2 shows an enlarged view of a first embodiment of the feeding device 8 for feeding the continuous thread 9. The continuous thread 9 is fed from the thread supply unit 10. The thread may be supplied from a reel and fed by any type of thread or string feeding unit which feeds the thread from the reel, wherein the thread feeding unit may comprise a thread tensioning unit. The feeding device 8 comprises a feeding wheel 7 having a rotation axis X. The circumferential surface 20 of the feeding wheel 7 has groove 21 as shown in a cross-section in Fig. 3. The cross-section B-B (Fig. 4) shows the thread 9 being placed into the filtering material band 2. Further on during the movement of the continuous filtering material 2 together with the wrapper 14 on a garniture belt 19, the continuous thread 9 is wrapped by the filtering material 2. In that embodiment, the continuous thread 9 contacts (encircles) the feeding wheel 7 along a half of its cylindrical circumferential surface 20. The large contact angle allows the continuous thread to be fed without slipping, i.e. with a circumferential speed of the feeding wheel 7, which corresponds to the speed of the movement of the band 2. The

feeding wheel 7 may have its own drive unit which is synchronized with drive units of other elements of the machine 1.

Fig. 5 shows a second embodiment of the feeding device 8'. The feeding device 8' comprises two thread supply units 10 and 10' for feeding the thread 9 and 9'. The threads 9 and 9' are fed onto single feeding wheel comprising two grooves 21 and 21' on its circumferential surface as shown in a cross-section C-C in Fig. 6. Fig. 7 shows a cross-section D-D in which the threads 9 and 9' are placed into the filtering material band 2. Owing to the application of the feeding wheel which comprises two grooves, it is possible to locate two threads symmetrically with respect to the center of the filtering material band 2. The same effect may be achieved by application of two feeding wheels 7 and 7' having grooves 21 and 21' as shown in Figs. 8 and 9. In both cases the grooves may be arranged such that the threads are in contact on the feeding wheel or on the feeding wheels and in a finished continuous rod.

In a third embodiment shown in Fig. 10, the feeding device 8'' comprises two thread supply units 10 and 10' and two feeding wheels 7 and 7'' comprising grooves 21, 21' wherein the wheels 7 and 7'' have different diameters, shown in a cross-section E-E in Fig. 11 and cross-section F-F in Fig. 12, owing to which the threads 9 may be distanced away from each other by a greater distance than in case of application of the wheels 7 and 7' having the same diameter or one wheel having two grooves. The feeding wheels 7 and 7'' may be connected with each other i.e. may have a form of a single wheel in which the diameters of the grooves 21 and 21' are different as shown in Fig. 11a and Fig. 12a.

In a fourth embodiment shown in Fig. 13, the feeding device 8''' comprises three thread supply units 10, 10' and 10'' and three feeding wheels 7, 7'' and 7''' with circumferential grooves 21, 21' and 21'' as shown in a cross-section G-G in Fig. 14 and cross-section H-H in Fig. 15.

The cross-section G-G in Fig. 16 and the cross-section H-H in Fig. 17 shows a single feeding wheel 7'''' comprising three grooves 21, 21', 21''. In another embodiment the feeding wheel may have the grooves 21 and 21' having the same diameter and the groove 21'' having greater diameter owing to which the threads are arranged in a form of a triangle in the final product.

Fig. 18 shows a machine for manufacturing rod-like elements from shredded tobacco. The tobacco material is fed by a fibrous band supply unit 17'. A continuous band of tobacco material is fed on the wrapper 14 and passes through the region of

operation of the feeding device 8, that feeds the continuous thread 9 into the band of tobacco material.

Further embodiments are possible, that comprise one or more of the features of the embodiments discussed above combined with each other.

CLAIMS

1. A feeding device (8, 8', 8'', 8''') for feeding a continuous thread (9) into a continuous fibrous band, in a tobacco industry machine for manufacturing rod-like elements, wherein the fibrous band is formed to a form of a continuous rod (CR) comprising the continuous thread (9) surrounded by the continuous fibrous band, the feeding device (8, 8', 8'', 8''') comprising:

- a thread supply unit (10) for feeding the continuous thread (9);
- a thread feeding unit (11) for feeding the continuous thread (9) into the continuous fibrous band wherein the continuous thread (9) is fed into the middle of the continuous fibrous band;
- wherein the feeding device (8, 8', 8'', 8''') is configured such that the thread feeding unit (11) is located between a fibrous band preparation unit (4) and a garniture unit (15) for forming the continuous rod;

the feeding device (8, 8', 8'', 8''') being characterized by further comprising:

- at least one feeding wheel (7), having at least one circumferential groove (21) for guiding at least one continuous thread (9).

2. The device according to claim 1, wherein the feeding wheel (7) comprises two circumferential grooves (21, 21') for guiding two threads (9, 9').

3. The device according to claim 2, wherein the circumferential grooves (21, 21') have different diameters.

4. The device according to claim 1, wherein the feeding wheel (7''') comprises three circumferential grooves (21, 21', 21'') for guiding three threads (9, 9', 9'').

5. The device according to claim 4, wherein the circumferential grooves (21, 21', 21'') have different diameters.

6. The device according to claim 1, comprising two feeding wheels (7, 7').

7. The device according to claim 6, wherein the feeding wheels (7, 7') have different diameters.

8. The device according to claim 1, comprising three feeding wheels (7, 7', 7'').
9. The device according to claim 8, wherein the feeding wheels (7, 7', 7'') have different diameters.
10. A machine (1) for manufacturing rod-like elements (R), the machine (1) comprising:
- a fibrous band supply unit (17, 17') for feeding a continuous fibrous band (2, 2');
 - a fibrous band preparation unit (4, 4') for preparing the fibrous band (2, 2');
 - a feeding device (8, 8', 8'', 8''') for feeding a continuous thread (9);
 - a wrapper feeding unit (18) for feeding a wrapper (14);
 - a garniture unit (15) for forming a continuous rod (CR), wherein the continuous rod (CR) comprises the fibrous band (2, 2') and the continuous thread (9) and is wrapped by the wrapper (14);
 - a cutting head (16) for cutting the continuous rod (CR) into the rod-like elements (R);
- characterized in that
- the feeding device (8, 8', 8'', 8''') is the feeding device according to any of claims from 1 to 9.

AMENDED CLAIMS
received by the International Bureau
on 25 April 2018 (25.04.2018)

1. A feeding device (8, 8', 8'', 8''') for feeding a continuous thread (9) into a continuous fibrous band, in a tobacco industry machine for manufacturing rod-like elements, wherein the fibrous band is formed to a form of a continuous rod (CR) comprising the continuous thread (9) surrounded by the continuous fibrous band, the feeding device (8, 8', 8'', 8''') comprising:

- a thread supply unit (10) for feeding the continuous thread (9);
- a thread feeding unit (11) for feeding the continuous thread (9) into the continuous fibrous band wherein the continuous thread (9) is fed into the middle of the continuous fibrous band;
- wherein the feeding device (8, 8', 8'', 8''') is configured such that the thread feeding unit (11) is located between a fibrous band preparation unit (4) and a garniture unit (15) for forming the continuous rod;

the feeding device (8, 8', 8'', 8''') being characterized by further comprising:

- at least one feeding wheel (7) comprising two circumferential grooves (21, 21') for guiding two threads (9, 9'),
- wherein the circumferential grooves (21, 21') have different diameters.

2. The device according to claim 1, wherein the feeding wheel (7''') comprises three circumferential grooves (21, 21', 21'') for guiding three threads (9, 9', 9'').

3. The device according to claim 2, wherein the circumferential grooves (21, 21', 21'') have different diameters.

4. The device according to claim 1, comprising two feeding wheels (7, 7').

5. The device according to claim 4, wherein the feeding wheels (7, 7') have different diameters.

6. The device according to claim 1, comprising three feeding wheels (7, 7', 7'').

7. The device according to claim 6, wherein the feeding wheels (7, 7', 7'') have different diameters.

8. A machine (1) for manufacturing rod-like elements (R), the machine (1) comprising:

- a fibrous band supply unit (17, 17') for feeding a continuous fibrous band (2, 2');
- a fibrous band preparation unit (4, 4') for preparing the fibrous band (2, 2');
- a feeding device (8, 8', 8'', 8''') for feeding a continuous thread (9);
- a wrapper feeding unit (18) for feeding a wrapper (14);
- a garniture unit (15) for forming a continuous rod (CR), wherein the continuous rod (CR) comprises the fibrous band (2, 2') and the continuous thread (9) and is wrapped by the wrapper (14);
- a cutting head (16) for cutting the continuous rod (CR) into the rod-like elements (R);

characterized in that

- the feeding device (8, 8', 8'', 8''') is the feeding device according to any of claims from 1 to 7.

STATEMENT UNDER ARTICLE 19 (1)

Replacement pages which replace the original pages 7-8 of the International application as filed, contain amended claims under Article 19 PCT. The original claim 1 is amended. The original claims 2 and 3 are cancelled. The original claims 4-10 are renumbered. Basis for amendments: amended claim 1 is based on original claims 1, 2 and 3; cancelled claims 2, 3 are combined with claim 1; amended claims 2-8 are based on original claims 4-10, respectively.

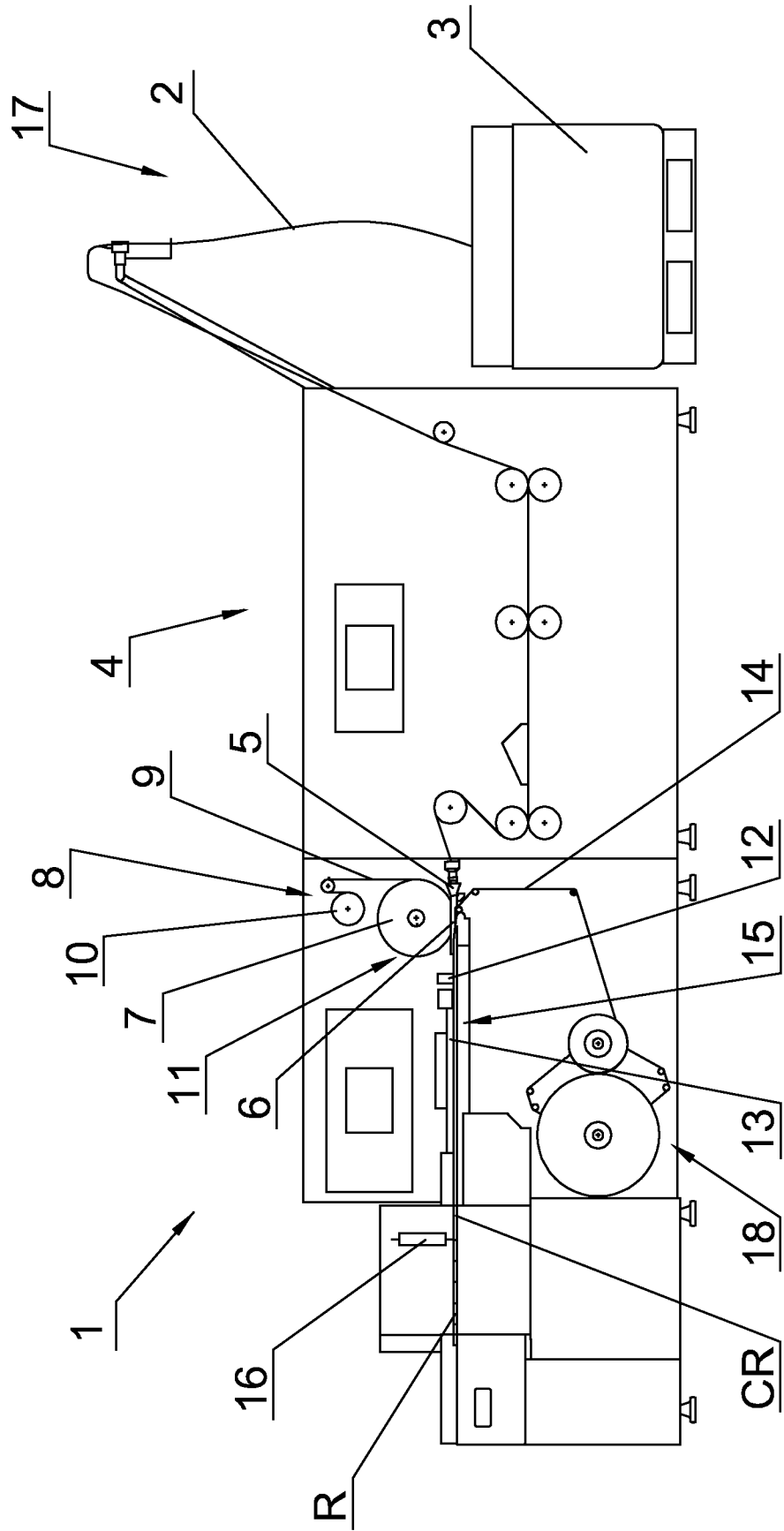


Fig. 1

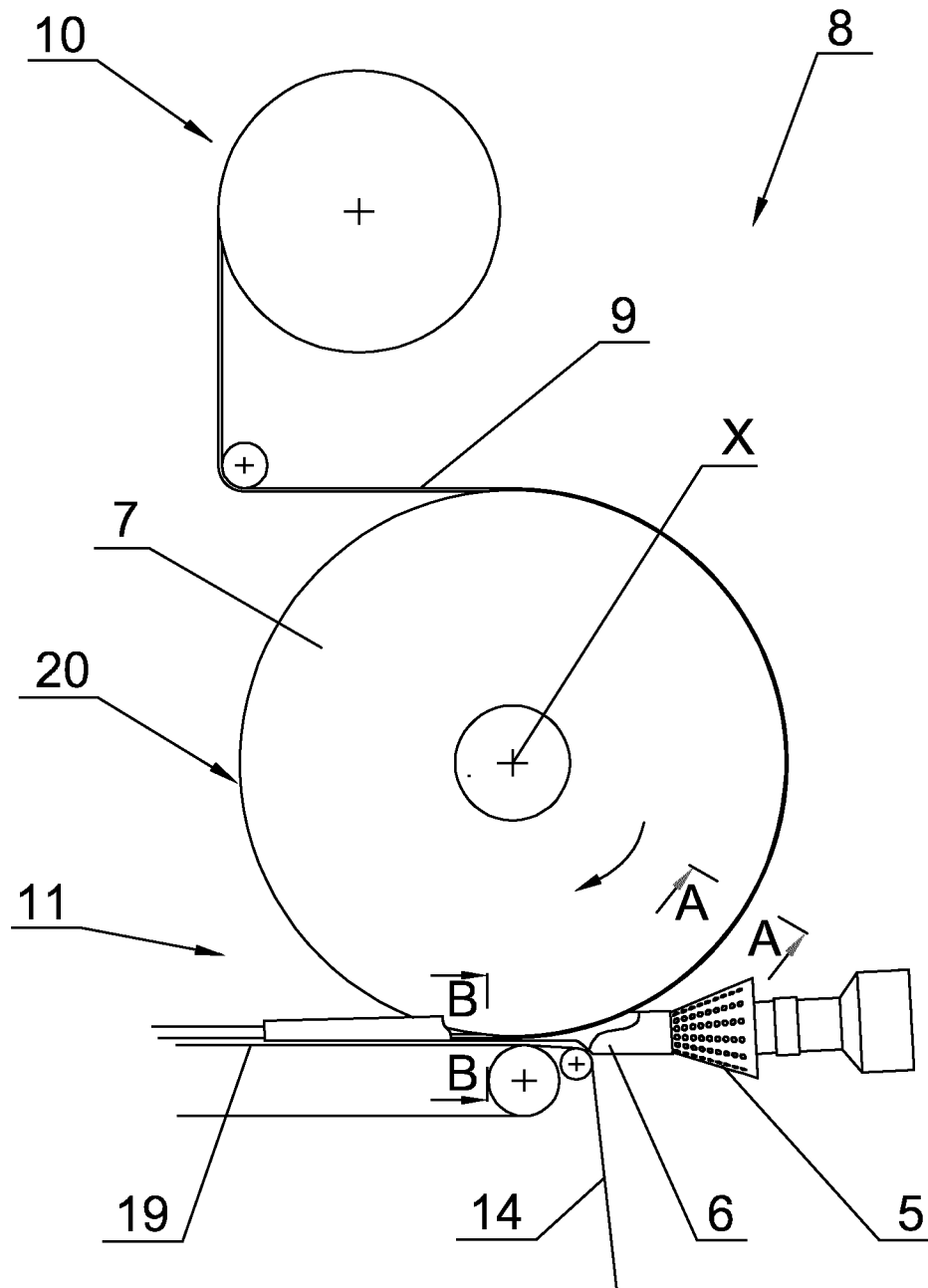


Fig. 2

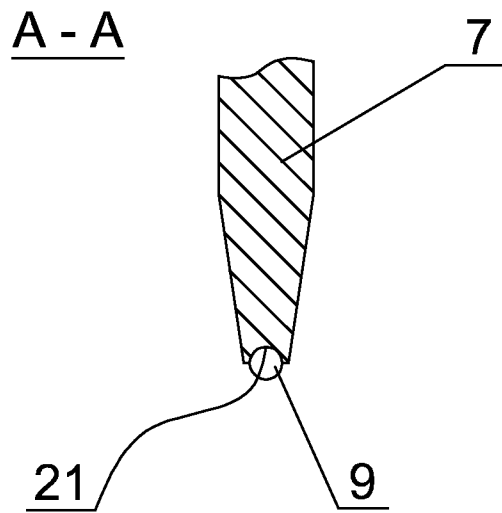


Fig. 3

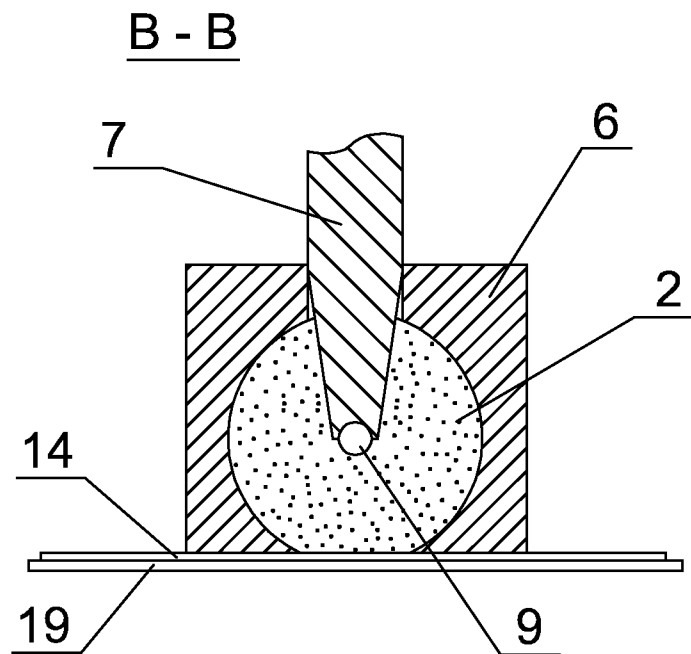


Fig. 4

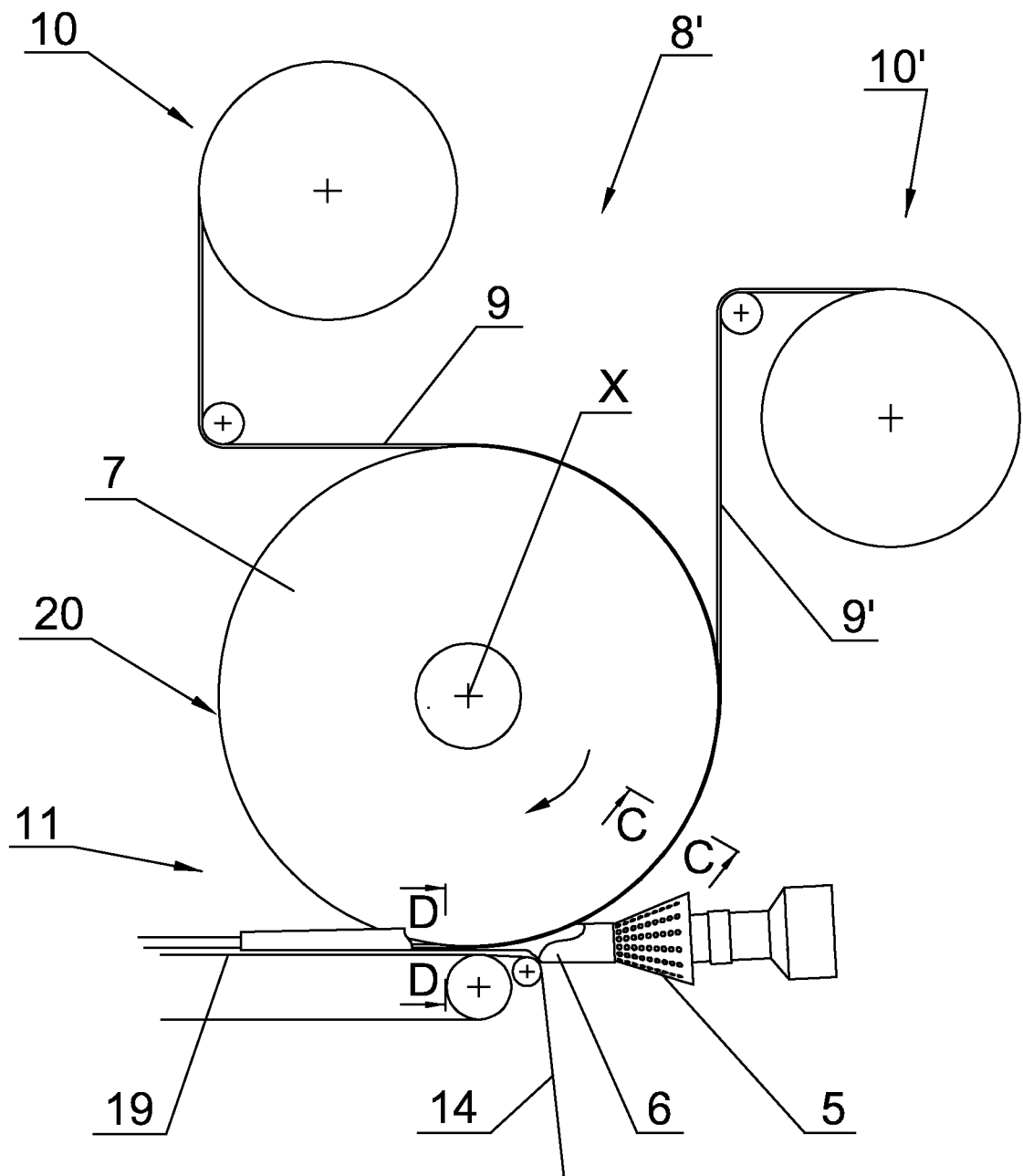


Fig. 5

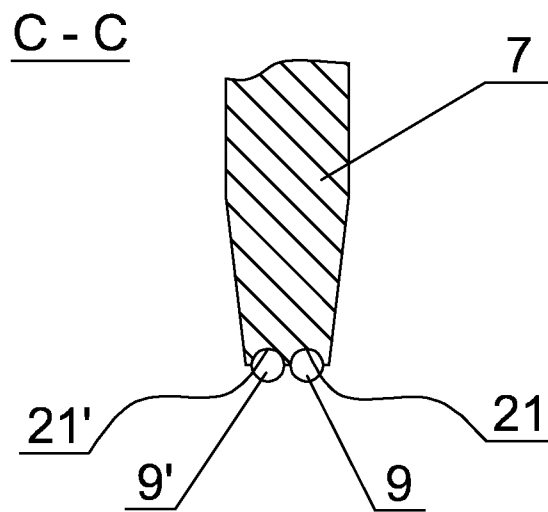


Fig. 6

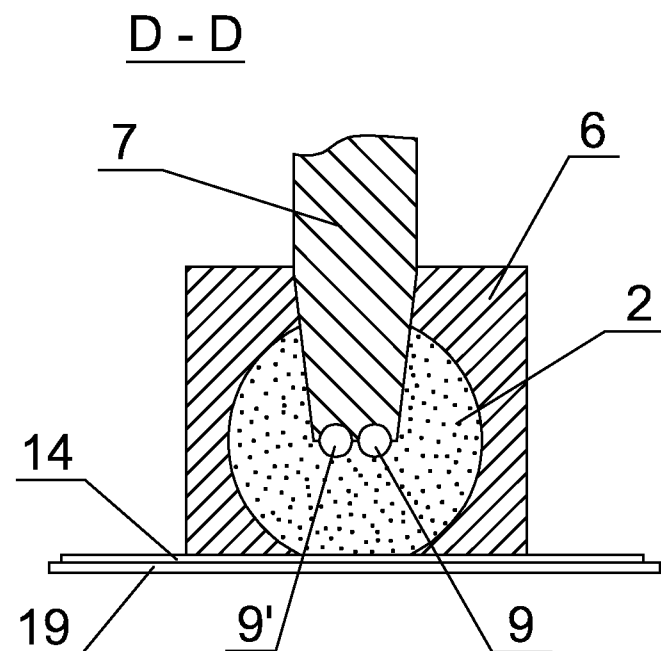


Fig. 7

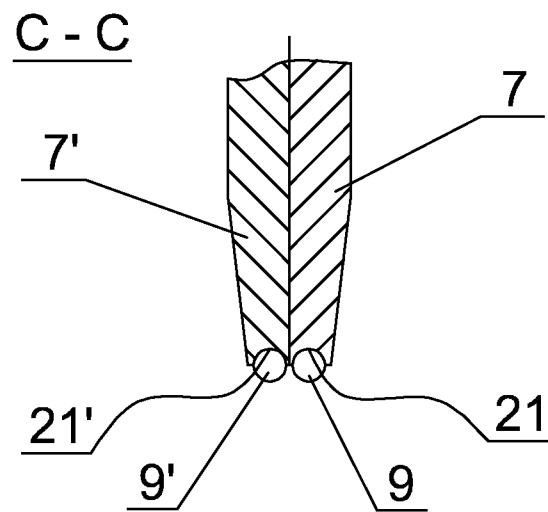


Fig. 8

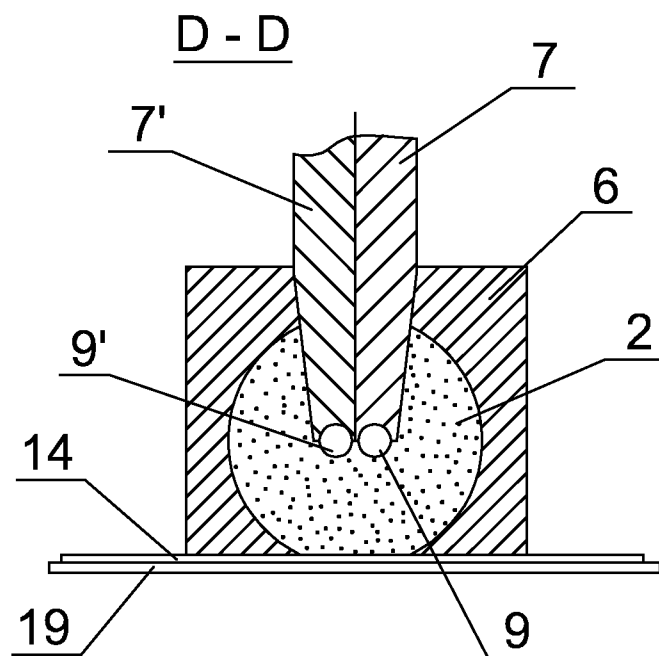


Fig. 9

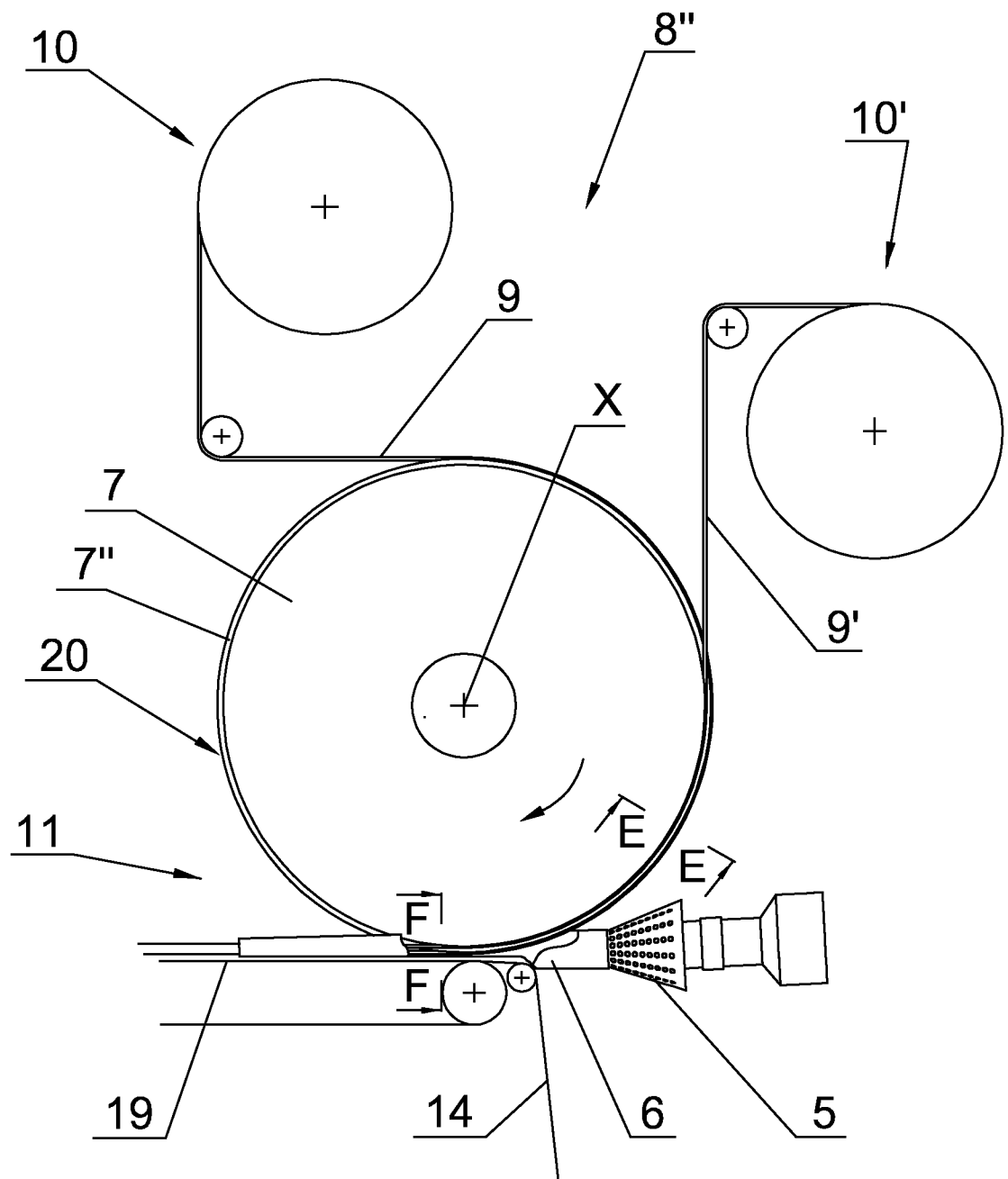


Fig. 10

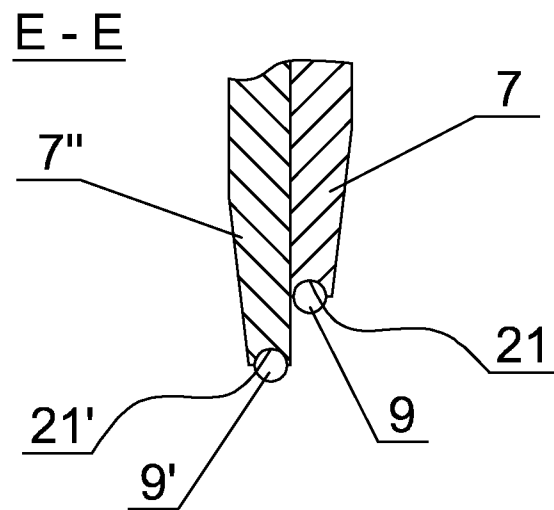


Fig. 11

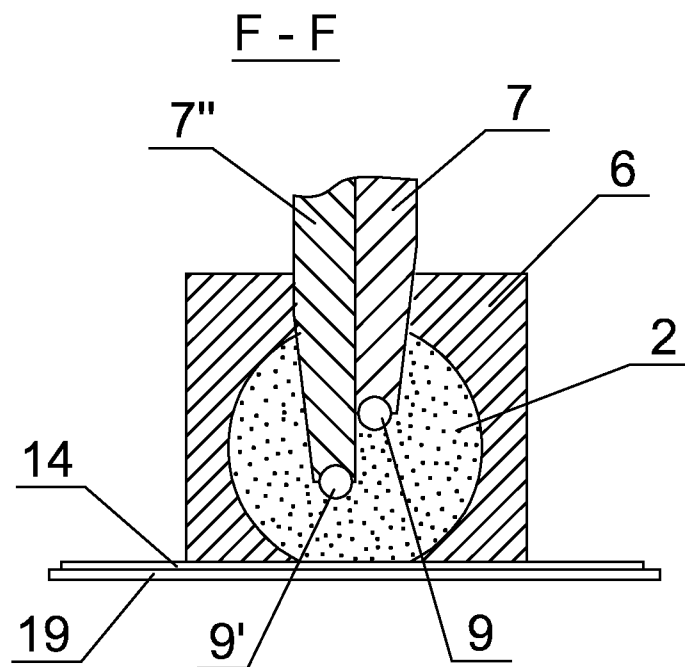


Fig. 12

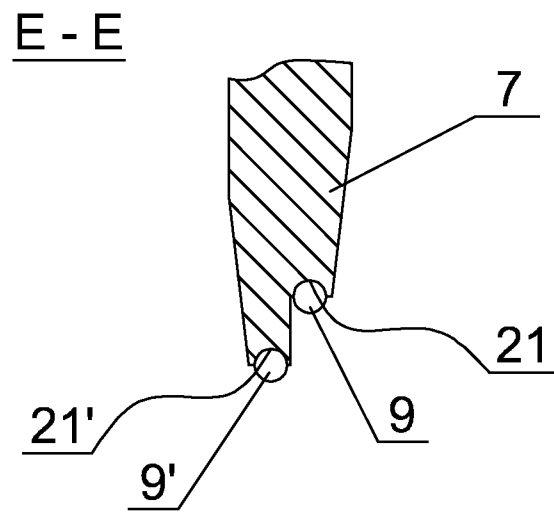


Fig. 11a

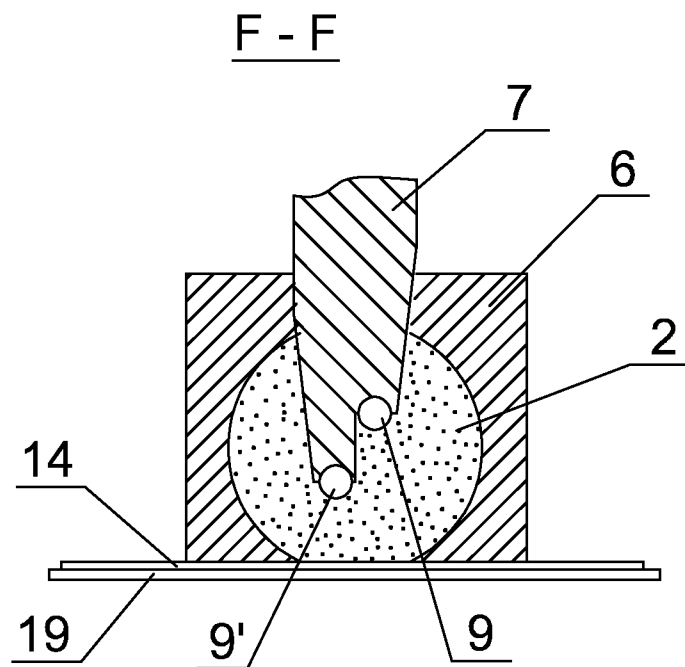


Fig. 12a

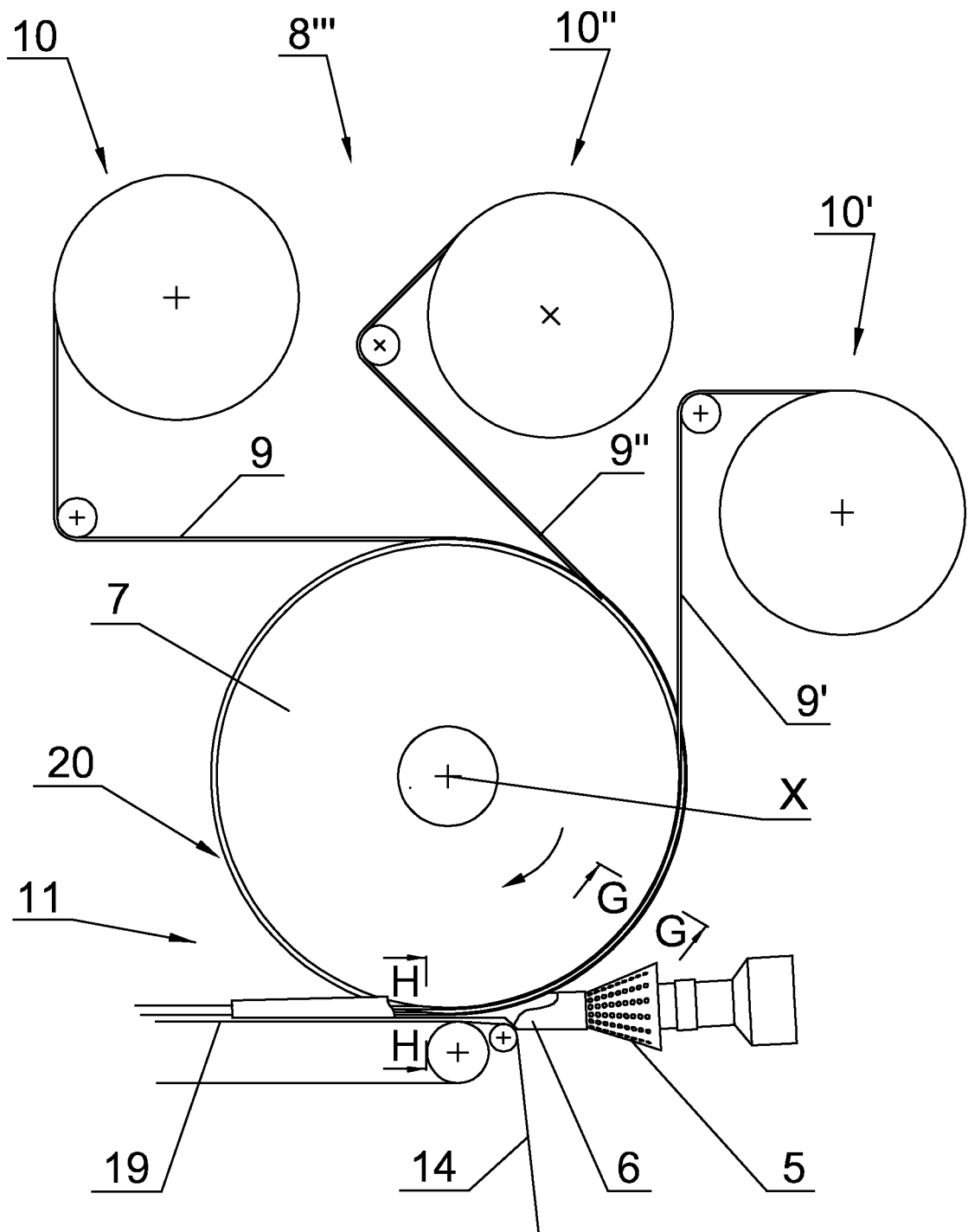


Fig. 13

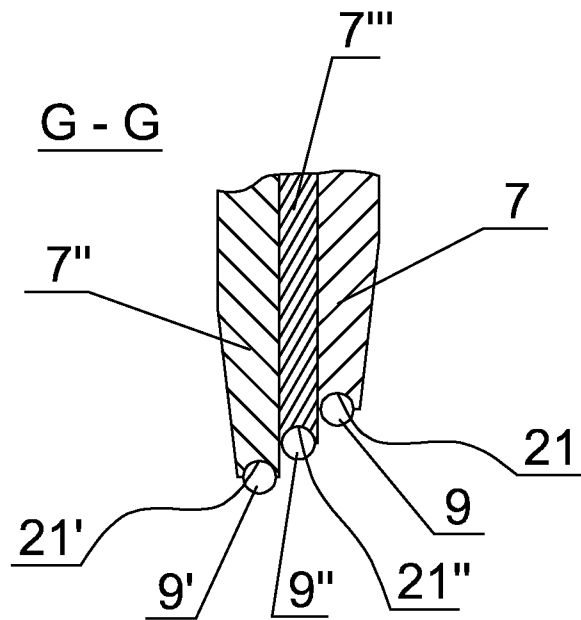


Fig. 14

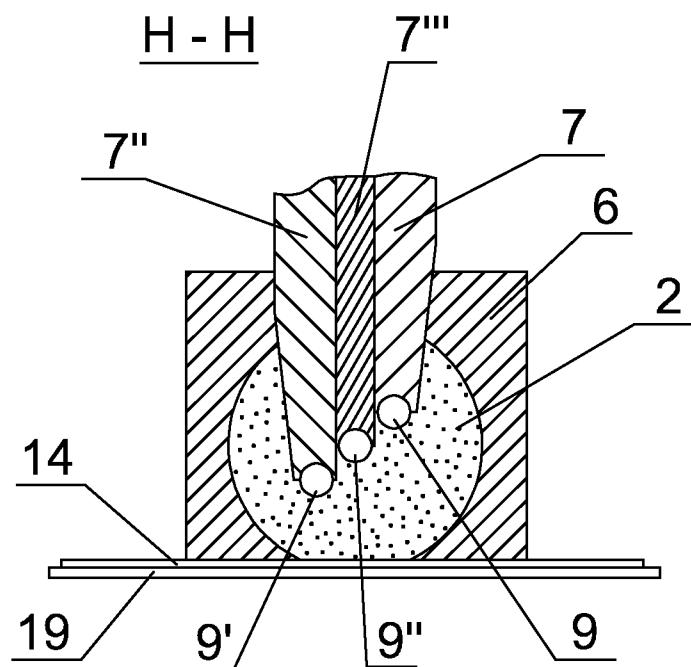


Fig. 15

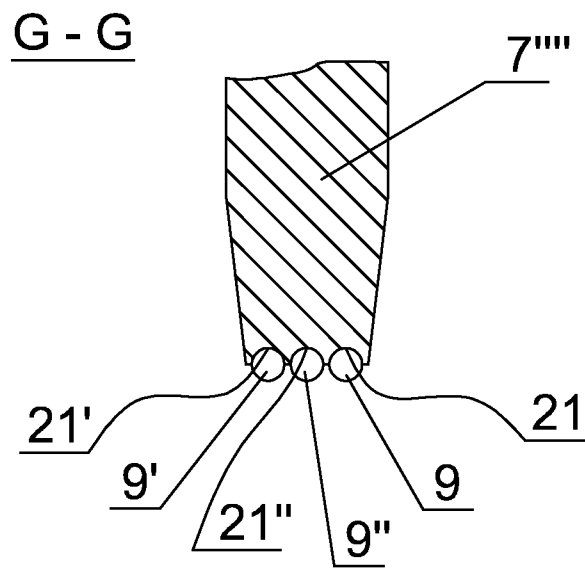


Fig. 16

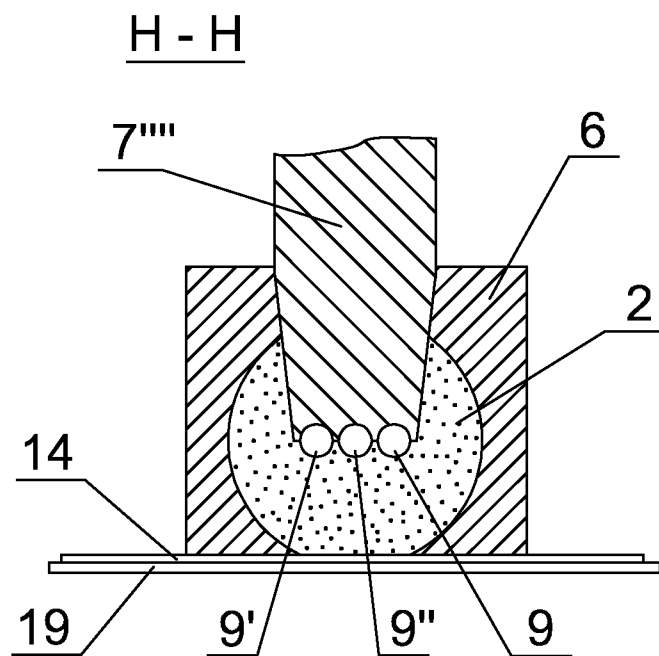


Fig. 17

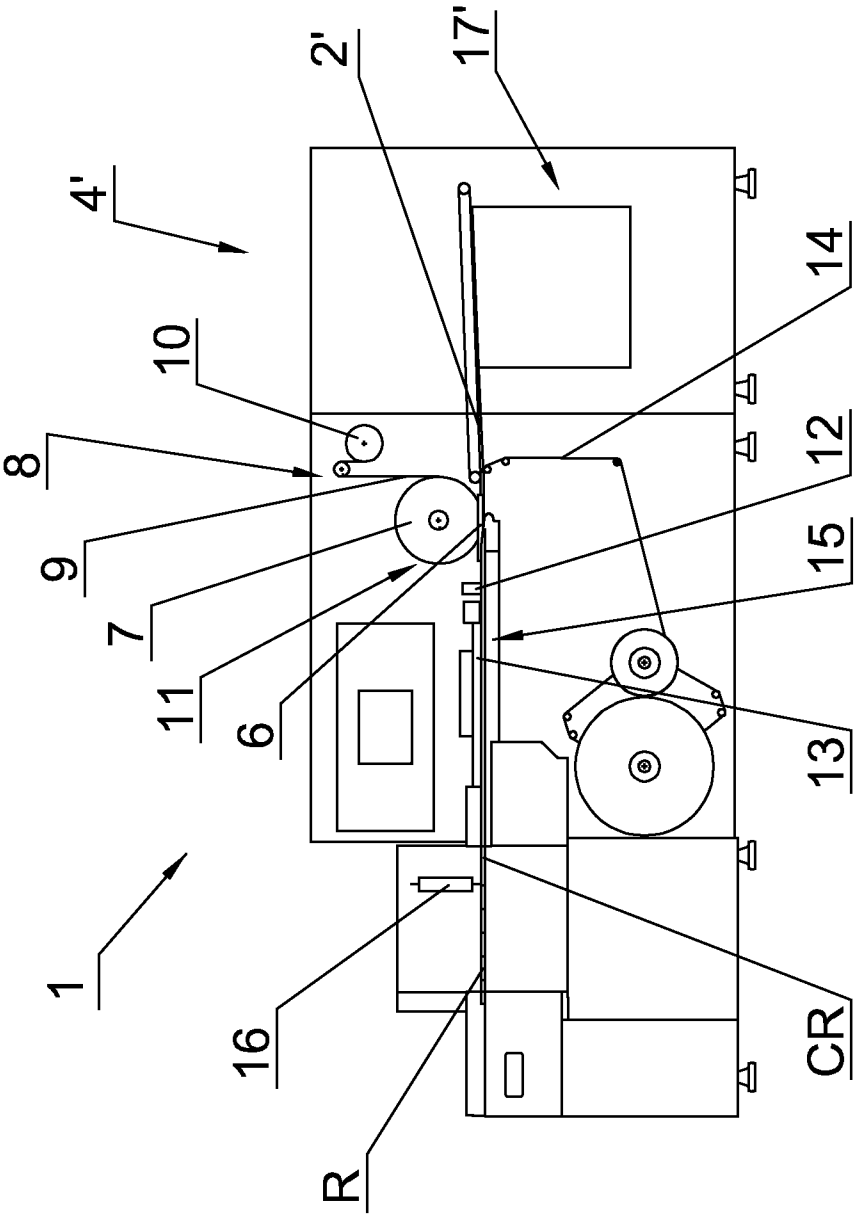


Fig. 18

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/079240

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24D3/02
ADD.

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)
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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2015/197674 A1 (ESSENTIA FILTER PRODUCTS DEV CO PTE LTD [SG]; ESSENTIA FILTER PRODUCTS) 30 December 2015 (2015-12-30)	1,2,4,10
A	figures 1,3,4,6 page 1, lines 4-5 page 4, lines 18-27 page 9, lines 8-15 page 13, line 35 - page 14, line 4 page 18, line 7 - page 19, line 3 page 19, line 21 - page 20, line 13 page 22, lines 19-30	3,5-9
X	US 2008/029118 A1 (NELSON JOHN LARKIN [US] ET AL) 7 February 2008 (2008-02-07) figures 1,2 paragraphs [0032] - [0037] ----- -/-	1,10



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

13 February 2018

Date of mailing of the international search report

01/03/2018

Name and mailing address of the ISA/

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Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Kirchmayr, Katrin

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2017/079240

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2006 025738 B3 (HAUNI MASCHINENBAU AG [DE]) 8 November 2007 (2007-11-08) figures paragraphs [0021], [0022] -----	1,10
A	EP 2 754 358 A1 (BRITISH AMERICAN TOBACCO CO [GB]) 16 July 2014 (2014-07-16) abstract; figures -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

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