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(54) A cigarette filter manufacturing machine

(57) A cigarette filter manufacturing machine (100) comprising at least two modules. One of the modules is a rod maker (122). The other is any one of the following:
(a) a tow processor (102),
(b) a non-wrapped acetate filter module (340),
(c) an object inserter (200),
(d) a filter section combiner (300),
(e) a paper crimper (330),
(f) a filter cavity creator (310),
(g) a carbon feeder (315),
(h) a transfer module,
(i) any other cigarette filter manufacturing machine module, and
(j) any other cigarette filter manufacturing machine module which is different from those set out in (a) to (i) above.

The two modules are connected together and are constructed to transfer filter-making material from the said other one of the modules to the said rod maker (122). The said other one of the modules may be readily replaced by any other one of the above-listed modules (a) to (j).

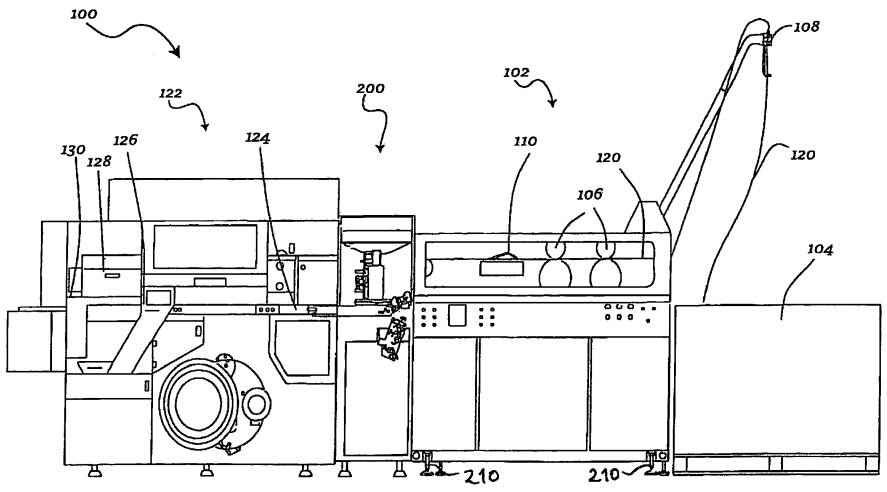

Fig. 1

EP 2 633 769 A1

Description

[0001] The present invention relates to a cigarette filter manufacturing machine.

[0002] One such machine is illustrated and described in GB-A-1095190. That machine is for making multi-sectional filters having a granular material sandwiched between fibrous or paper elements, modified so as to sandwich the granular material between elements of disparate lengths. Fibrous cellulose acetate filter rod material is fed through a conduit to a cutter assembly from which so formed filter elements pass into a reciprocating ledger tube which spaces the elements and deposits them on the upper run of a suction-backed perforated conveyer band. Triple length paper filter plugs are fed from a hopper to a drum on which they are each cut into three equal length filter elements, and these elements are separated on a drum and deposited in turn by a spoked wheel on to the conveyer between alternate elements. The alternating series of elements are then equi-spaced, and transferred on to a continuous strip of mouthpiece paper, by a threaded worm drum. The spaces between the alternate elements are filled with granular charcoal by an injection mechanism, the paper strip is folded around the composite rod and heat sealed, and the composite rod is cut by a cutter into plugs six times the length of the individual filter assembly desired for each cigarette. In another embodiment two continuous streams of fibrous filter rods are each fed, at different rates, to a reciprocable ledger in which they are cut to produce two streams of elements, the lengths of the elements in one stream differing from those in the other, and are fed by tubes to form a stream of spaced, alternating, unequal length elements on the porous conveyer.

[0003] A disadvantage of such a machine is that it is dedicated to the manufacture of multi-sectional filters. For some cigarette manufacturers, the cost of such a machine is considerable, compared to the use made of it. Other dedicated machines have to be bought by the same manufacturer to make other types of cigarette filters, and this increases the cost of the manufacture of their range of cigarettes considerably.

[0004] The present invention seeks to provide a remedy.

[0005] Accordingly, the present invention is directed to a cigarette filter manufacturing machine comprising at least two modules, one of which is a rod maker and the other one of which is any one of the following:

(a) a tow processor,
(b) a non-wrapped acetate filter module,
(c) an object inserter,
(d) a filter section combiner,
(e) a paper crimper,
(f) a filter cavity creator,
(g) a carbon feeder,
(h) a transfer module,
(i) any other cigarette filter manufacturing machine module, and
(j) any other cigarette filter manufacturing machine module which is different from those set out in (a) to (i) above;

in which the said two modules are connected together and are constructed to transfer filter-making material from the said other one of the modules to the said rod maker, and
in which the said other one of the modules may be readily replaced by any other one of the above-listed modules (a) to (j).

[0006] This provides equipment with considerable flexibility as to its manufacturing potential. Such replacement may be fully effected in about 3 to 8 hours.

[0007] The said rod maker may be provided with a control processor unit. The said at least two modules may include interengageable electrical connectors to change the signals issued by the central processor unit according to the identity of the said other one of the modules.

[0008] For this purpose, the said other one and the said any other one of the modules may be provided with respective slave controllers to operate those modules, the electrical connector being so constructed as to enable signals to be passed in both directions between the master controller and the slave controller for the time being connected thereto, the master controller being so constructed and/or programmable that the said change is effected by signals received by the master controller from the slave controller.

[0009] For example, in a construction of the rod maker in which filter-making material is fed on a tape through a garniture by way of at least two rollers, one of which is upstream of the garniture, and the other of which is downstream of the garniture, and in which a default setting of the control processor unit causes both of those rollers to be driven by one or more motors of the rod maker, so that the tape is both pushed and pulled through the garniture, in which the modules are so constructed that connection of the said other one of the modules to the rod maker causes drive of the said upstream roller to cease, such drive being transferred to a roller in the said other of the modules, whereby extension of the tape, or changing of the tape so that it passes around the roller of the said other of the modules now causes the tape to be pushed thereby through the garniture while being pulled therethrough by the said downstream roller.

[0010] The present invention extends to a cigarette filter manufacturing machine comprising a rod maker having a

paper wrapping garniture which is readily interchangeable with a non-wrapped acetate filter steamer.

[0011] The present invention also extends to a cigarette filter manufacturing machine comprising a rod maker and any two or more of the modules listed as (a) to (h) hereinabove, any one or more of the said two or more of the modules (a) to (h) being selectively connectible to the rod maker.

[0012] The present invention extends also to a method of making a cigarette filter involved in the use of a machine as described in one or more of the preceding paragraphs which relate to the present invention, and also to a cigarette filter made by such a machine and a cigarette having such a filter.

[0013] Examples of cigarette filter manufacturing machines embodying the present invention will now be described in greater detail by way of example with reference to the accompanying Figures, in which:

Figure 1	shows diagrammatically an elevational view of a machine embodying the present invention;
Figure 2	shows on a smaller scale and in a more simplistic fashion a side elevational view of the apparatus shown in Figure 1;
Figures 3 to 9	show respective further diagrammatic side elevational views of respective further embodiments of the present invention;
Figure 10	shows a diagrammatic side elevational view of a further embodiment of the present invention; and
Figures 11a to 11d	show successive cross-sectional views of a garniture and tape of the machine shown in Figure 10, in respective planes indicated by the lines XIa-XIa, XIb-XIb, XIc-XIc and XId-XId in Figure 10.

[0014] With reference to Figure 1, there is shown apparatus 100 for inserting capsules into filter webs. Apparatus 100 comprises a tow processor unit 102, a capsule insertion unit 200 and a rod making unit 122. The tow processor unit 102 is provided with a bale 104, a plurality of rollers 106, a plurality of banding jets 108 and a plasticizer chamber 110. The rod making unit 122 has a garniture bed 124, a sensor or sensors 126, a knife carrier 128 and an ejector 130. An acetate filter tow 120 is withdrawn from the bale 104, and directed towards the rollers 106 and banding jets 108, which facilitate the expansion and blooming of the tow 120 to a desired width. After passing through the banding jets 108 and between the rollers 106, the tow 120 is directed to the plasticizer chamber 110, where it is coated with plasticizer, thereby facilitating swelling of the fibres of the tow 120 and imparting greater cohesive properties thereto. Upon exiting the plasticizer chamber 110, the tow 120 is directed towards the capsule insertion unit 200, and thence to the rod making unit 122.

[0015] The rod making unit 122, the capsule insertion unit 200, and the tow processor unit 102 are each made in a modular fashion, so that they may be readily separated from one another and readily reconnected to other modules for the manufacture of cigarette filters.

[0016] One simple change that can be effected as a result of this modular construction is shown by the difference between the apparatus shown in Figure 2 (being on a smaller scale a simplified diagram of what is shown in Figure 1) and the apparatus shown in Figure 3. To effect this change, the modular construction of the apparatus enables the capsule insertion unit 200 to be removed and the tow processor unit 102 to be connected directly to the rod making unit 122, so that the feed of the two 120 from the tow processor unit 102 may pass directly to the rod making unit 122.

[0017] As a result of this change, the apparatus is reconfigured from one which manufactures cigarette filters incorporating capsules, for example frangible capsules containing menthol, to apparatus for manufacturing simple monoacetate cigarette filters without capsules.

[0018] The level of the height of the tow processor unit 102 to facilitate this may be adjusted by means of adjustable feet 210 at the base of the tow processor unit 102.

[0019] The apparatus may comprise further modules as shown in Figures 4 to 9. Thus, Figure 4a shows two filter section combining modules or units 300 connected in series with one another, the downstream one of these modules or units being connected to a combining/cavity creating module 310 in turn being connected to the rod making unit 122 so that the output of the filter combiners 300 is fed into the input of the module 310 which in turn feeds the rod maker 122.

[0020] The apparatus shown in Figure 4b differs from that shown in Figure 4a only by the presence of a carbon feeder module 315 sandwiched between the rod making unit 122 and the cavity creating module 310, so that the apparatus is able to manufacture cavity filters with carbon.

[0021] Figure 5 shows a paper feed 320 and a tow processor unit 102 connected together and to feed a paper crimper 330 which in turn is connected to feed combined crimped paper and tow material to the rod making unit 122.

[0022] In Figure 6, the apparatus shown in Figure 3 has been changed by swapping the garniture bed 124 thereof with a steamer unit 340 to enable the machine to manufacture non-wrapped acetate cigarette filters.

[0023] The apparatus shown in Figure 7 comprises apparatus shown in Figure 5, with the difference that the tow processor unit 102 has been removed, and the paper feed 320 has been connected directly to the paper crimper 330 to provide apparatus for making crimped paper cigarette filters.

[0024] The apparatus shown in Figure 8 comprises a filter cavity creating module 310 connected to receive filter material from a series of two filter section combining modules 300 and to supply filter material to a capsule insertion unit 200 which in turn feeds filter material to a tow processor unit 122. This apparatus therefore is capable of manufacturing

cigarette filters with capsules inserted in cavities thereof.

[0025] Figure 9 shows apparatus comprising a carbon feeder module 315 sandwiched between a rod making unit 122 and a tow processor unit 102 with a bale 104. This apparatus provides for the manufacture of carbon filters for cigarettes.

[0026] It will be appreciated that, because of the modular construction of the different units of the apparatus illustrated in Figures 2 to 9, any one or more of the modules which are connected to feed filter material to the rod making unit 122 may be selectively interchanged with one or more different such modules.

[0027] One manner in which such modular interchangeability can be effected is shown in Figure 10. This shows a tow processor unit 122 with an upstream motor-driven roller 400, a downstream motor-driven roller 410 and a guide roller 420. The rollers 400 and 410 are at substantially the same level and are located at the inlet and outlet of the tow processor unit 122 respectively. The roller 420 is located at a lower level than the rollers 400 and 410, and in the absence of any modular unit connected to this tow processor unit 122, a drive tape loop 430 extends around the outsides of the rollers 400, 410 and 420, the part of the loop 430 which extends between the rollers 420 and 400 being here represented by a broken line.

[0028] A garniture 440 extends along the general horizontal path of the loop 430 between rollers 400 and 410. Successive cross-sections of the garniture and tape progressing in a downstream direction from the roller 400 towards the roller 410, in planes indicated in Figure 10 by the lines XIa-XIa, XIb-XIb, XIc-XIc and XId-XId are shown respectively in Figures 11a to 11d.

[0029] With the rollers 400 and 410 driving the loop 430 in an anti-clockwise sense, viewing the tape 430 as in Figure 10, tow material 120 is introduced on to the tape loop 430, at a position between planes XIb-XIb and XIc-XIc, over wrapping paper 442 which is also fed on to the tape loop 430, underneath the tow material, when the apparatus is in use. The wrapping paper 442 and tow material 120 is drawn along by the tape through garniture 440 into a rod of generally circular cross-section by virtue of the increased curvature of the garniture progressing towards roller 410, with the acetate tow material 120 wrapped inside the wrapping paper 442.

[0030] The garniture unit 440 may be replaced by a steamer unit 450 shown in broken lines in Figure 10 to manufacture a non-wrapping acetate cigarette filter.

[0031] When a modular unit 500, which may be any one of the modular units shown in Figures 2 to 9, is connected to the tow processor unit 122, in the embodiment shown in Figure 10, the tape loop 430 is replaced by a longer loop to enable it now to pass around a motor-driven roller 510 as well as the rollers 410 and 420. At the same time, mutually interengaging electrical connector parts of the unit 500 and the unit 122 together form a connector 520. This enables a central processor unit or master controller 530 of the tow processor unit 122, which can be programmed by user controls 540, and which is also connected to control the motor-driven rollers 400 and 410 to control, by way of the connector 520 and a slave controller 550 connected thereto, the motor-driven roller 510. In this arrangement the control processor unit 530 switches off the motor-driven roller 400 (which now acts as a passive roller) and switches on the motor-driven roller 510. This enables feed of filter material from the unit 500 to the tow processor unit 122.

[0032] Numerous variations and modifications to the illustrated apparatus may occur to the reader without taking the resulting construction outside the scope of the present invention. For example, other combinations of the various modules shown in Figures 2 to 9 may be created which are not illustrated therein. The feed path from roller 510 to roller 400 could be replaced by a separate driven path which transfers filter segments to the rod making unit 122. There may be a plurality of different modular units 500, each being respective modular units from any of those shown in Figures 2 to 9, and each with a connector part to constitute part of the connector 520, and each with a slave controller 550. The master controller 530 of the tow processor unit 122 may be so constructed and programmed that the master controller 530 recognises which selected unit 500 is connected to it by signals it receives from the slave controller 550 of the unit 500, and adapts its operation to suit that unit 500 accordingly, whereby operation of the master controller 530 is determined in dependence upon which of the plurality of modules 500 is connected to the unit 122, to create a plug and play system.

[0033] The master controller 530 and the slave controllers 550 may be programmable logic controllers to operate the motors of the motor driven rollers, and also to operate further programmable logic controllers to operate other parts of the apparatus.

[0034] The rod maker 122 may be fitted with a measurement system (not shown) which can control the performance of the modules via the master and slave controllers, and also verify the final product quality.

Claims

1. A cigarette filter manufacturing machine (100) comprising at least two modules, one of which is a rod maker (122) and the other one of which is any one of the following:

   (a) a tow processor (102),
   (b) a non-wrapped acetate filter module (340),

(c) an object inserter (200),
(d) a filter section combiner (300),
(e) a paper crimper (330),
(f) a filter cavity creator (310),
(g) a carbon feeder (315),
(h) a transfer module,
(i) any other cigarette filter manufacturing machine module, and
(j) any other cigarette filter manufacturing machine module which is different from those set out in (a) to (i) above;
in which the said two modules are connected together and are constructed to transfer filter-making material from the said other one of the modules to the said rod maker (122), and
in which the said other one of the modules may be readily replaced by any other one of the modules (a) to (j).

2. A cigarette filter manufacturing machine (100) according to claim 1, **characterised in that** the said rod maker (122) is provided with a central processor unit (530).

3. A cigarette filter manufacturing machine (100) according to claim 2, **characterised in that** the said at least two modules include interengageable electrical connectors (520) to change the signals issued by the central processor unit (530) according to the identity of the said other one of the modules.

4. A cigarette filter manufacturing machine (100) according to claim 3, **characterised in that** the said other one and the said any other one of the modules is provided with respective slave controllers (550) to operate those modules, the electrical connectors (520) being so constructed as to enable signals to be passed in both directions between the central processor unit (530) and the slave controller (550) for the time being connected thereto, the central processor unit (530) being so constructed and/or programmable that the said change is effected by signals received by the central processor unit (530) from the slave controller (550).

5. A cigarette filter manufacturing machine (100) according to claim 4, **characterised in that** in the rod maker (122), filter-making material is fed on a tape (430) through a garniture (440) by way of at least two rollers (400, 410), one (400) of which is upstream of the garniture (440), and the other (410) of which is downstream of the garniture (440), and in which a default setting of the central processor unit (530) causes both of those rollers (400, 410) to be driven by one or more motors of the rod maker (122), so that the tape (430) is both pushed and pulled through the garniture (440), in which the modules are so constructed that connection of the said other one of the modules to the rod maker (122) causes drive of the said upstream roller (400) to cease, such drive being transferred to a roller (510) in the said other of the modules, whereby extension of the tape (430), or changing of the tape (430) so that it passes around the roller (510) of the said other of the modules now causes the tape (430) to be pushed thereby through the garniture (440) while being pulled therethrough by the said downstream roller (410).

6. A cigarette filter manufacturing machine (100) comprising a rod maker (122) having a paper wrapping garniture (440) which is readily interchangeable with a non-wrapped acetate filter steamer (340).

7. A cigarette filter manufacturing machine (100) comprising a rod maker (122) and any two or more of the modules listed as (a) to (j) in claim 1, any one or more of the said two or more of the modules (a) to (j) being selectively connectible to the rod maker (122).

8. A method of making a cigarette filter using a machine (100) as claimed in one or more of the preceding claims.

9. A cigarette filter made by a machine (100) or a method as the case may be as claimed in any one of claims 1 to 8.

10. A cigarette having a cigarette filter as claimed in claim 9.

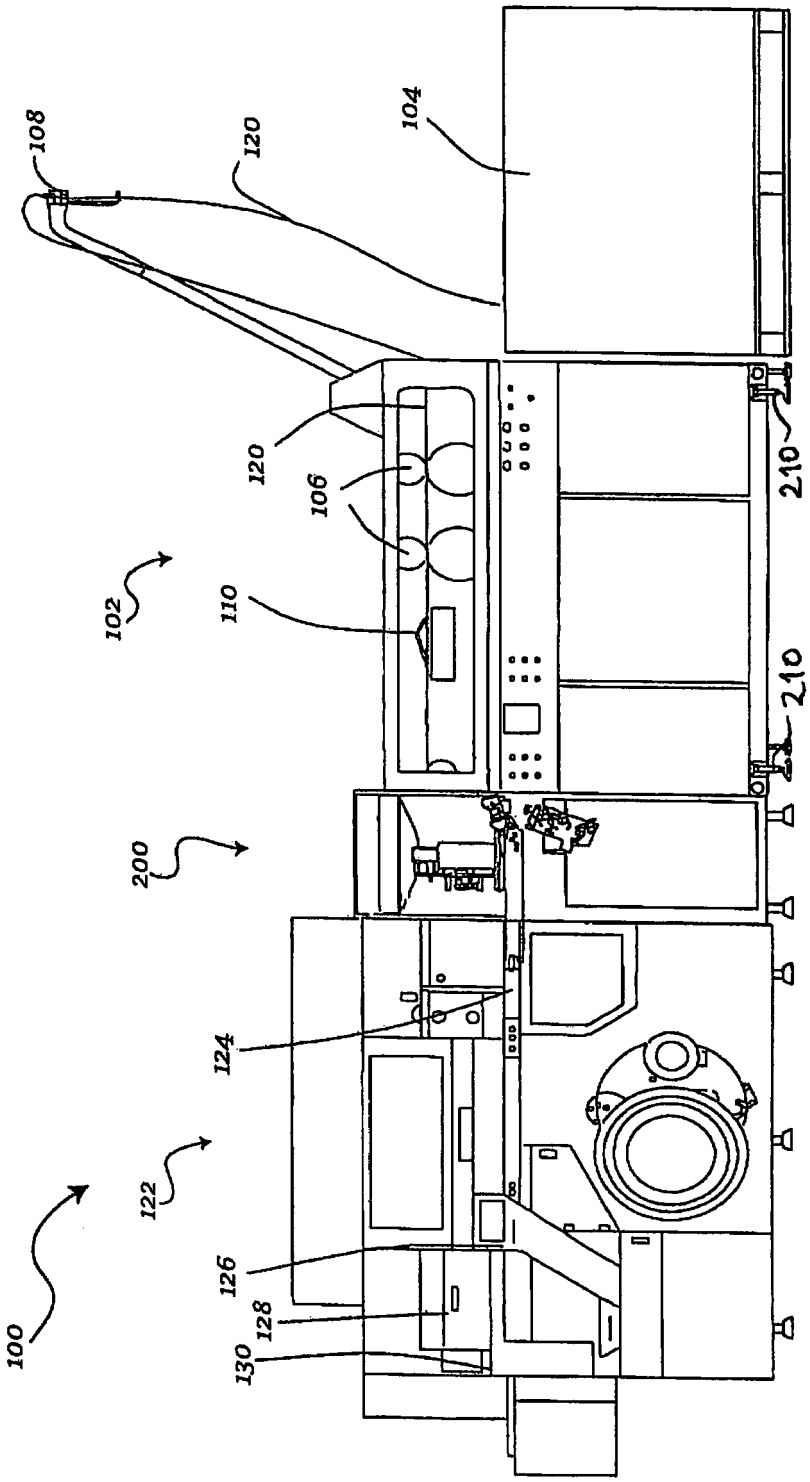

Fig. 1

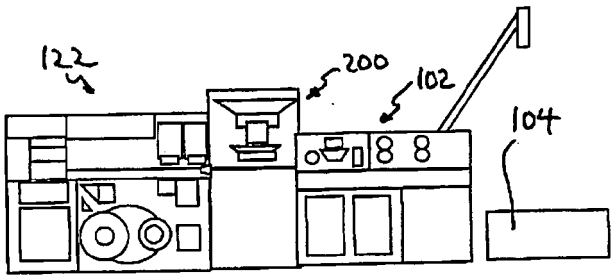

Fig. 2

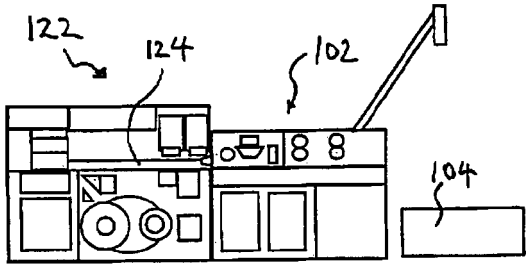

Fig. 3

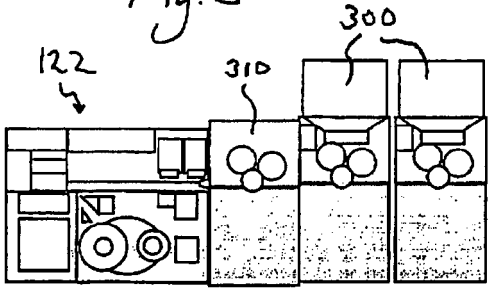

Fig. 4a

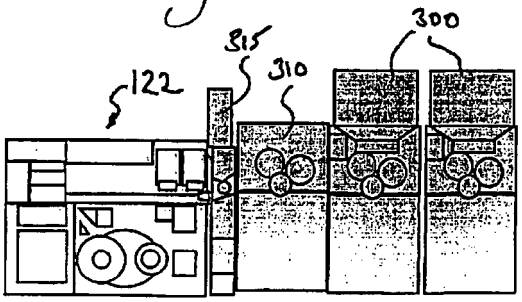

Fig. 4b

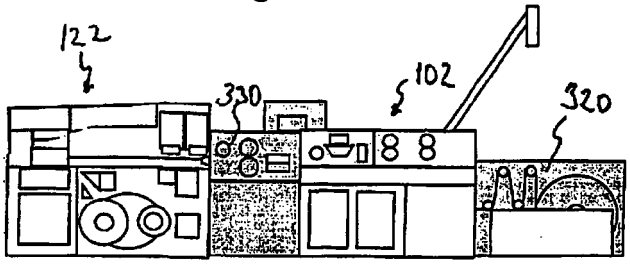

Fig. 5

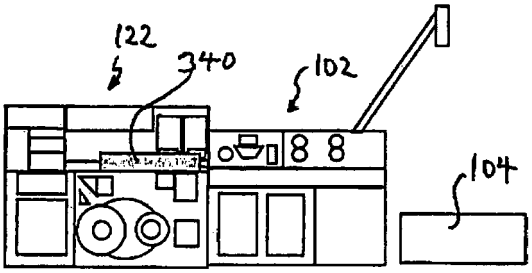

Fig. 6

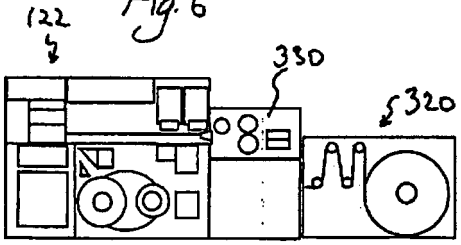

Fig. 7

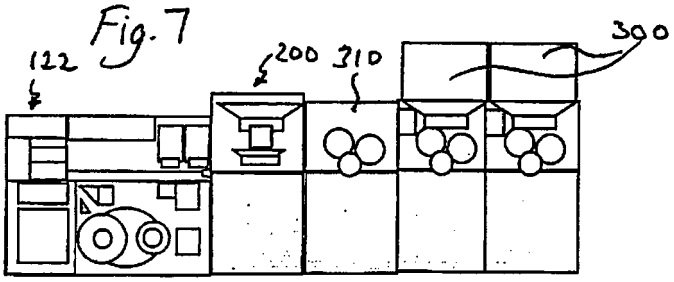

Fig. 8

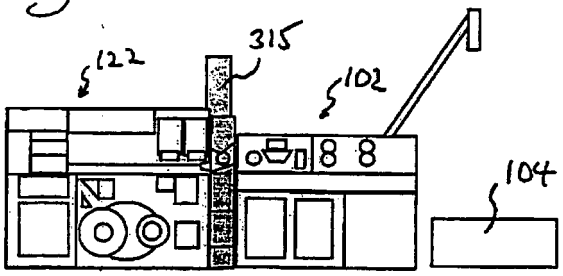

Fig. 9

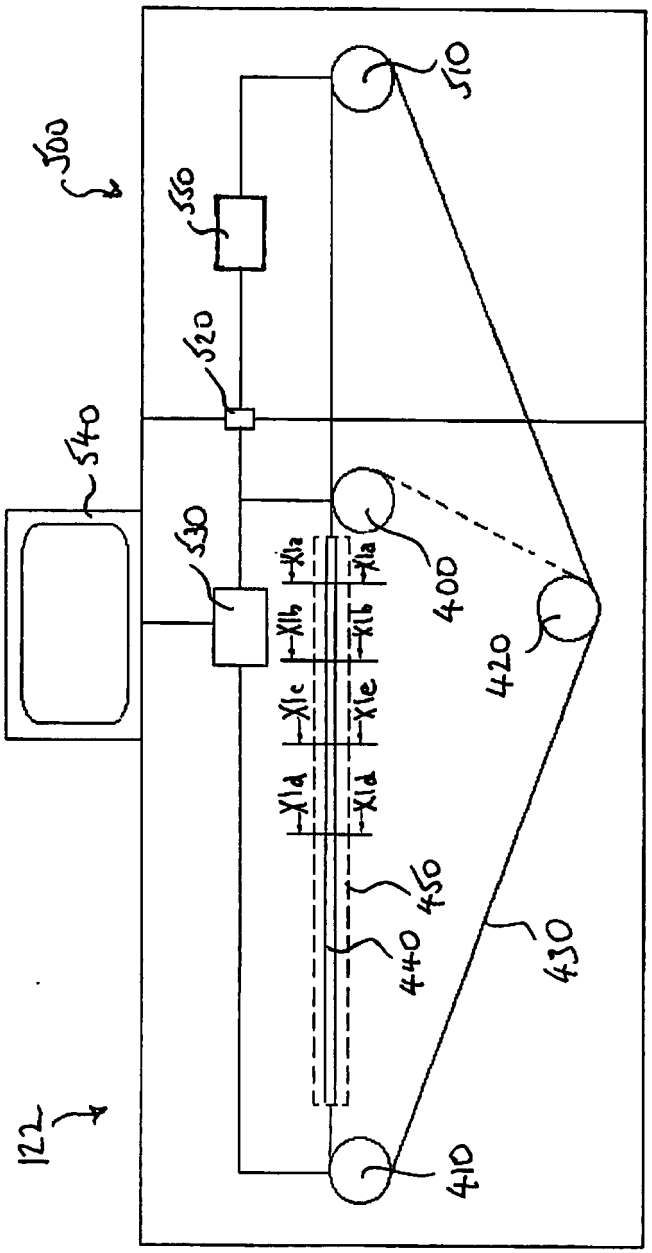
500
510
550
520
540
530
400
420
430
440
450
410
122
X1a
X1b
X1c
X1d
X1e

Fig. 10

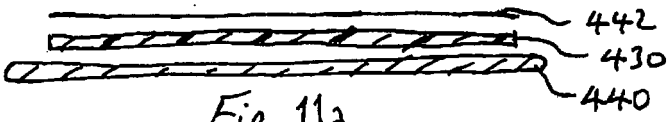

Fig. 11a

Fig. 11b

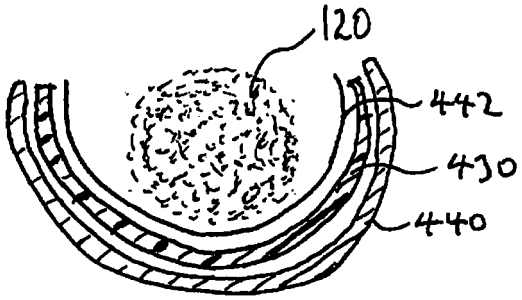

Fig. 11c

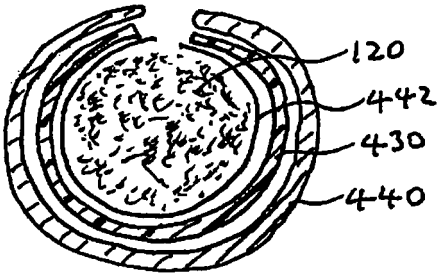

Fig. 11d

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EUROPEAN SEARCH REPORT

Application Number
EP 13 25 0020

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 726 223 A2 (HAUNI MASCHINENBAU AG [DE]) 29 November 2006 (2006-11-29) * paragraph [0018] * * paragraph [0037] - paragraph [0042]; figures *	1-10	INV. A24D3/02
X	WO 2011/083406 A2 (AIGER GROUP AG [CH]; YANCHEV DIMITAR [BG]; BUROV TODOR [BG]) 14 July 2011 (2011-07-14) * paragraph [0013] - paragraph [0025]; figures *	1-10	
X	EP 1 847 187 A1 (HAUNI MASCHINENBAU AG [DE]) 24 October 2007 (2007-10-24) * paragraph [0032] - paragraph [0065]; figures *	1-10	
X	WO 2011/008802 A2 (YANCHEV DIMITAR [BG]; LLIEV PLAMEN [BG]; YANCHEV YANKO [US]) 20 January 2011 (2011-01-20) * paragraph [0020] - paragraph [0021]; figures *	1-3,8-10	
			TECHNICAL FIELDS SEARCHED (IPC)
X	EP 1 673 990 A2 (HAUNI MASCHINENBAU AG [DE]) 28 June 2006 (2006-06-28) * the whole document *	1,7-10	A24D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 May 2013	Marzano Monterosso

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 25 0020

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02-05-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1726223 A2	29-11-2006	CN 1868348 A	29-11-2006
		DE 102005024645 A1	30-11-2006
		EP 1726223 A2	29-11-2006
		JP 2006325591 A	07-12-2006
		US 2007004573 A1	04-01-2007
WO 2011083406 A2	14-07-2011	EP 2552252 A2	06-02-2013
		US 2011162665 A1	07-07-2011
		WO 2011083406 A2	14-07-2011
EP 1847187 A1	24-10-2007	CN 101057707 A	24-10-2007
		DE 102006018101 A1	25-10-2007
		EP 1847187 A1	24-10-2007
		JP 2007282635 A	01-11-2007
		US 2008251090 A1	16-10-2008
WO 2011008802 A2	20-01-2011	US 2011011412 A1	20-01-2011
		WO 2011008802 A2	20-01-2011
EP 1673990 A2	28-06-2006	CN 1795769 A	05-07-2006
		DE 102004063097 A1	06-07-2006
		EP 1673990 A2	28-06-2006
		JP 2006174834 A	06-07-2006
		US 2006130858 A1	22-06-2006

EPO FORM P0459

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- GB 1095190 A **[0002]**