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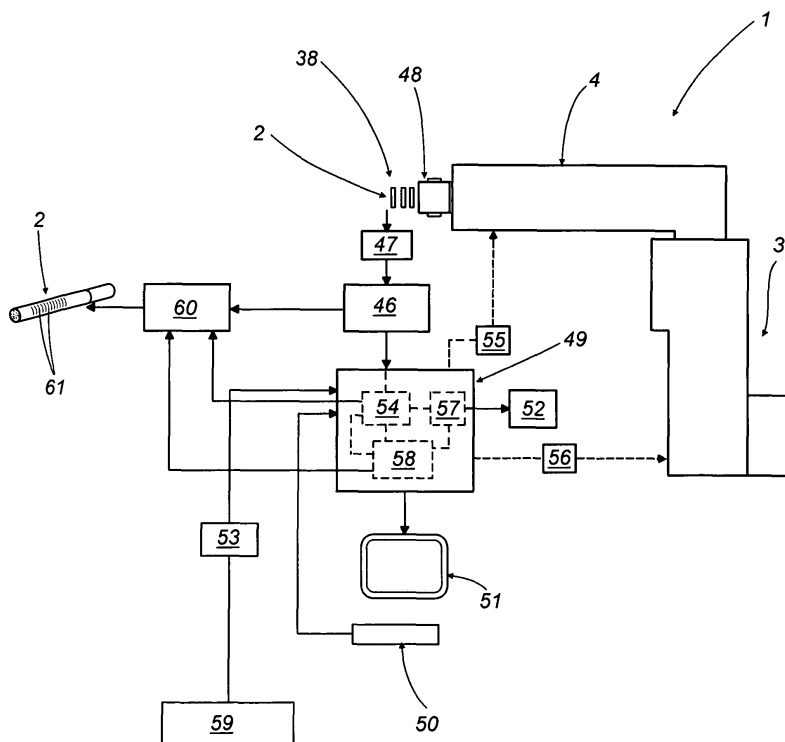
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(54) **A method and a unit for testing the quality of production in a line for manufacturing tobacco products**

(57) Single cigarettes (2) selected as samples at the outfeed stage (38) of a manufacturing line (1) undergo a systematic quality control operation, performed by a testing unit (46), that consists in verifying a given number of characteristics for each cigarette (2) and generating a set of signals each reflecting the quality of a respective

characteristic; the succession of signals, each assigned a value on a predetermined scale, is represented in the form of a graph. Once a significant sample has been processed, the values assigned to all the characteristics of the tested cigarettes (2) are displayed in a table, ordered such that each column will serve effectively as a production report on an individual cigarette (2).

**FIG. 1**



## Description

**[0001]** The present invention relates to a method and a unit for testing production quality in a line for manufacturing tobacco products.

**[0002]** The invention is applicable to the art field of systems for the manufacture of tobacco products, and of cigarettes in particular, comprising both cigarette maker and filter tip attachment machines, albeit no limitation is implied.

**[0003]** More exactly, the invention is concerned with testing the various characteristics or properties of cigarettes sampled at the outfeed of the line during the course of the production cycle.

**[0004]** Among the characteristics of cigarettes subjected to such tests, certain items are notably important: the weight, the consistency of the filler at the cut ends, the degree of ventilation, the quality of the print, the integrity of the paper wrap, and the soundness of the join between filter and cigarette.

**[0005]** Conventionally, sample cigarettes taken at the outfeed end of the manufacturing line for quality control purposes will undergo tests conducted by a specialist operator who selects single cigarettes at regular intervals. The samples are subjected to a quality control procedure implemented in part visually and manually by the operator, and in part instrumentally by dedicated testing devices.

**[0006]** In practice, the procedure in question serves to verify whether or not the different characteristics of the sample cigarettes are within given limits, which in the case of certain characteristics, at least, will be determined by the experience and judgement of the operator.

**[0007]** In the event of at least one among the tested characteristics failing to meet the standards of acceptance, the operator will identify those parts of the cigarette maker or the filter tip attachment machine to which any defects found in the finished product are attributable, and proceed to take the appropriate action.

**[0008]** It will be appreciated from the foregoing that the quality control procedure in question depends to a large extent on the experience and judgement of the operator. Consequently, the evaluation of certain characteristics presented by the cigarettes is necessarily subjective and may not always be made uniformly, even within the scope of a single production run.

**[0009]** The object of the present invention is to provide a method and a unit whereby all the characteristics of products turned out by a manufacturing line of the above noted type are evaluated on the basis of rigorously objective criteria that remain constant over time.

**[0010]** The stated object is realized, according to the invention, in a method and a unit for testing the quality of production in a line for manufacturing tobacco products, of which the essential features are recited in one or more of the appended claims.

**[0011]** The invention will now be described in detail, by way of example, with the aid of the accompanying

drawings, in which:

- figure 1 is a block diagram representing a line for the manufacture of tobacco products, equipped with a unit for testing the quality of production such as will implement the method according to the present invention;
- figure 2 is a schematic perspective representation of the line for manufacturing tobacco products as illustrated diagrammatically in figure 1;
- figures 3 and 4 show two graphs obtainable using the unit of figure 1;
- figures 5 and 6 show a table and a corresponding graph, respectively, obtainable using the unit of figure 1.

**[0012]** With reference to figures 1 and 2, numeral 1 denotes a production line, in its entirety, for the manufacture of tobacco products such as cigarettes, denoted 2, comprising a cigarette maker 3 and a filter tip attachment machine 4.

**[0013]** The cigarette maker 3 incorporates a plurality of devices and machine units and, more exactly, is equipped at the upstream end with a carding unit 5 in receipt of tobacco from an infeed hopper (not illustrated); proceeding downstream, the tobacco is taken up onto a carding drum 6 and projected by an impeller roller 7, operating in conjunction with the carding drum 6, into a descent duct or chute 8, thence onto a belt conveyor 9 and into an ascent duct or chimney 10.

**[0014]** The top end of the chimney 10 is enclosed by an aspirating belt 11 on which the tobacco particles collect and are formed gradually into a continuous stream 12 that will ultimately provide the filler for the cigarettes 2.

**[0015]** The stream 12 of tobacco is released onto a strip of paper 13 decoiling from a roll 14 along a path that passes initially through a printing device 15, and advances into a garniture section 16 where it is enveloped longitudinally by the aforementioned strip 13 to form a continuous cigarette rod 17.

**[0016]** The continuous rod 17 is fed toward and through a cutting station 18 where it will be divided up by a rotary cutter device 19 into discrete segments of predetermined and constant length, and more exactly into sticks 20 of length measuring twice the length of a stick making up a single cigarette 2.

**[0017]** Numeral 21 denotes a device by which the double length sticks 20 are transferred, through a set of infeed rollers 22 forming part of the filter tip attachment machine 4, to a cutting station 23 where each successive double length stick 20 is separated into two single cigarette sticks 24 by the action of a roller 25 and a disc cutter 26.

**[0018]** The single cigarette sticks 24 are directed from the roller 25 of the cutting station 23, first onto a distancing roller 27 on which the two sticks 24 separated by each cutting stroke are spaced apart axially one from the other, then onto an assembling roller 28, whereupon a double

length filter plug 29 supplied by a respective feed unit, denoted 30 in its entirety, is interposed between the two single sticks 24 of each advancing pair.

**[0019]** The resulting assemblies, each consisting of two single cigarette sticks 24 and one double length filter plug 29 placed between them, are released from the assembling roller 28 onto a roller 31 that forms part of a finishing station 32, comprising a unit 33 by which tipping papers 34 are cut and fed to the selfsame station 32, and a rolling device 35 such as will take up the stick/double-filter/stick assemblies and the tipping papers 34 and roll each successive tipping paper 34 about a corresponding assembly to fashion a double length cigarette 2.

**[0020]** The double length cigarettes 2 are fed by way of an intermediate roller 36 to a cutter device 37 and divided by a cutting stroke made through the double length filter 29 to generate two successions of single filter cigarettes 2 appearing identical one to another.

**[0021]** The two successions of filter cigarettes 2 are directed toward an outfeed stage 38 of the filter tip attachment machine 4, advancing first onto an overturning roller 39 by which a single succession of cigarettes 2 is established, then passing onto a final train of rollers denoted 40 in its entirety, along which the cigarettes 2 will undergo further finishing steps of a familiar nature.

**[0022]** As illustrated in figure 2 for example, the final train 40 of rollers, supported together with the aforementioned rollers 22, 25, 27, 28 and 31 by a vertical bulkhead 41 associated with the frame 42 of the filter tip attachment machine 4, comprises a roller denoted 43 on which ventilation holes are pierced in the cigarettes 2 by a laser generator device 44, and a roller denoted 45 on which the cigarettes are scanned.

**[0023]** Referring again to figure 1, the manufacturing line 1 comprises a unit 46 by means of which to test the production quality of the cigarettes 2, connected on the input side by way of a single cigarette sampling device, indicated as a block 47, to a roller 48 coinciding with the outfeed stage 38 of the filter tip attachment machine 4.

**[0024]** The unit 46 in question is designed to test the quality of a plurality of characteristics presented by the single cigarette 2, and in particular, the integrity of the paper wrap, the consistency of the end fill, the degree of ventilation obtained with the holes pierced by the laser generator 44, the quality of the print, the weight, and so forth.

**[0025]** With reference in particular to figure 1, the quality testing unit 46 is connected on the output side to a central data processing and sorting unit or CPU 49, connected in turn to a keyboard 50, a video display unit 51 and a printer 52. The CPU 49 can also be connected by way of a web network 53 to the Internet, represented schematically by a block denoted 59.

**[0026]** Once the quality testing unit 46 has inspected a significant number of single cigarettes 2 (say 10, for example) selected at the outfeed station 38, the CPU 49 will receive signals relating to each of the characteristics tested, which it processes and outputs in the form of

graphs, as illustrated by way of example in figures 3 and 4, viewable on the video display unit 51.

**[0027]** The CPU 49 comprises processing means 54 by which each signal received from the testing unit 46 is assigned a value on a predetermined scale common to all of the tested characteristics.

**[0028]** In the graphs of figures 3 and 4, the "x" axis represents the succession of cigarettes 2 subjected to quality testing, whilst the "y" axis is marked 0 to 10, denoting the values on the aforementioned scale.

**[0029]** Observing the graphs relative to a succession of cigarettes 2 sampled from the outfeed stage 38, the quality of production as reflected in each of the tested characteristics will be readily discernible. Self-evidently, a substantially flat line indicates that the quality of the tested characteristic has remained substantially constant over time, whilst an upward trend toward the higher numbers on the scale indicates an improvement and a downward trend indicates a deterioration.

**[0030]** In the latter instance, the information provided will enable the operator to take corrective action on the devices of the line 1 to which the negative trend is attributable.

**[0031]** The action in question might occur automatically, triggered by feedback control circuits indicated schematically in figure 1 as blocks denoted 55 and 56, by way of which the CPU 49 is connected to the various devices and units of the cigarette maker 3 and of the filter tip attachment machine 4.

**[0032]** The CPU 49 further comprises sorting means 57 by which the signals reflecting the characteristics of each single cigarette 2 tested can be represented as numerical values in a table as illustrated in figure 5.

**[0033]** Accordingly, each column in the table of figure 5 provides information amounting effectively to a "report" on a respective cigarette.

**[0034]** The central data processing and sorting unit 49 is equipped with computing means 58 able to produce an overall assessment of the tested characteristics for each cigarette 2 sampled. In the example of figure 5, each of the overall assessments indicated on the bottom line of the table is attributed by computing the average of the values assigned for the single characteristics.

**[0035]** On the basis of the overall assessments produced by the computing means 58, the processing means 54 are able to generate a graph of the type shown in figure 6, which indicates the trend of the overall assessments relating to a given series of sampled cigarettes 2.

**[0036]** It will be seen that the line 1 is equipped in conventional manner with a succession of devices serving to monitor the cigarette-making process, and devices serving to reject any cigarettes 2 of which the characteristics may not register within prescribed limits. Thus, all of the cigarettes 2 scrutinized by the quality testing unit 46 will be identifiable, at least in theory, as conforming to an acceptance threshold defined in the graphs of figures 3, 4 and 6, by the line A parallel to the "x" axis.

**[0037]** Thus, with the graphs described above providing an index as to the quality of a given production cycle, the manufacturer will be able, on the basis of these same graphs, to select the most suitable market for a particular type of production lot.

**[0038]** Accordingly, selection means might be installed at the outfeed stage 38 of the line 1, with the end in view of organizing the tobacco products into distinct lots destined for different markets.

**[0039]** As illustrated in figure 1, the system might also comprise a printing device 60, associated with the quality testing unit 46 and driven by the computing means 58 and/or the processing means 54, such as will impress the sampled cigarettes 2 with marks 61 serving to indicate the overall quality assessment attributed by averaging the values assigned for all of the characteristics tested, or to indicate the value assigned for one such characteristic.

## Claims

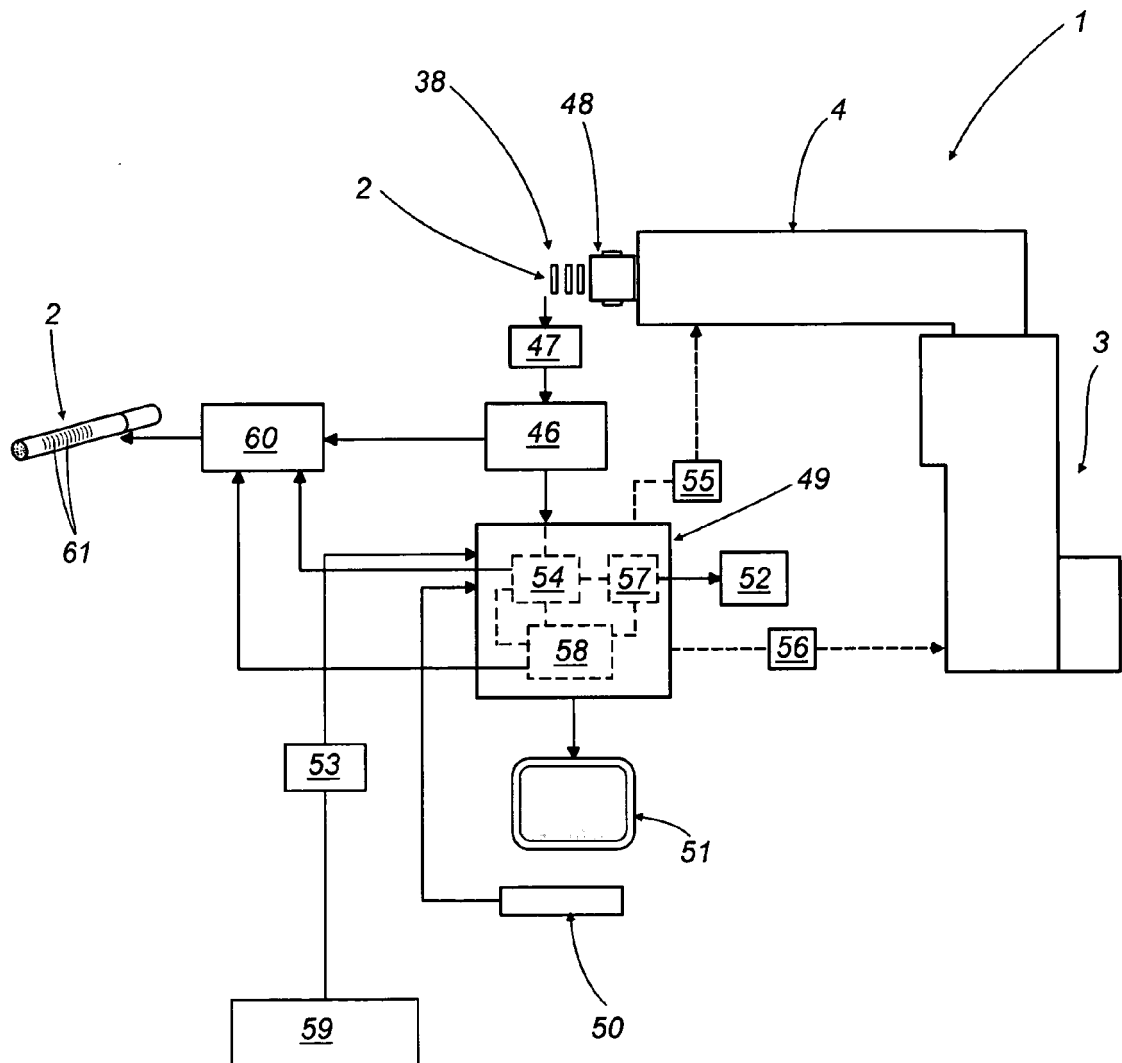
1. A method of testing the quality of production in a line for manufacturing tobacco products,  
**characterized**  
**in that** it includes the steps of:
  - sampling a given number of finished products (2) taken from the outfeed stage (38) of the line (1) ;
  - subjecting each of the sampled products (2) to a step, performed by a relative testing unit (46), in which the quality of a predetermined number of characteristics is evaluated in such a way as to obtain a plurality of signals each reflecting the quality of a single characteristic presented by each product (2).
2. A method as in claim 1, including a further step in which the succession of signals reflecting the single characteristics of the sampled products (2) is represented in the form of a graph.
3. A method as in claim 1 or 2, including a step of evaluating the signals according to a predetermined scale of values.
4. A method as in claim 3, wherein the scale of values is the same for all of the characteristics.
5. A method as in claim 3 or 4, including the step of displaying a table of values assigned to all of the tested characteristics, for each of the sampled tobacco products (2).
6. A method as in claim 4 or 5, including the step of attributing an overall assessment in respect of each sampled tobacco product (2), based on the values

assigned to a plurality of the tested characteristics.

7. A method as in claim 6, wherein the overall assessment is the average of the values assigned to the tested characteristics.
8. A method as in claim 6 or 7, including a step in which the succession of overall assessments attributed to the sampled products is represented in the form of a graph.
9. A method as in claims 1 to 8, including a step in which marks (61) are printed on the tested tobacco products (2) to indicate the overall assessment, or to indicate the value assigned in respect of a given characteristic.
10. A unit for testing the quality of production in a line for manufacturing tobacco products, typically a line (1) equipped with a machine (3) for making the tobacco products (2) and a filter tip attachment machine (4),  
**characterized**  
**in that** it comprises a unit (46) such as will test the quality of a given number of characteristics presented by single products (2) sampled at the outfeed stage (38) of the line (1) and generate output signals reflecting the quality assignable respectively to each of the single characteristics of each sampled product (2), also a central processing and sorting unit (49) by which the output signals are received from the testing unit (46), processed, and transmitted to video display means (51) on which the selfsame processed signals are represented in the form of graphs.
11. A unit as in claim 10, wherein the central data processing and sorting unit (49) comprises processing means (54) by which each signal received from the quality testing unit (46) is assigned a value on a predetermined scale.
12. A unit as in claim 11, wherein the central data processing and sorting unit (49) comprises sorting means (57) by which the signals reflecting the characteristics of each tested tobacco product (2) are listed in a table.
13. A unit as in claim 11 or 12, wherein the central data processing and sorting unit (49) comprises computing means (58) by which each tested tobacco product (2) is attributed an overall assessment in respect of all the tested characteristics, based on the predetermined scale of values.
14. A unit as in claim 13, wherein the overall assessment attributed to each tested product (2) is the average of the values assigned to the tested characteristics.

15. A unit as in claims 13 and 14, wherein the central data processing and sorting unit (49) comprises processing means (54) by which a graph is generated to indicate the trend of the overall assessments for a given number of sampled products (2). 5
16. A unit as in claim 15, comprising means, interlocked to the central data processing and sorting unit (49), by which the end products (2) emerging from the line (1) are selected and organized into identifiable lots, according to the trend of the overall assessments. 10
17. A unit as in claims 10 to 16, comprising print means (60) connected to the quality testing unit (46) and driven by the central data processing and sorting unit (49), by which the tested tobacco products (2) are impressed with marks (61) indicating the overall assessment or the value assigned to a given characteristic. 15
- 20
- 25
- 30
- 35
- 40
- 45
- 50
- 55

**FIG. 1**



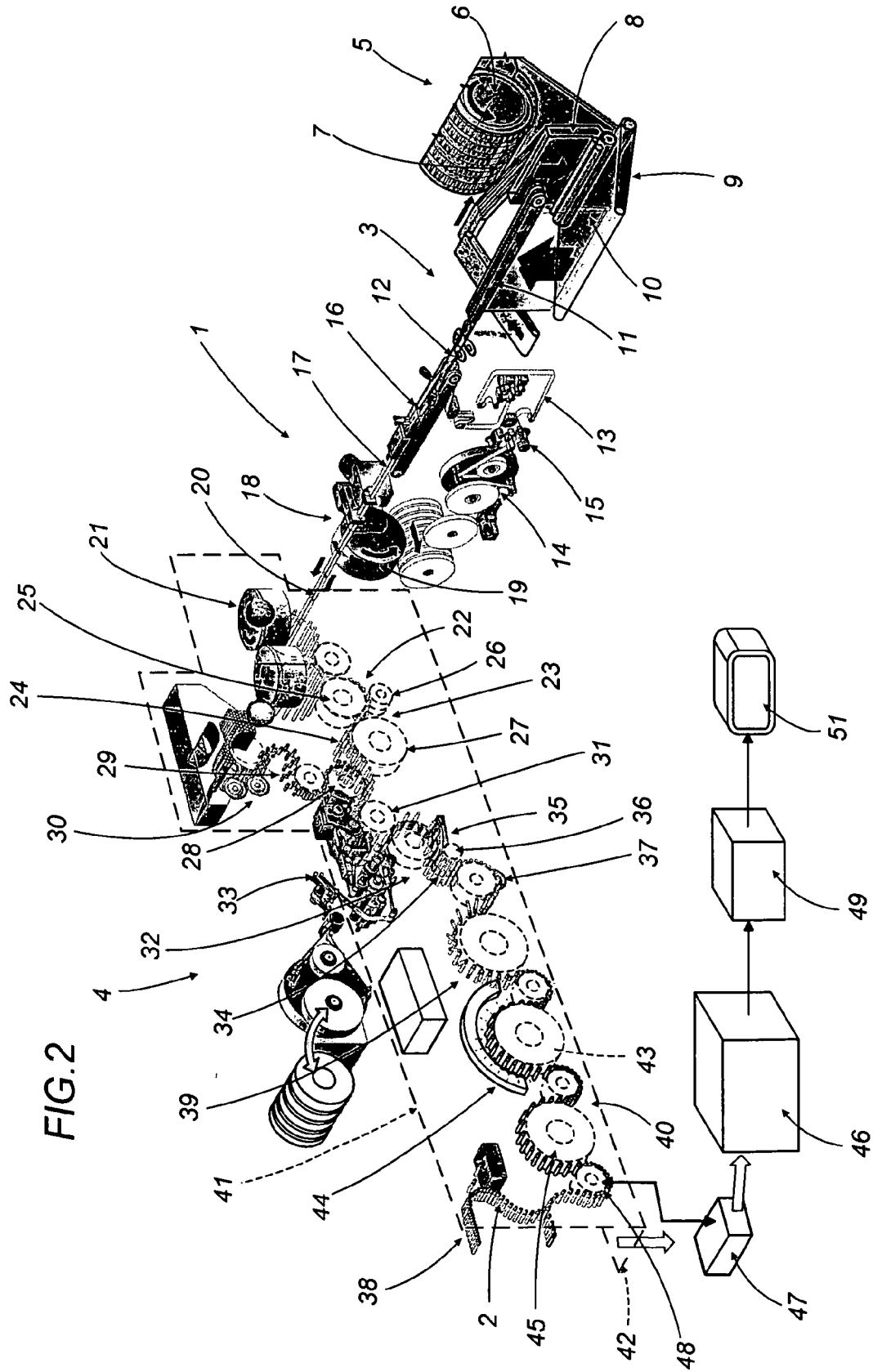


FIG.3

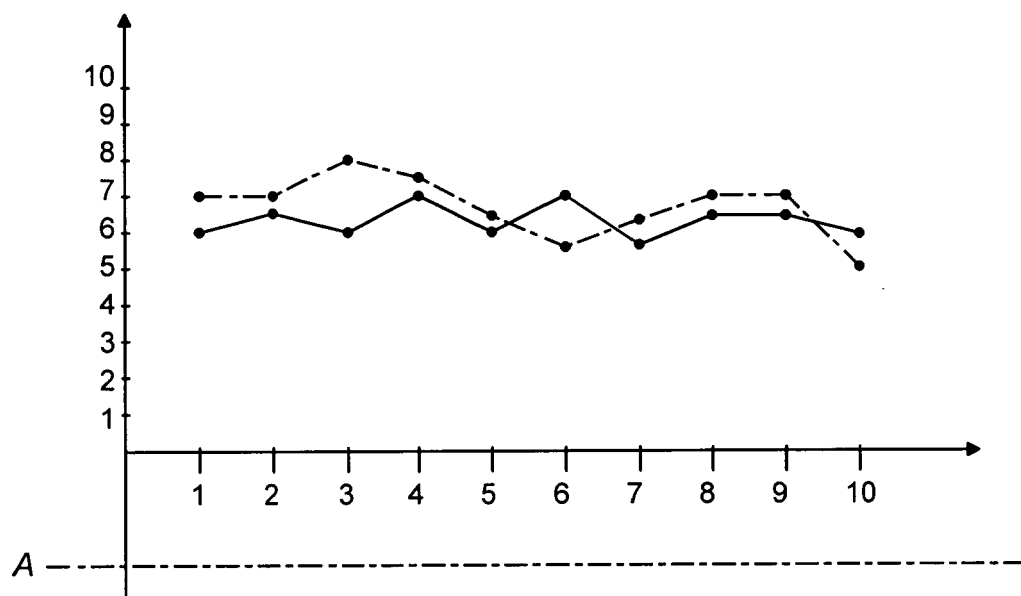


FIG.4

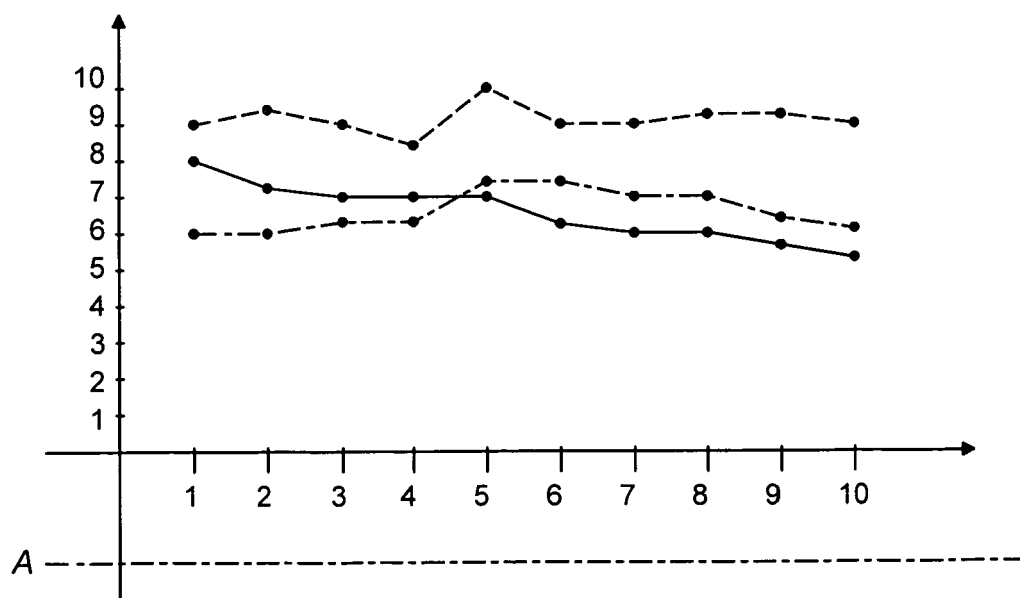
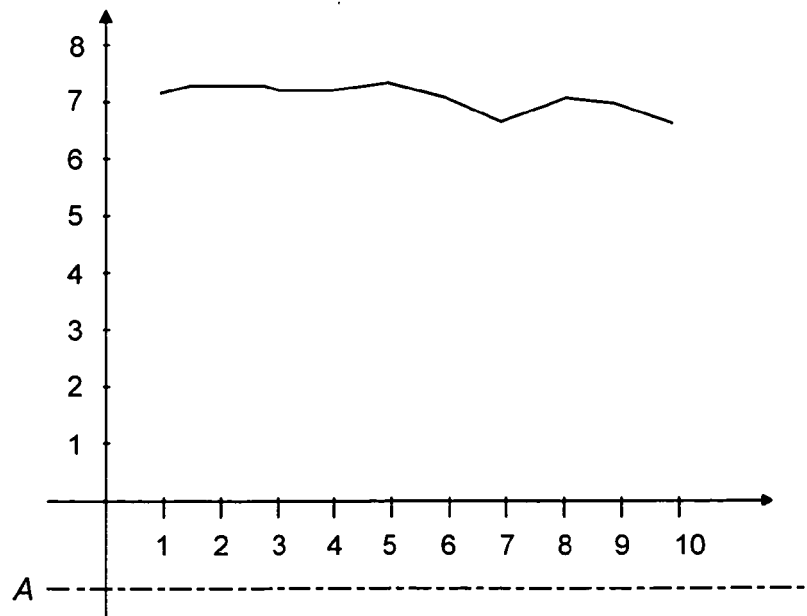


FIG.5

|                         | CIG | CIG            | CIG            | CIG            | CIG            | CIG            | CIG            | CIG            | CIG            | CIG            |
|-------------------------|-----|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| PRINT QUALITY           | 8   | $7\frac{1}{2}$ | 7              | 7              | 7              | $6\frac{1}{2}$ | 6              | 6              | $5\frac{1}{2}$ | 5              |
| DEGREE OF VENTILATION   | 6   | 6              | $6\frac{1}{2}$ | $6\frac{1}{2}$ | $7\frac{1}{2}$ | $7\frac{1}{2}$ | 7              | 7              | $6\frac{1}{2}$ | $6\frac{1}{2}$ |
| INTEGRITY OF PAPER WRAP | 9   | $9\frac{1}{2}$ | 9              | $8\frac{1}{2}$ | 10             | 9              | 9              | $9\frac{1}{2}$ | $9\frac{1}{2}$ | 9              |
| END FILL                | 7   | 7              | 8              | $7\frac{1}{2}$ | $6\frac{1}{2}$ | $5\frac{1}{2}$ | $6\frac{1}{2}$ | 7              | 7              | 5              |
| WEIGHT                  | 6   | $6\frac{1}{2}$ | 6              | 7              | 6              | 7              | $5\frac{1}{2}$ | $6\frac{1}{2}$ | $6\frac{1}{2}$ | 6              |
| OVERALL ASSESSMENT      | 7,2 | 7,3            | 7,3            | 7,3            | 7,4            | 7,1            | 6,8            | 7,2            | 7              | 6,3            |

FIG.6





European Patent  
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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                           |                                                                                                                                                                       |                                                                                                                                                                                                                                                                              |                                                        |
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| Place of search<br><b>Munich</b>                                                                                                                                                                                                                              |                                                                                                                                                                       | Date of completion of the search<br><b>18 May 2006</b>                                                                                                                                                                                                                       | Examiner<br><b>MARZANO MONTEROSSO</b>                  |
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