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(54) Feed mechanism and method for ironing machine

(57) The present invention relates to an ironing machine (100) which has an ironing means (3) with a width. The ironing means (3) comprises an inlet for receipt of laundry workpieces (6) and a feed means (8) arranged in use to feed a said workpiece (6) into said inlet. The ironing machine (100) further comprises sensing means (40) connected to a control means (50) for measurement of a value related to a temperature of the ironing means (3). The sensing means (40) are arranged in use to supply to said control means (50) a signal indicative of the temperature distribution in the ironing means (3). The control means (50) are arranged in use to control, in response to said signal, at least the location of introduction of the workpieces (6) in the ironing machine (100) with respect to the width of the ironing means (3).

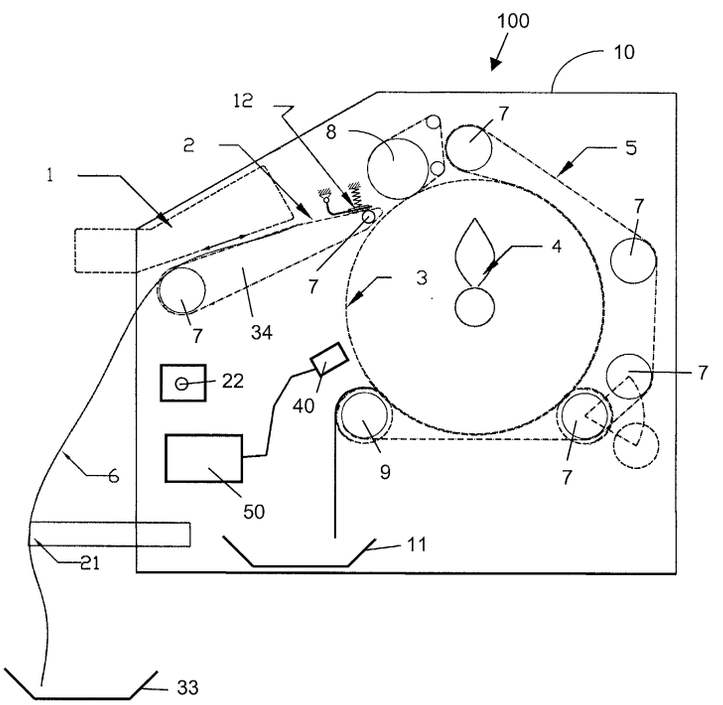

Fig. 1

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Description

Technical field of the invention

[0001] The present invention relates to ironing machines and in particular, but not exclusively to a feed mechanism and method for such ironing machines.

Background of the invention

[0002] It is known to provide laundry apparatus adapted to iron fabric workpieces on an industrial scale, such fabrics often comprise linen, sheets, pillowcases, tablecloths and similar laundry items and are sometimes referred to for convenience as flatwork. Some such prior art apparatus comprise in general terms a heated main cylinder, having several small cylinders and textile belts that convey fabric workpieces across and in contact with the heated main cylinder. A heating system for heating of the main cylinder may be provided by a variety of means, such as electrical elements, gas, steam or heated fluid oil. The heating system keeps the cylinder at an optimal temperature set by the operator according to the type of linen. A preferred situation is to keep the main cylinder and the ironing process at a stable temperature. The efficiency of ironing depends on a combination of cylinder temperature, ironing pressure and the transportation speed of the fabric across the surface of the heated main cylinder.

[0003] The fabric workpiece is inserted in the middle of the ironer by an introduction system that consists of two clamps in which the operator clamps the workpiece. By pressing a button, the workpiece is stretched by means of a pneumatic cylinder which moves a cable on which the clamps are permanently fixed. Entangled fabrics workpiece is disentangled by means of brushes, for example as described in US-3736678, which push each end of the workpiece to an appropriate side of the ironer.

[0004] The brushes cause the following problems :

- They can damage the fabrics workpiece.
- A lot of dust is created which requires extra dust collecting systems.
- The system requires a lot of maintenance: adjustment of brush tension, regular removal of fibres and dust, etc.
- The fabric has to be introduced in the middle of the machine.

[0005] A classical introduction system, of which a top view is shown in Fig. 3, works in a way that a fabric workpiece 6 is put by an operator in clamps 13 and 14. The clamps 13, 14 are fixed to a rope 15 which itself is fixed to jack 32 of pneumatic cylinder 23. On the command of an operator, e.g. by pushing control button 22, the pneumatic cylinder 23 moves and stretches the fabric workpiece 6. While the fabric 6 is stretched, the brushes 24 start rotating in order to disentangle the fabric 6. This latter has the negative effect that the fabric 6 is introduced always in the middle of the machine which results in overheating of the heated main cylinder on those places were the fabric 6 never passes. This has as consequence that the operator should always iron sheets that are equal to the width of the ironer cylinder (which is in practice not feasible) or, when smaller sheets are ironed, the operator should cool down the sides where the fabric 6 does not pass at regular intervals (which results in a loss of efficiency).

[0006] A classic construction of the introduction system is also described e.g. in US-3729846 and US-3421756. In these documents it is explained that the fabric is inserted always in the middle of the machines. This causes overheating of the edges of the heated main cylinder, which causes unequal drying of the fabric. This unequal drying effect can lead to burnt fabric and/or problems in a folding device, if present.

Summary of the invention

[0007] It is an object of the present invention to provide an ironing machine comprising an ironing means for drying and ironing fabric workpieces, in which the ironing means does not overheat at its edges, as well as a method of operating the machine.

[0008] The above objective is accomplished by a device and a method according to the present invention.

[0009] An ironing machine is provided with a feeding mechanism which allows the introduction of the fabric workpieces in a sequential way. This has the advantage that the ironing means is kept at a substantially homogeneous temperature, by which a substantially constant ironing quality is assured.

[0010] An ironing machine according to the present invention has an ironing means, for example but not limited thereto a heated cylinder, with a width. The ironing means comprises an inlet for receipt of laundry workpieces and a feed means arranged in use to feed a said workpiece into said inlet. The ironing machine further comprises sensing means connected to a control means for measurement of a value related to a temperature of the ironing means. The sensing means are arranged in use to supply to the control means a signal indicative of a temperature distribution in the ironing means. The control means are arranged in use to control at least one operating parameter of the ironing machine in response to the signal from the sensing means, said at least one parameter including the location of introduction of the workpieces with respect to the width of the ironing means. The at least one parameter may furthermore include an ironing temperature.

[0011] A system for changing the location of introduction of the workpiece in the ironing machine may furthermore be provided. This system for changing the location of introduction of the workpiece may comprise a first clamp and a second clamp for clamping the workpiece, and a movement system onto which these clamps are

fixed for moving them with respect to the width of the ironing means before introduction of the workpiece in the ironing machine. This movement system may comprise a flexible line such as a wire or rope, to which the first clamp is releasably connected by releasable fastening means, such as a coil for example, and to which the second clamp is continuously connected.

[0012] The control means may send, in response to the signal of the sensing means, a control signal to a gearbox for changing the location of introduction of the workpiece with respect to the ironing means, or thus for driving the system for changing the location of introduction of the workpiece, more particularly the movement system thereof. A torque limiter may be mounted on the gearbox.

[0013] The ironing machine may furthermore comprise a width measuring device for measuring the width of the workpiece. The width measuring device may for example comprise a rotation encoder which sends out a signal relating to a distance travelled. Other width measuring devices can be used as well.

[0014] In an embodiment, the ironing machine is provided with a retractable, rounded table at the inlet thereof. This table aids in nicely stretching the workpiece.

[0015] The present invention also provides a method of controlling an ironing machine having an ironing means with a width. The method includes:

a) sensing of a value related to the temperature of the ironing means , and

b) controlling at least one operating parameter of said ironing machine in proportion to the sensed value of said temperature, said at least one parameter including the location of introduction of workpieces with respect to the width of the ironing means.

[0016] The method may furthermore comprise controlling ironing temperature and/or measuring the width of a workpiece.

[0017] The present invention also provides a control means for an ironing machine. This control means is arranged in use to control at least one operating parameter of the ironing machine in dependence on one or more signals from sensing means, of which a signal is indicative of the temperature distribution of at least part of the ironing means. The at least one parameter which is to be controlled by the control means includes the location of introduction of the workpieces with respect to the ironing means.

[0018] The control means may furthermore be arranged in use to control ironing temperature and/or a distance over which a workpiece is moved.

[0019] Although there has been constant improvement, change and evolution of laundry apparatus in this field, the present concepts are believed to represent substantial new and novel improvements, including departures from prior practices, resulting in the provision of devices that improve the quality of ironing.

[0020] These and other characteristics, features and advantages of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention. This description is given for the sake of example only, without limiting the scope of the invention. The reference figures quoted below refer to the attached drawings.

Brief description of the drawings

[0021]

Fig. 1 is a schematic cross-sectional side view of an ironing machine with an introduction system according to an embodiment of the present invention.
Figs. 2.1 to 2.5 are schematic views of sequential stages of the introduction according to the present invention of a fabric workpiece into an ironing machine.
Fig. 3 is a schematic view of a conventional stretching mechanism.
Fig. 4 is a schematic view of the sequential way of introducing linen done by an operator when manually entering the linen in an ironing machine.

[0022] In the different figures, the same reference figures refer to the same or analogous elements.

Description of illustrative embodiments

[0023] The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto but only by the claims. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes.

[0024] Referring to the drawings and in particular to Fig. 1, an ironing machine 100 comprises an outer casing 10 that houses an ironing means, the ironing means being expressed in one embodiment in the form of an ironing cylinder 3 provided with a heating system 4 to keep the ironing cylinder 3 at a specific and preferably predetermined temperature. The heating system 4 may take a variety of forms, e.g. electrical, gas, steam or heated fluid oil heating. The heating system is not considered to be a limitation on the present invention. The cylinder 3 is adapted for rotation, and may be driven for rotation by a suitable motor, e.g. a variable speed motor and transmission (not represented in the drawings). The active heating surface that heats the fabric workpiece 6 is preferably about 3/4 of the total surface of the heating cylinder 3.

[0025] An inlet means is provided which may comprise an entry table 2. The inlet means presents a fabric workpiece 6 to a feed means. A feed means may be

provided in the form of a pressure cylinder 8, which rests substantially parallel to and on or in the neighbourhood of the ironing cylinder 3. Such a feed means may be arranged in use to feed the fabric workpiece 6 into the ironing machine 100 and to drive it through the machine 100 from the inlet to an outlet and to keep it in contact with the ironing cylinder 3. The pressure cylinder 8 may be part of the inlet of the ironing means 3 and may co-operate with one or a plurality of continuous/endless textile belts 5 which are trained around the pressure cylinder 8 and around a series of belt cylinders 7. In at least one point of their path, the belts 5 are trapped between cylinders 3, 7 and 8 in such a way that movement is imparted to the belts 5 and they feed a fabric workpiece 6 into the machine 100 and drive it through, keeping the fabric 6 in contact with the heating cylinder 3. At the end of the ironing process, the feed means is adapted to return the fabric workpiece 6, e.g. via an outlet comprising an exit table roller 9, to an exit table 11 where an operator can fetch it in an ironed condition.

[0026] A control unit may be provided for controlling the operation of the complete machine or the control unit may be split up into one or more controllers, each controller carrying out specific control functions, e.g. temperature, movement control. The control unit may make use of any suitable control method, e.g. mechanical, electronic, hydraulic, pneumatic although an electronic control system using microcontrollers or similar, e.g. a PLC, is preferred.

[0027] The operation of the ironing is essentially as follows: once an ironing temperature has been achieved at the surface of the heated ironing cylinder 3 that is suitable for the type of fabric 6 (e.g. cotton, linen, synthetics) to be ironed, the fabrics work piece 6 is put on the top fabrics holder 33. The top fabrics holder 33 acts as an input of the machine 100 and is used for receipt of fabric workpieces 6 upstream of the ironing cylinder 3. An operator then moves the fabrics 1 to the transportation belts 34 and initiates a machine ironing cycle, e.g. by means of a user device such as a pedal or button 22. Initiating an ironing cycle starts the turning of the belts 5 and cylinders 7. By friction, the fabrics 6 are transported automatically by the belts 5 into the machine 100 between the pressure cylinder 8 and the heated ironing cylinder 3. Body part protection, such as finger protection (not represented in the drawings) may be provided to protect an operator from injury, and is then adapted to put the drive motor in reverse if something goes wrong at the entry table 2, e.g. if an operator body part passes beyond a finger protection trip switch. Body part protection therefore comprises a sensor suitable for sensing a body part passing beyond a finger protection trip switch, which sensor sends a corresponding signal to the control unit. The control unit then sends, in response to the signal received from the sensor, an appropriate signal to the drive motor of the ironing cylinder 3 for driving the ironing cylinder 3 in reverse.

[0028] In a case where the ironing machine 100 is provided with a folding mechanism (not represented in the drawings), the fabrics 6 will be folded automatically when leaving the exit table 11.

[0029] According to an embodiment of the present invention, the cylinder 3 is provided with sensing means 40 for direct in situ measurement of a value related to a temperature or to a temperature distribution over the surface of the cylinder 3, e.g. temperature sensors are provided at a plurality of places on the surface of the cylinder 3, distributed over its width. The sensing means 40 are connected to a controller 50 which may be part of the control unit. The sensing means 40 are arranged in use to supply to the controller 50 a signal indicative of the temperature distribution at the surface of the cylinder 3. The controller 50 is arranged in use to control at least one operating parameter of the ironing machine 100 in response to said signal. The arrangement of the present invention preferably detects a temperature distribution of the surface of the cylinder 3 itself, thus taking a substantially direct measurement thereof, rather than taking a measurement in the neighbourhood. The sensing means 40 may be located anywhere near, adjacent or abutting the surface of the cylinder 3.

[0030] The at least one operating parameter controlled by the controller 50 includes the introduction position of the fabric. The at least one operating parameter may furthermore include the ironing temperature. When a wet fabric workpiece 6 is introduced in the ironing machine 100, the reference temperature of that part of the ironing means 3 which is in contact with the fabric workpiece 6 diminishes. The controller 50 controls the temperature of the ironing means 3 by adapting the power supplied to the heating means thereof.

[0031] Referring to Fig. 1 the fabric workpiece 6 can be introduced manually by the operator by putting the unfolded fabric 6 on the entry table 2 or by help of an introduction system 1 which will automatically stretch the fabric workpiece 6 and put it on the entry table 2 in such a way that the fabric workpiece 6 will be introduced sequentially so that the temperature of the ironing cylinder 3 is cooled down homogeneously.

[0032] It will be appreciated by those skilled in the art from the following that the introduction system 1 according to an embodiment of the present invention is constructed in a way that the width of the fabric workpiece 6 is measured during stretching and that on the basis of this width and the temperature values on different spots of the cylinder 3 the introduction system 1 will introduce the fabric workpiece 6 so that the fabric 6 is introduced where the temperature at the surface of the cylinder 3 is suitable or optimal, e.g. at the point where the temperature is the highest. The way in which this is technically realised is described in detail with respect to Figs. 2.1 to 2.5.

[0033] The introduction system 1 comprises a first clamp 13 and a second clamp 14. The second clamp 14 is continuously connected with a rope or wire 15. The first clamp 13 can be alternatively connected to the

frame 16 of the machine 100 or with the rope 15, by a releasable fastening means, e.g. by means of a coil 17.

[0034] The rope 15 is driven by gearbox 18, which may be provided with a torque limiter 19. On the opposite site an encoder 20 is mounted.

[0035] In Fig. 2.1 the fabric 6 has been inserted between the clamps 13 and 14. The operator pushes a control button 22 to start the introduction process of the fabric 6.

[0036] As can be seen on Fig. 2.2, the gearbox 18 drives the rope 15 on which clamp 14 is fixed, thus pulling the clamp 14 to the right. Clamp 13 stays fixed to the frame 16 by means of releasable fastening means such as e.g. a coil 17. During the stretching process, the width of the fabric 6 is measured by means of a fabric width measuring device, comprising for example a rotation encoder 20 with resolution of a predefined number of pulses per rotation. The output from the rotation encoder 20 is read by a counter input of a control device, e.g. a PLC which may be part of the control unit, where the signal is filtered and interpreted before being passed as an actual distance. Alternatively, the width of the fabric 6 can be detected with an array of optical or capacitive detectors, using for example a test for presence or absence of the fabrics. A resulting signal is sent to the controller 50 which therefrom obtains information about the width of the fabrics 6 and can calculate an optimum position of the fabrics 6 with regard to the temperature distribution on the cylinder 3. An optimum position of the fabrics may for example be such that the middle of the width of the fabrics 6 is located on the hottest spot on the cylinder 3.

[0037] A rounded table 21, which can also be used without the introduction system 1 of the present invention, ensures that the fabric 6, after introduction into the ironing machine, is nicely stretched without the need of brushes.

[0038] As shown in Fig. 2.3, at a certain point in time the fabric 6 is stretched in the width, and a friction coupling 19 mounted on the gearbox 18 starts slipping. At that moment the encoder 20 outputs a signal to a control unit such as a PLC for example which may be part of the control unit, from which signal can be derived that no movement is occurring anymore. The control unit then sends a corresponding signal to suitable release means, which then release the releasable fastening means, in casu the coil 17, by which the clamp 13 becomes connected to the rope 15. The fabric 6 is then transported so as to be located in an optimum position with respect to the temperature profile on the cylinder 3, e.g. especially with respect to the hottest place of the cylinder 3, as represented on Fig. 2.4. Such an optimum position may be e.g. so that the middle of the width of the fabric workpiece is located on the hottest spot of the surface of the cylinder 3. Alternatively, an optimum position may be e.g. so that the hottest part of the surface of the cylinder 3 is covered as much as possible by the introduced fabric workpiece 6. The distance over which the fabric workpiece 6 moves for reaching the optimum position is measured by a measuring device, e.g. comprising rotation encoder 20 which sends a signal relating to the distance travelled to the control unit, this signal for example being a number of pulses. The output from the rotation encoder 20 is read by a counter input of the control unit, e.g. a PLC, where the signal is filtered and interpreted as an actual distance

[0039] Having reached the optimum position, the fabric 6 is then introduced in the machine according to Fig. 2.4 by raising the part of the introduction system 1 mounted on frame 16. The fabric 6 is released onto the entry table 2. Returning to Fig. 1 the fabric 6 introduced onto the entry table 2 passes humidity sensor 12 and optionally other sensors which determine the humidity, and also thickness and the kind of fabric 6 and the speed of rotating of the cylinder 3 or the power of the heating 4 is adapted by the control unit according to these parameters. The control unit receives signals from the sensors and sends appropriate signals to the respective drive mechanisms of the ironing machine. Mechanical parts in the form of distance pieces (not represented in the drawing) may keep the fabrics 6 at a constant distance from the head of the humidity detector 12, e.g. from its capacitive electrodes. The information gathered by the humidity detector 12 is sent to the control unit, which may be the same as the controller 50 or a different one, and, as a consequence, the control unit modulates the heating of the heated cylinder 3 so as to obtain the necessary power output according to the desired/reference ironing temperature and also, if necessary, sets the ironing speed to a predefined (reference) value according to the desired residual humidity.

[0040] The table 21 can optionally be withdrawn or retracted during the stretching operation and be extended when the fabric 6 is stretched over its width. This allows free moving of the fabric 6 and as the table 21 extends the fabric 6 is additionally being stretched in its length direction.

[0041] By thus introducing fabric 6 in a sequential way (as shown in Fig. 4) the cylinder 3 will be kept at a substantially homogeneous temperature.

[0042] In carrying the invention into effect, the controller 50 sets the infeed location of the fabrics 6 depending on the temperature distribution of the cylinder 3. The controller 50 may compare the values of the temperature sensors distributed over the length of the ironing means 3, and drive the clamps 13, 14 so as to feed the fabric 6 at an optimum location with respect to the temperature distribution of the cylinder 3, generally where the temperature of the cylinder 3 is the highest. The controller 50 may carry out suitable manipulations of the received temperature values, e.g. obtain maximum values or determined averages as is known to the skilled person.

[0043] It is to be understood that although preferred embodiments, specific constructions and configurations, have been discussed herein for devices according

to the present invention, various changes or modifications in form and detail may be made without departing from the scope and spirit of this invention.

Claims

1. An ironing machine (100) having an ironing means (3) with a width, the ironing means (3) comprising an inlet for receipt of laundry workpieces (6) and a feed means (8) arranged in use to feed a said workpiece (6) into said inlet, said ironing machine (100) further comprising sensing means (40) connected to a control means (50) for measurement of a value related to a temperature of the ironing means (3), said sensing means (40) being arranged in use to supply to said control means (50) a signal indicative of a temperature distribution in the ironing means (3) and said control means (50) being arranged in use to control at least one operating parameter of said ironing machine (100) in response to said signal, said at least one parameter including the location of introduction of the workpieces (6) with respect to the width of the ironing means (3).

2. An ironing machine (100) according to claim 1, wherein the ironing means (3) is a heated cylinder.

3. An ironing machine (100) according to any of the previous claims, wherein the at least one parameter furthermore includes an ironing temperature.

4. An ironing machine (100) according to any of the previous claims, furthermore comprising a system for changing the location of introduction of the workpiece (6).

5. An ironing machine (100) according to claim 4, wherein the system for changing the location of introduction of the workpiece (6) comprises a first clamp (13) and a second clamp (14) for clamping the workpiece (6) and a movement system onto which these first and second clamps (13, 14) are fixed for moving these clamps.

6. An ironing machine (100) according to claim 5, wherein the movement system comprises a flexible line (15) to which the first clamp (13) is releasably connected by releasable fastening means (17), and to which the second clamp (14) is continuously connected.

7. An ironing machine (100) according to claim 6, wherein the releasable fastening means (17) is a coil.

8. An ironing machine (100) according to any of the previous claims, wherein the control means (50) sends, in response to the signal of the sensing means, a control signal to a gearbox (18) for changing the location of introduction of the workpiece (6) with respect to the ironing means (3).

9. An ironing machine (100) according to claim 8 as far as depending on any of claims 5 to 7, wherein the gearbox (18) is adapted for driving the movement system (15).

10. An ironing machine (100) according to any of claims 8 or 9, furthermore comprising a torque limiter (19) mounted on the gearbox (18).

11. An ironing machine (100) according to any of the previous claims, furthermore comprising a width measuring device (20) for measuring the width of the workpiece (6).

12. An ironing machine (100) according to claim 11, wherein the width measuring device (20) comprises a rotation encoder.

13. An ironing machine (100) according to any of the previous claims, furthermore comprising a retractable table (21) at the inlet of the ironing machine (100) for aiding in stretching the workpiece (6).

14. A method of controlling an ironing machine (100) having an ironing means (3) with a width, the method including:

    c) sensing of a value related to the temperature of the ironing means (3), and
    d) controlling at least one operating parameter of said ironing machine (100) in proportion to the sensed value of said temperature, said at least one parameter including the location of introduction of workpieces (6) with respect to the width of the ironing means (3).

15. A method according to claim 14, furthermore comprising controlling ironing temperature.

16. A method according to any of claims 14 or 15, furthermore comprising measuring the width of a workpiece (6).

17. A control means for an ironing machine, said control means being arranged in use to control at least one operating parameter of said ironing machine in dependence on one or more signals from sensing means, a signal being indicative of the temperature distribution of at least part of the ironing means, said at least one parameter including the location of introduction of the workpieces with respect to the ironing means.

18. A control means according to claim 17, furthermore being arranged in use to control ironing temperature.

19. A control means according to any of claims 17 or 18, being arranged for furthermore controlling a distance over which a workpiece (6) is moved.

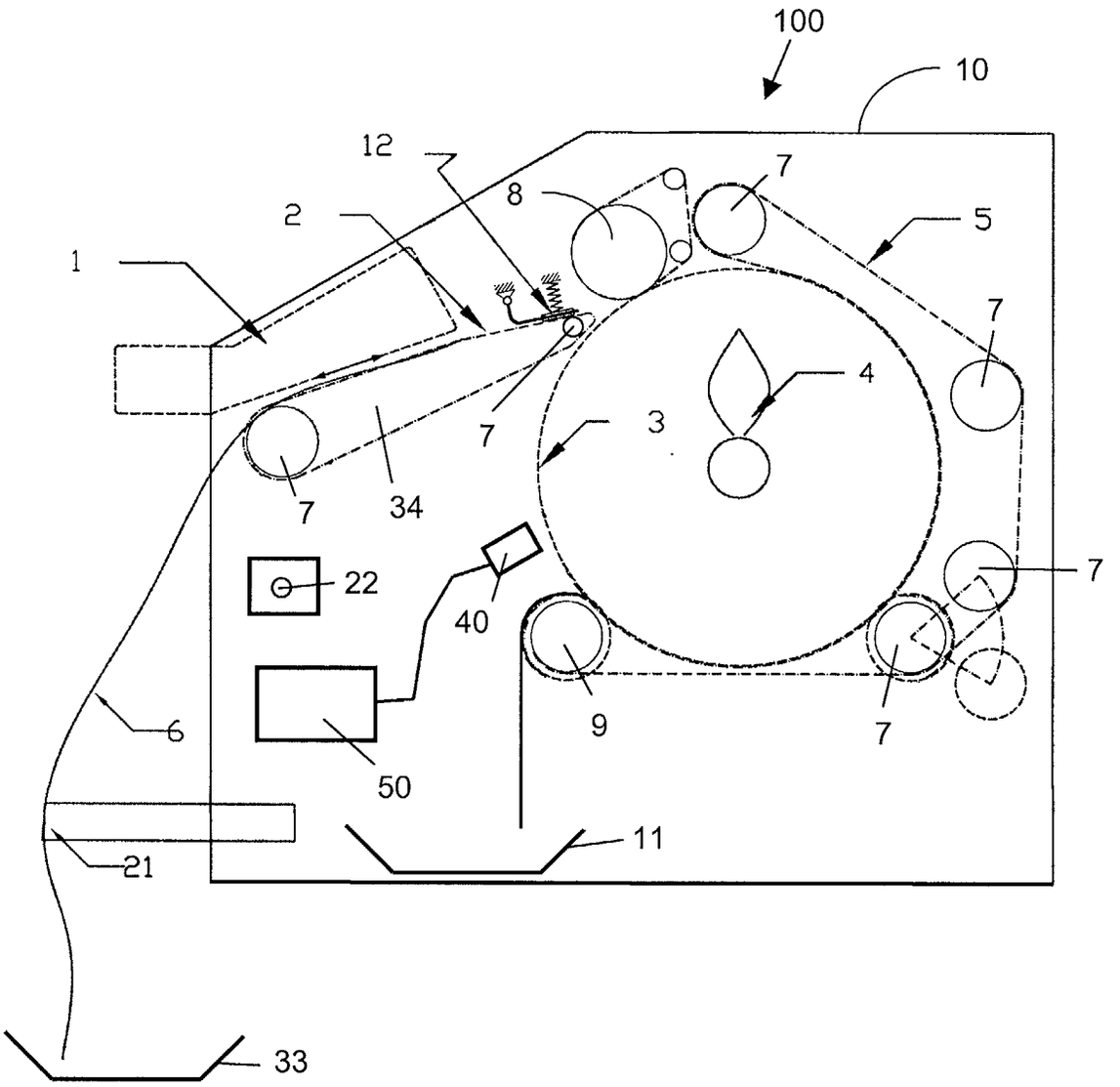

Fig. 1

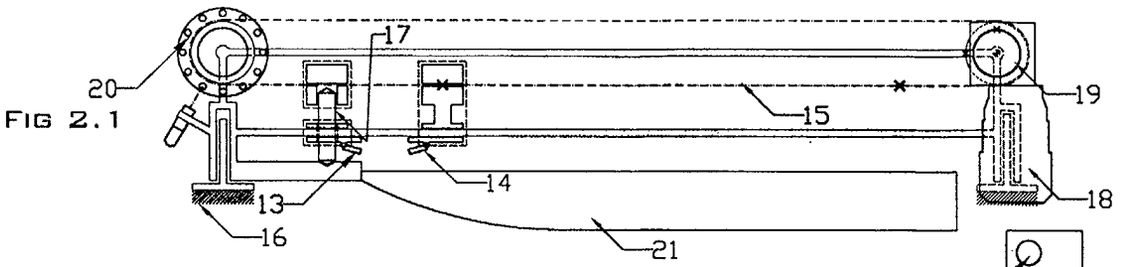

FIG 2.1

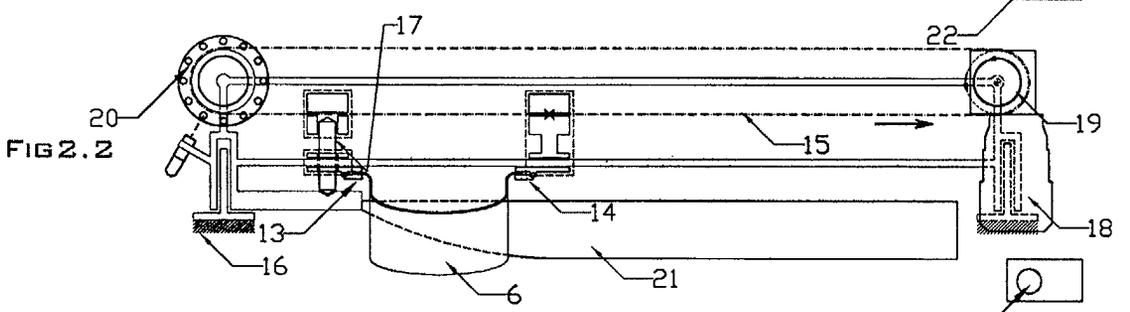

FIG2.2

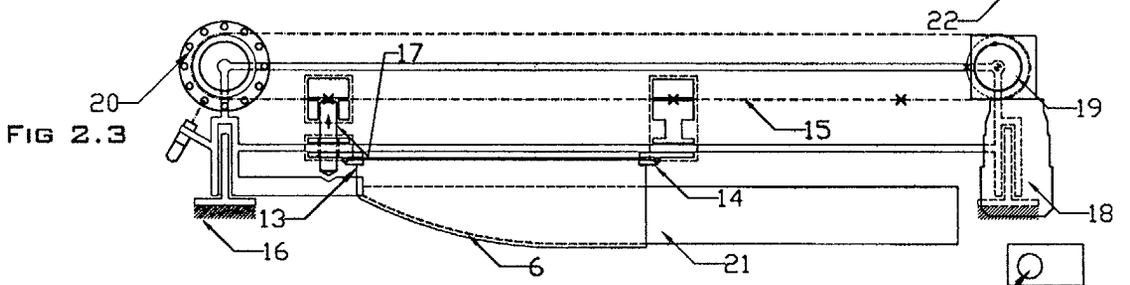

FIG 2.3

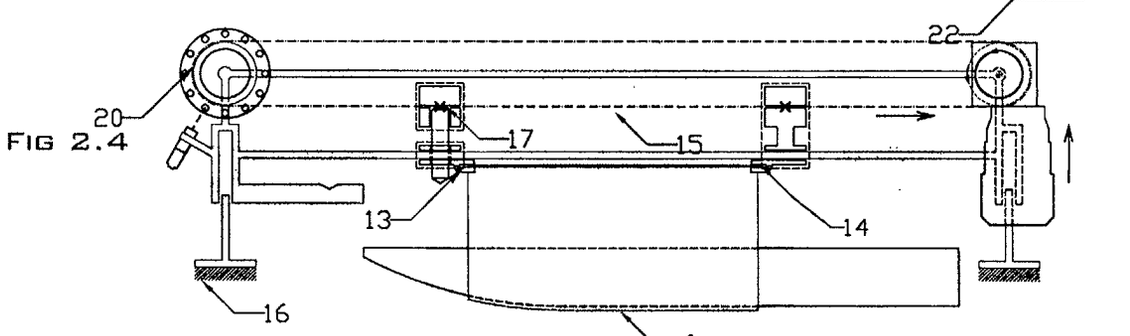

FIG 2.4

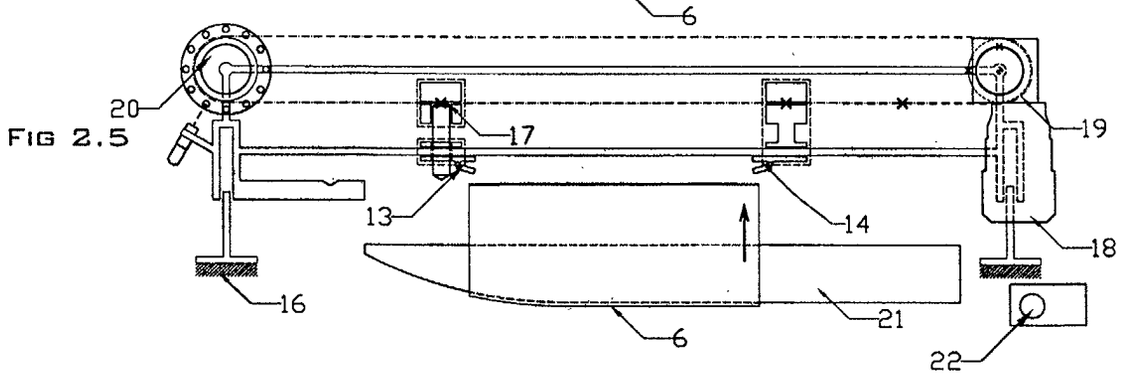

FIG 2.5

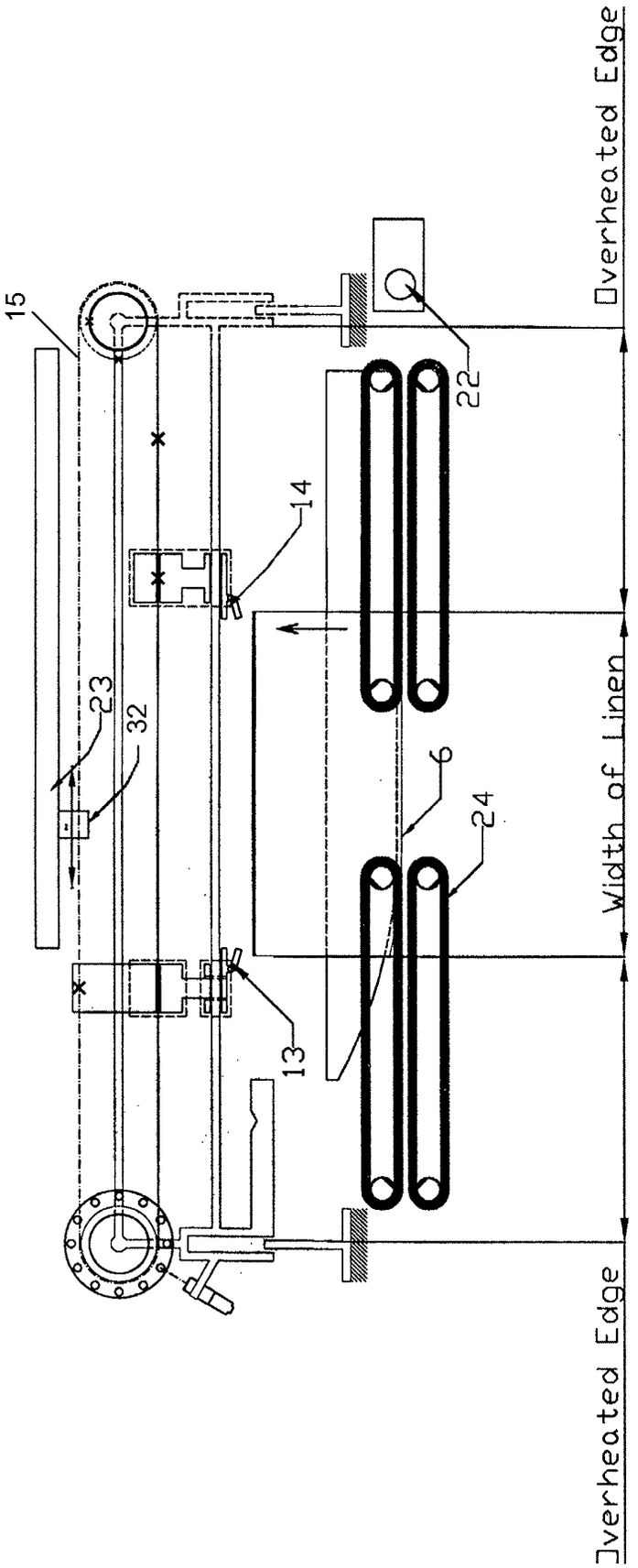

Fig. 3 - PRIOR ART

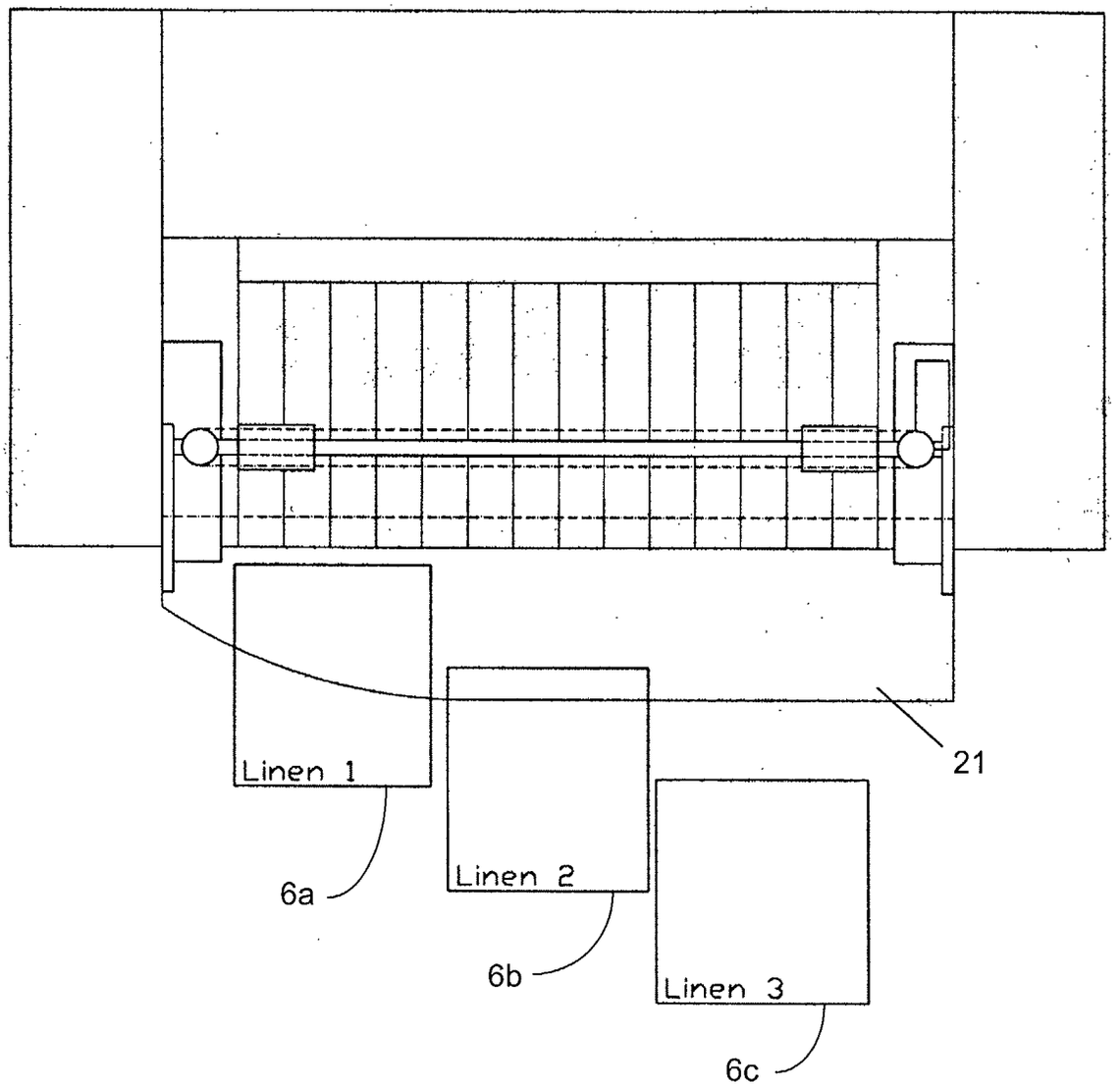

Fig. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 07 9372

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 0 528 745 A (GIRBAU SA) 24 February 1993 (1993-02-24) * the whole document *	1,14,17	D06F67/04 D06F67/02
A	EP 0 637 643 A (WECOTEC LTD) 8 February 1995 (1995-02-08) * the whole document *	1,14,17	
A	FR 2 652 832 A (DUBIX DE SOUZA ETS) 12 April 1991 (1991-04-12) * the whole document *	1,14,17	
A	US 4 428 133 A (KAMBERG EDUARD) 31 January 1984 (1984-01-31) * the whole document *	1	
A,D	US 3 729 846 A (WEIR H) 1 May 1973 (1973-05-01) * the whole document *	1	
A	US 4 562 655 A (BOSSHART JOHN ET AL) 7 January 1986 (1986-01-07) * the whole document *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.7) D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 March 2003	Norman, P

CATEGORY OF CITED DOCUMENTS

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