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54 **Method for the ageing, softening, washing and fulling of fabrics, with pneumatic transfer of the fabric and machine for carrying out the method.**

57 The machine comprises a concave grid-shaped wall (3), against which the fabric (T) is thrown at high velocity; said fabric is moved into a transfer duct (18, 18A, 20A, 20B, 20C, 20D) in form of a Venturi tube; at least a drive cylinder (10) recalls and feeds the fabric into said duct; the forced air may be at least partially or totally sucked from the outside and conditioned by heating and humidification.

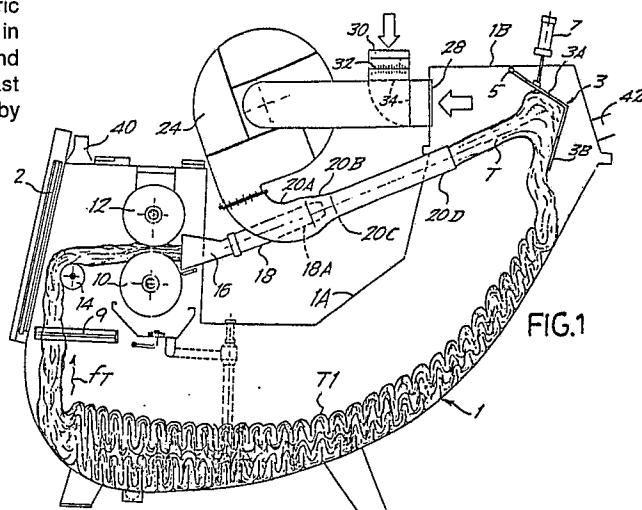


FIG.1

## Description

### METHOD FOR THE AGEING, SOFTENING, WASHING AND FULLING OF FABRICS, WITH PNEUMATIC TRANSFER OF THE FABRIC AND MACHINE FOR CARRYING OUT THE METHOD.

The invention relates to a method for ageing and softening of fabric and to a machine for carrying out said method.

In EP-A-0 215 745 a machine is disclosed in which, in combination with a wall against which the fabric is delivered to strike thereon and receive the action therefrom, there are provided: a fabric-transferring duct; means for feeding said fabric to said duct; and means for conveying a transfer air stream to the outlet of said fabric-transferring duct in order to pneumatically throw the fabric against said wall which is grid-shaped and angularly adjustable. The conveyor means have a section forming an annular nozzle around the outlet of the duct for the fabric; the section forming the nozzle made up by the cooperation of a shaping of the transfer duct and a shaping of a pneumatic pipe surrounding said fabric-transferring duct; these two shapings may be axially adjustable one with respect to the other. Means are provided for feeding the fabric, the speed of these means being set according to the fabric demand. A fan sucks from the inside and/or the outside of the working housing and blows in said pipe upstream of the shapings. This known machine is intended for washing, breaking and fulling of fabrics.

An unexpected novel utilization of the above machine has been found for a process of ageing and softening of fabrics, especially of light fabrics, with a suitable degree of humidity and with a possible drying during the final stage of same process.

Accordingly, the invention relates to a method for ageing and softening of fabrics, characterized in that in a washing and fulling machine comprising a wall against which the fabric is made to strike, a duct for the dragging of the fabric, means to feed said fabric to said duct, means to convey a dragging air stream to the outlet of said duct, the fabric is made to violently impact onto the grid under suitable velocity, humidity and temperature conditions and time of treatment.

According to the invention, the ageing and softening of fabrics, especially light fabrics, is achieved with high speed of the pneumatically transferred fabric and with consequent violent strike thereof onto the grid of a washing and fulling machine. Thus a new and unexpected use of such a machine and a new method for ageing and softening of fabrics are obtained. The use of a pneumatic duct for the transfer of the fabric and its launching against the grid allows reaching of very high speeds of the fabric, up to 1000 m/min, which are not achievable in common ageing and softening machines.

In practice, a limited degree of humidity, e.g. 40% of the fabric weight, can be previously set and the drying taking place during the final stage of the ageing and softening treatment enhances the effects thereof. The degree of humidity is determined by the intake of water, through nozzles provided within the duct for the pneumatic transfer and/or

downstream of the opposite grid at the outlet of the duct. At the end of the treatment, hot air may be used for drying the fabric.

The invention refers also to a machine for carrying out the ageing and softening treatment, said machine comprising: a wall against which the fabric is made to strike; a duct for the transfer or dragging of the fabric; means to feed said fabric to said duct; means to convey a dragging air stream to the outlet of said duct; and means for the air exchange and air heating. Such a machine can be indifferently used for carrying out a washing, breaking and fulling treatment of the fabric and/or an ageing and softening treatment of the same.

The machine can be further provided with nozzles located within the duct for the pneumatic transfer of the fabric and/or downstream of the grid against which the fabric is made to strike, said nozzles and said air heating means providing for the air conditioning, the restoring of humidity during treatment and the drying of the fabric during the final stage of the treatment.

The machine may further comprise an air sucker at the back of the concave grid, able to suck residual carbonization particles of a fabric carbonized by a dry process and treated in the machine. An air sucker may be provided also in the zone where the fabric is withdrawn through the pneumatic duct.

A gravity-operating discharge in the rear of the grid may also be provided.

The invention will be better understood by following the description and the attached drawing, which shows a practical, non limitative exemplification of the same invention. In the drawing:

Fig.1 shows an ensemble sectional side view; and

Fig.2 shows a detail of the pneumatic nozzle.

According to what is illustrated in the drawing, numeral 1 indicates a tank formed by the bottom of a housing that may be closed in its upper part at 1A and has suitable access means with inspection and control doors like that indicated by 3. Towards the upper end 1B of the housing a grid-like wall 3 is provided, articulated at 5, its inclination with respect to the vertical being adjustable by means of a suitable control 7. The grid 3 is concave on the active side thereof and, in particular, may have two portions 3A; 3B at an angle to one another.

Towards the grid-like wall 3 a transfer air jet is delivered, which drags and throws the fabric T at high speed against the grid 3; the fabric makes part of a roll of cloth or of more rolls of cloth having a closed (simple or multiple) ring arrangement; the fabric piles up in T1 on the bottom of the housing 1, and is recycled over and over again and made to impinge against the grid 3 (3A, 3B). The fabric is recalled upwardly according to arrow FT through rings 9 by a system of two transfer cylinders 10 and 12, at least one of which being driven into rotation in an adjustable manner and the other being urged

towards the first one and possibly also driven into rotation at the same peripheral speed, or even by only one matching cylinder, like that indicated by 10 or that indicated by 14. The fabric is fed through a mouthpiece 16 into a duct 18 for the pneumatic transfer of the fabric. This duct 18 is inclined upwardly and towards the grid 3, and has a terminal portion 18A in form of a nozzle within a curved and wide part 20A of a blowing duct which is tapered; in 20B around the portion 18A in form of a nozzle and possibly extends with a slightly throttled portion 20C and then with a wider portion 20D into alignment with the axis of duct 18 and upwardly oriented towards the grid-like wall 3. The assembly 18A, 20A, 20B, 20C, 20D makes up a Venturi nozzle for the transfer of the fabric (coming from duct 16, 18) by pneumatic effect, through air blown by a fan 24 overhanging the wall 1A; said fan 24 sucks through a mouth 28 from the housing, and partially or totally through a mouth 30 from the outside via a thermal battery 32. Humidification nozzles are provided within the air circuit, in order to have the air conditioned as for humidity and temperature as well, the inlet from the inside being more or less shut by a gate 34. The air stream moved forwards by the fan 24 makes up a very fast pneumatic transfer means for the fabric outcoming from the outlet 18A of duct 18, so that said fabric is dragged along by the air stream coming from the duct 20A and flowing inside the annular passage between the portion 18A, in form of a nozzle and the duct 20B, through the nozzle formed by the portions 20C, and inside the duct 20D. The strong air jet with which the nozzle acts over the fabric coming out from the outlet 18A, drags said fabric along the duct 20D and projects it violently against the grid 3, where the fabric treatment takes place.

During the treatment, the fabric may be made to acquire a degree of humidity of e.g. about 40% of the fabric weight, and at the end of the process a normal drying of the fabric can be achieved through heating.

By providing a short and direct air duct as indicated by 20C, 20D, fabric transfer speeds are obtained which are practically unattainable in machines for similar use. The high speed, combined with the presence of the grid or panel 3 at the outlet of duct 20D causes (by known means) a deep, typical and irripoducible mechanical working of the fabric, especially applicable to cotton, linen, wool, silk and blend of these fibres through which a greatly appreciable "soft to the feel", i.e. an ageing feature is achieved. The projection is obtained without any contacting mechanical members, and a speed equal or even exceeding 1000 meters per minute can be reached.

In order to further improve the final effect in the fabric, it is often appropriate to dry up a more or less high percentage of humidity during the working at high speed. This drying may be necessary to achieve fibre swelling effects, cracks, shrinkages and other. To this end, along the suction ducts of the fan(s) there are placed one or more heat exchangers provided with thermoregulation means. The higher or lower humidity percentage may be supplied

during a phase preceding the working, either inside the same machine by means of nozzles located within the duct, or immediately after the grid or panel.

The machine maintains its performance capabilities with respect to the washing and/or the fulling of fabrics by providing proper setting, suitable wet processes and speed reduction.

Suctions from openings like that indicated by 40 and/or that indicated by 42 allow the discharge of air mixed with water, of powders and/or carbonization residues (in case of a dry process).

The treatments are effective and very fast, even with very long rolls of cloth.

It is understood that the drawing shows an exemplification given only as a practical demonstration of the invention, as this may vary in the forms and dispositions without nevertheless departing from the scope of the idea on which the same invention is based.

## Claims

1. Method for ageing and softening of fabrics, characterized in that in a washing and fulling machine comprising a wall (3) against which the fabric is made to strike, a duct (18, 18A) for the dragging of the fabric, means (10, 12, 14) to feed said fabric to said duct, means (20A, 20B) to convey a dragging air stream to the outlet (18A) of said duct (18), the fabric is made to violently impact onto the grid under suitable velocity, humidity and temperature conditions and time of treatment.

2. Method according to claim 1, characterized in that the ageing and softening is carried out under controlled humidity conditions, and that the fabric is subjected to drying during the final part of the ageing and softening treatment in order to enhance the effects of said treatment.

3. Method according to claims 1 and 2, characterized in that the degree of humidity is restored during treatment by the introduction of water through nozzles located within the duct for the pneumatic transfer and/or downstream of the grid facing the duct outlet.

4. Method according to claims 1 and 2, characterized in that at the end of the treatment hot air is employed for drying the fabric.

5. Machine for ageing and softening of fabrics comprising: a wall (3) against which the fabric is made to strike; a duct (18, 18A) for the dragging of the fabric, means (10, 12, 14) to feed said fabric to said duct; means to convey a dragging air stream to the outlet (18A) of said duct (18); and means (30, 32, 34) for the air exchange and air heating.

6. Machine according to claim 5, characterized in that it comprises an air sucker (42) located at the rear of the concave grid (3), able to suck residual carbonized particles of a fabric

carbonized by a dry process carried out by the same machine.

7. Machine according to claims 5 and 6, characterized in that it comprises an air sucker (40) provided in the zone where the fabric is

recalled by the pneumatic duct (18).

8. Machine according to claims 5 to 7, characterized in that it comprises a gravity-operated discharge at the rear of the grid (3).

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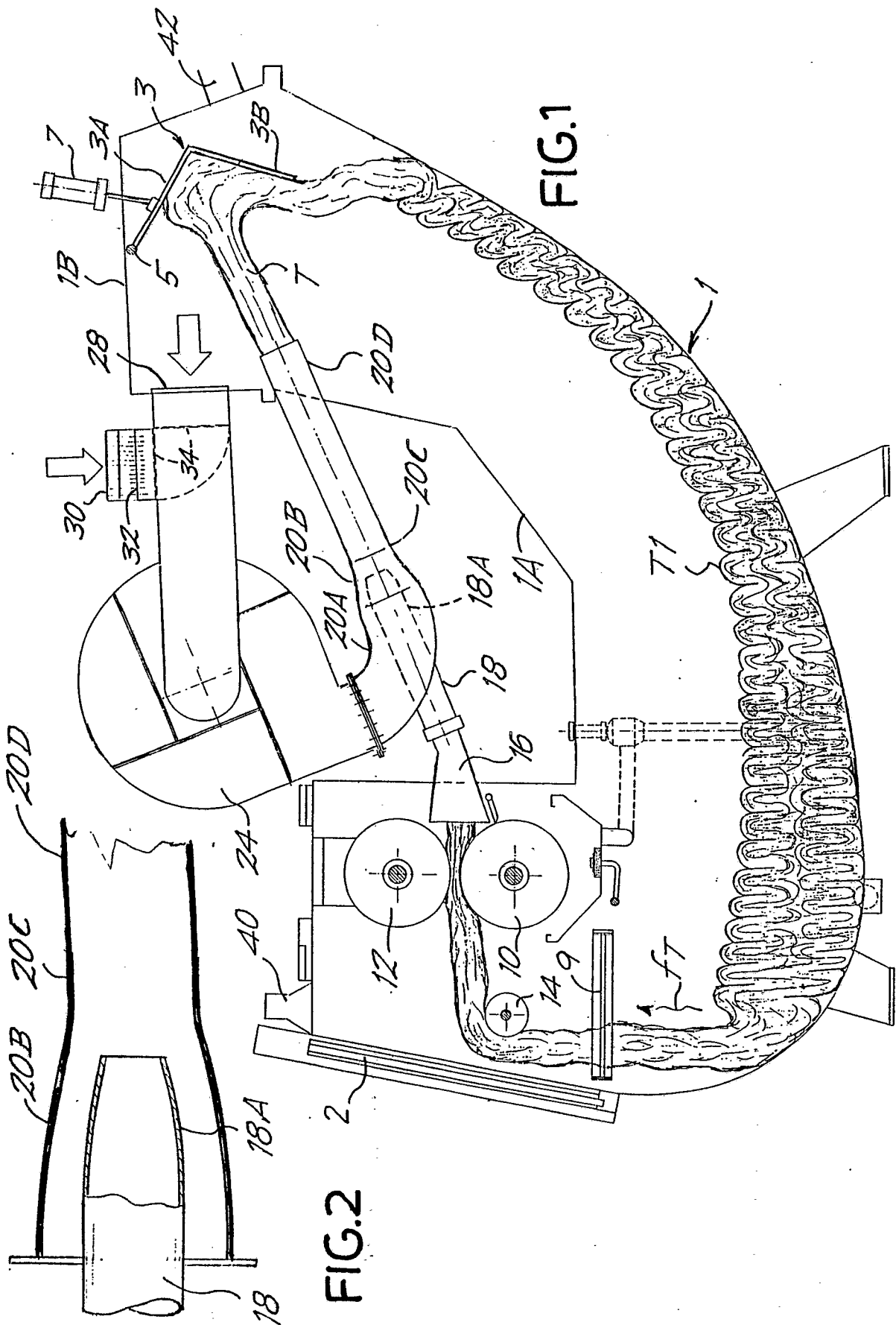
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European Patent  
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## EUROPEAN SEARCH REPORT

Application Number

EP 88 83 0414

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.4)
X,D	EP-A-215745 (OFFICINA MECCANICA BIANCALANI ...) * the whole document *	1, 5	D06C17/04
A	FR-A-2317407 (TEXTILE PROCESSING AB.)		
A	GB-A-2089858 (ZONCO FEDERICO E FIGLIO DI FEDERICO ZONCO)		
A	DE-A-1760848 (ZONCO FEDERICO E FIGLIO DI FEDERICO ZONCO)		
A	DE-A-3437758 (MASCHINENFABRIK L. PH. HEMMER)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			D06C D06B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 20 JANUARY 1989	Examiner PETIT J.P.
<b>CATEGORY OF CITED DOCUMENTS</b>			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document			