(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 026 445**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **80105735.7**

(22) Date of filing: **24.09.80**

(51) Int. Cl.³: **D 06 B 3/12**
D 06 B 3/20

(30) Priority: **01.10.79 IT 2615479**

(43) Date of publication of application:
08.04.81 Bulletin 81/14

(84) Designated Contracting States:
CH DE FR GB LI

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(54) **Continuously operating system for scouring cloth, knitted fabric and the like.**

(57) In the technical field of machines for treating fabrics or the like while being processed, there is provided a system for continuously scouring woven or knitted fabrics, in their flat or tubular condition, which can be used in the preparation, mercerization, scouring after dyeing and after printing, as well as during the final finishing stage.

The technical problem faced is that of providing a system of a truly universal type and with a specially efficient scouring action, such that no tension is exerted on the fabric being scoured, while allowing the fabric to change its shape spontaneously.

The solution to the problem consists of providing a system which comprises a plurality of parallel and closely adjacent rollers (3, 4) such that they cause the fabric (2) or the like to follow a path of substantially continuous contact with the rollers (3, 4), which are all driven in a non-rigid manner, and comprises means (5, 8, 4, 3) adapted for subjecting the fabric simultaneously to three different types of scouring action.

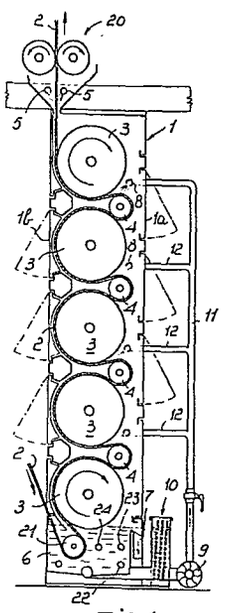

Fig.1

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This invention relates to a continuously operating system for scouring cloth, knitted fabrics, and the like, which system is suitable for use at various processing steps thereof, such as preparation, mercerization, scouring after dyeing and after printing, as well as in the course of final finishing.

As is known, many continuously operating scouring systems or tanks are currently available in various designs and constructions. The most widely accepted and generally utilized ones, when scouring only is to be carried out, comprise a large enclosure accommodating several rollers of comparatively small diameters. These rollers function as fabric deflecting members and are mutually spaced apart and aligned vertically or horizontally, such as to lead the fabric, or the like, through a series of elongated loops which extend vertically or horizontally. The fabric is swept by water and steam jets while run through such loops, and is driven forward by final powered rollers which may cooperate with additional powered rollers located at intermediate positions in the fabric path.

Such scouring systems, which are more closely related to this invention, and all of the scouring systems manufactured heretofore, have in general the following disadvantages.

First and foremost, each single scouring

system is only suitable for treating one product type. For scouring requirements other than those for which the machine has been intended, no fully satisfactory results can be achieved; actually, there is no such thing as a really universal scouring tank or system, that is such as to ensure optimal results regardless of the type of woven or knitted fabric being handled, whether in the flat or tubular form.

A further problem arises from the way the fabric is run and controlled inside the tank or system. Usually the fabric, in following said loops or bights, tends to change its length to width ratio, such that on leaving the scouring system it has different dimensions from those it had when entering it. This phenomenon is further enhanced by the final drive for the fabric, which stretches and tensions the whole fabric length included in the path through the scouring tank. This same phenomenon cannot be eliminated, but merely mitigated, by providing additional drives at other, intermediate points of the fabric length in the tank. In fact, added tension areas are thus created which, while applying individually lower tractive efforts than the effort applied by a single final drive, all contribute to the stretching of the fabric being scoured.

It is important to observe that the latter drawback, that is the fabric stretching effected by a limited number of drives within the tank,

cannot be solved by simply powering all of the fabric deflecting rollers. This mainly for two reasons. The first is that, over its portions out of contact with the deflecting rollers, the fabric is in any case subjected to tension efforts exerted at far apart points, and the second that it is not advisable to restrain the fabric rigidly along a given path. On the contrary, the fabric must be allowed to adapt itself spontaneously to particular, sometimes unforeseeable, situations, such as may arise, for example, on account of conditioning factors either upstream or downstream of the scouring system, or because of a particular and unexpected response of the fabric to the scouring process. In other words, the fabric should be let free, to a certain extent, to give and deform, as due to internal stresses or in order to accommodate exceptional and unforeseen treatment conditions. In such cases, if the fabric is restrained rigidly in its movement, as where driven throughout its length, the likely result would be a failure in the scouring system due to the very high tensions induced in the fabric.

To these basic shortcomings of conventional scouring systems, it should be added that such systems can be largely improved as regards their scouring effectiveness. In fact, the scouring process, which is generally carried out simply in counterflow or by direct spraying, requires, to meet its requisites, considerably large dimensions of the system and an accompanying considerable consumption of water and

steam. Accordingly, it becomes desirable to appreciably increase the effectiveness of the scouring process such that both the system size and water and steam consumption can be reduced, which results in a concurrent reduction of the system operating costs.

This invention sets out to provide a novel continuously operating scouring system which can satisfactorily obviate the drawbacks mentioned above.

Within that general aim, it can be arranged that the continuous operation scouring system according to this invention is of a truly universal type, i.e. capable of operating in an optimum manner with any types of fabrics, knitted fabrics, etc., whether in the open or flat condition or tubular condition.

It is further possible to arrange that the scouring system of this invention is designed and constructed such as to impart no tension on the fabric being scoured, while allowing the fabric to develop any spontaneous shape changes.

It is further possible to arrange that the continuous scouring system of this invention affords a particularly efficient and active scouring action, and in particular a more effective scouring action than that provided by currently available systems.

According to one aspect of the present invention, there is provided a continuously

operating system for scouring cloth, knitted fabrics, and the like, which comprises an enclosure or housing containing a plurality of guiding rollers, means for carrying out a scouring process within said enclosure or housing, and means for driving a number of said roller plurality, characterized in that said rollers are parallel and closely adjacent each other such as to oblige a fabric, or the like, to a path of substantially continuous contact with said roller plurality, and that said scouring means are arranged, relative to said roller plurality and said path, such as to be active on both sides of said fabric, or the like.

Further features and advantages will be more clearly apparent from the following description of a preferred, but not limitative, embodiment of the invention, as illustrated by way of example in the accompanying drawings, where:

Figure 1 is a diagramatical sectional view of a scouring system according to the invention;

Figure 2 shows, to a much enlarged scale with respect to Figure 1, a drive, not shown in Figure 1, which comprises a wheel and chain;

Figure 3 shows, also to an enlarged scale, a portion of said chain in section, as relaxed on the wheel shown in section in Figure 2;

Figure 4 shows some links of the chain in the same arrangement as Figure 3, but as under stress on the wheel of Figure 2; and

Figure 5 is a partly ghostline schematic representation of a portion of a scouring line comprising two serially connected scouring systems according to this invention.

With reference to the drawing figures, and more particularly to Figure 1, the scouring system of this invention comprises an enclosure or housing 1 which extends tower-like in a vertical direction, and wherethrough is passed a continuous web of woven cloth, knitted fabric, or the like, either in the flat open or tubular condition, which will be termed hereinafter "fabric" for simplicity and designated with the reference numeral 2. The fabric 2 is inserted into the system at the base of the housing 1 and led out of the system at the top of the housing.

The housing, or enclosure, 1 is provided along its vertical extension with a series of inspection rings 1a and a series of flow directing baffles 1b which can be tilted outwards to gain full access to the housing inside.

As shown in Figure 1, the housing 1 supports rotatably a plurality of main rollers 3 of large size, and a plurality of squeezing rollers 4 of smaller dimensions. The main rollers 3 are parallel to one another and stacked to precisely overlie each other at positions of close proximity. The squeezing rollers 4 are also parallel to one another and to the main rollers 3, as well as vertically aligned to each

other. Each squeezing roller 4 is closely adjacent and at a forced contact position with a main roller 3. All of the cited rollers 3 and 4 serve a fabric guiding function. The fabric 2, after running over a considerable portion of a main roller 3, engages with a squeezing roller 4, from which it is redirected to a main roller 3 overlying the former.

The fabric follows each time the same path, and in practice a series of loops or bights, while in contact with the rollers 3 and 4 such as to leave free but extremely reduced portions of the fabric, which appear quite negligible compared to the fabric extent passed around the rollers. Moreover, on one side of the housing 1, the left side in Figure 1, the fabric 2 follows a true transfer path in the vertical direction, whereas on the opposite side of the housing 1, the right side in Figure 1, the fabric 2 is simply deflected to said one side.

According to the invention, there are provided also means adapted for actuating the scouring of the fabric 2, which means advantageously operate on both sides of the fabric. These scouring means subject the fabric to three discrete types of scouring action, which are mutually coordinated such that the various scouring actions enhance one another.

A first type of scouring action is carried out in counterflow adjacent that side of the housing 1 whereat the fabric 2 follows practically a vertical travel path, that is, in Figure 1, at the left-hand side of the housing 1. More specifically, at the top

of the housing 1, there are arranged main nozzles 5 operative to spray tap water, which after sweeping the fabric 2 directly while the latter leaves the scouring system flows downwards to sweep the fabric around the main rollers 3.

The flow directing baffles 1b, as mentioned, are arranged adjacent the main rollers 3, thereby favoring the counterflow scouring action. The cascading water flows downwardly into a collecting tank 6 at the bottom of the housing 1, where an overflow device 7 discharges it gradually.

From the collecting tank 6 originates the second scouring action, which consists of a forced scouring action effected by spraying the fabric 2 directly through spray nozzles 8 which are oriented to sweep the fabric 2 immediately ahead of where it winds over each main roller 3.

Specifically, the second scouring step or forced spraying scouring action, is effected by a centrifugal pump 9 which cycles back into the housing 1 the water collected at the bottom of the collecting tank 6, after the same has been filtered through a filtering device 10. The centrifugal pump 9 feeds a vertical conduit 11 from which there extend, in parallel relationship, branching channels 12 which feed the spray nozzles 8 directly. It should be noted that the spray nozzles 8 are arranged to sweep that side of the fabric 2 which, during the preceding scouring step in counterflow, contacted the main rollers 3 directly. In practice,

the nozzles 8 are on that side of the housing 1 which is opposite the one involved in the counter-flow scouring action by cascading water supplied from the main nozzles 5.

A third scouring action or step, and an especially active one, which is also capable of enhancing the effects of the previous scouring steps, is effected directly by the squeezing rollers 4. These rollers do not serve solely for deflecting the fabric 2 toward that side of the main rollers 3 whereat the counterflow scouring occurs, but also to squeeze the fabric 2 prior to each series of scouring steps to eject the liquid accumulated therein. The squeezing rollers 4 are biased by elastic means acting on their ends and comprising, for example, either springs or calibrated pressure pneumatic springs, against the main rollers 3, where the fabric just reverses its ascending motion.

The scouring action by squeezing enhances the other scouring actions in that not only an effective alternation of absorptions and squeezes is created in the fabric, but also because by freeing the fabric of the water absorbed during the preceding scouring steps and partially drying it, the subsequent scouring actions are made more effective.

Figures 2 to 5 show, inter alia, how the main rollers 3 are driven, around which extends a major portion of the travel path of the fabric 2. In accordance with an original aspect of this invention, it is contemplated that all the main

rollers 3 are rotatively driven, i.e. contribute all to entraining the fabric wound around them. However, the driving action of the main rollers 3 is not of a rigid type, and can be overcome, both in acceleration and deceleration, by any tensions generated in the fabric, which tensions will in practice oblige each main roller 3 to turn at the most appropriate speed.

In fact, as shown in Figure 5, on the outside of each scouring system, there are keyed to the ends of the main rollers 3 plain disks or wheels 13 which engage with a chain 14 or equivalent drive member.

Figure 2 shows the use of a double chain 14 and above all the fact that, as shown also in Figures 3 and 4, direct contact with the wheel 13 occurs at the rotatable bushings 15 of the chain 14 rather than at the links 16. This creates, as evidenced in an intentionally exaggerated manner in Figure 3, a sliding engagement between the chain 14 and each wheel 13 rigid with a main roller 3. This sliding engagement gradually converts to a forced driving engagement as the chain 14 is pulled tight to increase the friction between the pins 17, rigid with the links 16, and bushings 15 encompassing the pins 17. Figure 4 shows, again in an exaggerated manner, the situation of forced contact created between the chain and wheel 13 when the chain is under tension.

In practice, with the drive just described, all of the main rollers 3 are driving rollers, but each

roller is allowed to disengage itself from the driving action of the chain 14 as an effort is applied thereto by the fabric 2 which exceeds that required to overcome the frictional resistance between the pins 17 and bushings 15. This frictional resistance will be directly proportional to the amount of tension applied to the chain 14.

In Figure 5, there is illustrated schematically a device 10 for tensioning the chain 14. Also in Figure 5 are shown, between the wheels 13, simple elements 19 for deflecting the chain 14.

To the foregoing description, it should be added that each scouring system is provided at its end, in a manner known per se, with a squeezer unit 20, and at the bottom, with a deflecting roller 21 submerged in the collecting tank 6. In the collecting tank 6, there are provided, moreover, a conduit 22 for indirectly heating the bath by steam, a conduit 23 for direct heating by steam, and a conduit 24 for supplying chemicals.

It has also been found advantageous, from a technological standpoint, to coat the main rollers 3 with hard rubber, and the squeezing rollers 4 with synthetic rubber. The centrifugal pump 9 is preferably a high pressure variable flow one.

It should be further noted that as shown in Figure 5 where in a scouring line two or more systems according to this invention are provided, it may be preferable to arrange the systems in pairs, at mirror-image symmetrical locations, such as to effect

all the treatments provided by the invention on both sides of the fabric.

The continuous operation scouring system of this invention, just described hereinabove structure-wise, operates as follows.

The fabric 2 initially enters the collecting tank 6 at the bottom of the housing 1, then proceeds upwards under the drive of the main rollers 3 to undergo the triple scouring action described hereinabove. More precisely, as the fabric 2 is wound around each main roller 3, it undergoes a counterflow scouring action, then as it leaves the main roller 3, it is squeezed, and subsequently violently sprayed on the opposite side where it had been mainly subjected to a scouring action in counterflow. Successively, the fabric is passed over a fresh main roller 3, and the scouring actions are reiterated as far as the last of the main rollers 3. This arrangement results in the fabric coming out perfectly cleansed from the top of the housing 1 already after a relatively small number of turns or loops around the main rollers 3. In the embodiment shown, the fabric 2 is scoured five times in counterflow on one side and five times by spraying on the opposite side. Furthermore, the fabric is squeezed four times.

During all these treatments the fabric is never released and virtually adheres always to a roller, thereby it tends spontaneously to retain the same dimensions it had on entering the scouring system.

The fabric is in practice driven forward continuously along its entire length, from the inlet end to the outlet end of the system, and the driving action induces no tensions and stresses in the fabric which may result in dimensional modifications of the same. However, if an unforeseen situation or an irregularity in the operation of the members located upstream and downstream of the scouring system subjects the fabric 2 to particular efforts, any serious tension in the fabric and scouring system is avoided by virtue of the cited sliding engagement drive provided by the chain 14 and wheels 13; when a predetermined stress threshold is exceeded, proportionally to the chain tension, the fabric is enabled to take control of the action of the rollers 3, and accordingly of the squeezing rollers 4 as well, independently of the movement of the chain 14.

The invention achieves its objects.

A continuously operating scouring system for fabrics has been provided which, thanks to its output potential, adaptability, and the absence of any stretching of the fabric or otherwise during the scouring process, finds universal application to the treatment of any types of fabric, whether woven cloth, knitted fabric, in the flat or tubular condition thereof, in the course of their processing.

Moreover, the scouring system of this invention is more efficient than conventional ones, thanks to the simultaneous application of three scouring

actions or steps. This reflects in a reduced size of the system, which advantage is further enhanced by the prevailingly vertical arrangement of the system.

The invention as described is susceptible to many modifications and variations without departing from the true scope of the instant inventive concept. Furthermore, all of the details may be replaced with other, technically equivalent elements.

In practicing the invention, the materials and dimensions may be any ones to suit individual requirements.

C L A I M S

1. A continuously operating system for scouring cloth, knitted fabric, and the like, comprising an enclosure or housing containing a plurality of guiding rollers, means for carrying out a scouring process within said enclosure or housing, and means for driving a number of said roller plurality, characterized in that said rollers (3, 4) are parallel and closely adjacent each other such as to oblige a fabric (2), or the like, to a path of substantially continuous contact with said roller plurality (3, 4), and that said scouring means (5, 8, 4, 3) are arranged, relative to said roller plurality (3, 4) and said path, such as to be active on both sides of said fabric (2) or the like.

2. A scouring system according to Claim 1, characterized in that said guiding rollers (3, 4) are stacked vertically such as to cause said fabric (2) to follow a vertically extending path with substantially horizontal loops or bights, and that said scouring means mainly act at both ends of said loops or bights along vertically extending lines.

3. A scouring system according to Claim 1, characterized in that said roller plurality (3, 4) comprise main rollers (3) and squeezing rollers (4), said squeezing rollers (4) being of a smaller size than said main rollers and serving for deflecting said fabric (2) between main rollers (3), and that all said main rollers (3) are power driven.

4. A scouring system according to Claim 3, characterized in that said main rollers (3) are driven

by means of a chain (14) in sliding engagement with wheels (13) keyed coaxially to said main rollers (3).

5. A scouring system according to Claim 3, characterized in that said squeezing rollers (4) are mounted idle on their axles and elastically biased against said main rollers (3) such as to effect a scouring action by squeezing the fabric (2) being passed between said rollers (3, 4).

6. A scouring system according to Claim 5, characterized in that said scouring means (5, 8) are adapted to carry out both a counterflow scouring step and a forced spraying scouring step.

7. A scouring system according to the preceding claims, characterized in that said main rollers (3) are aligned vertically to one another and at offset locations with respect to said squeezing rollers (4), also aligned vertically to one another, and that said counterflow scouring step is effected by cascading detergent liquid from above over the fabric (2) portions which are wound around said main rollers (3) and mutually aligned vertically, said forced spraying scouring step being carried out at said squeezing rollers (4) on the fabric (2) side in direct contact with said main rollers (3).

8. A continuously operating system for scouring cloth, knitted fabric, and the like, according to the preceding claims and as herein described and illustrated for the objects specified.

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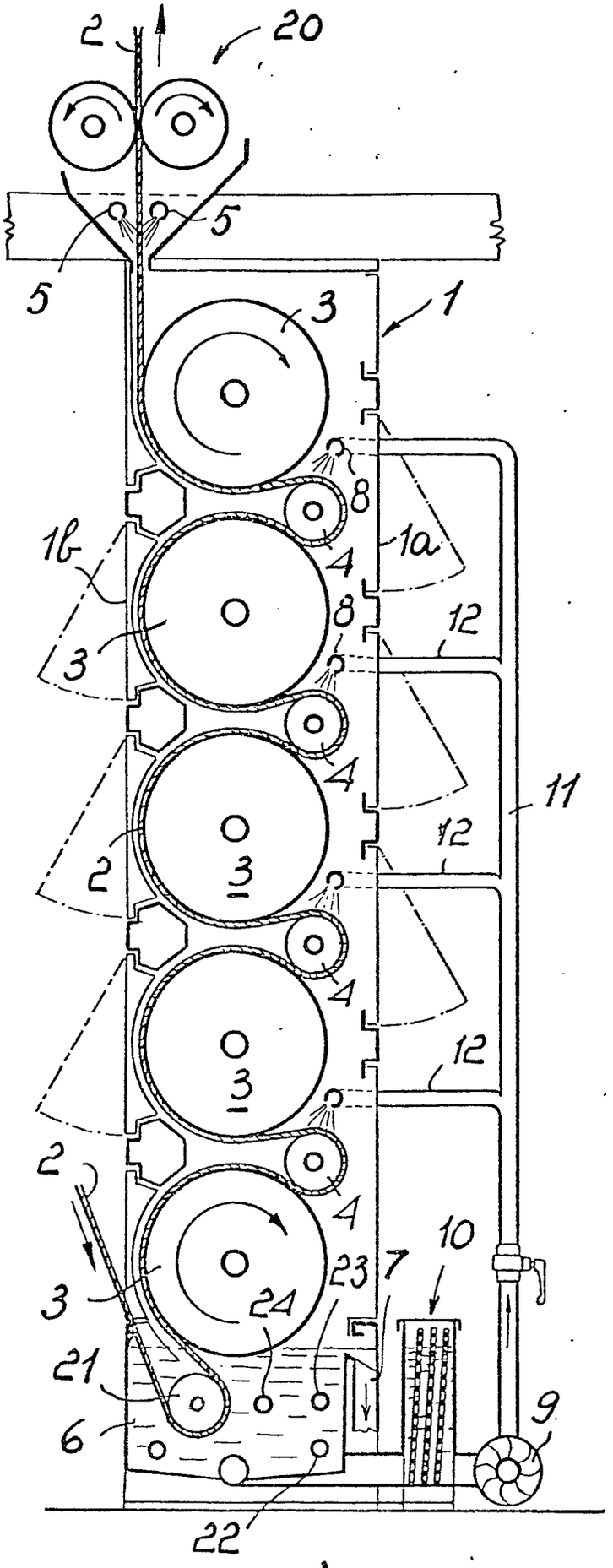

Fig.1

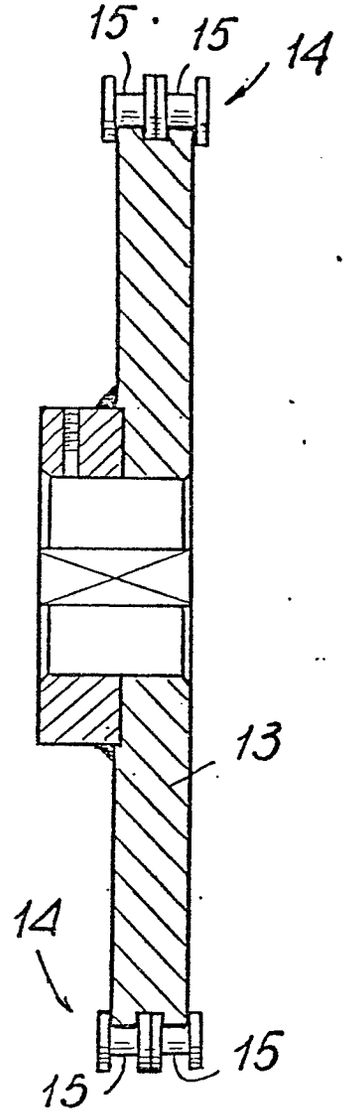

Fig.2

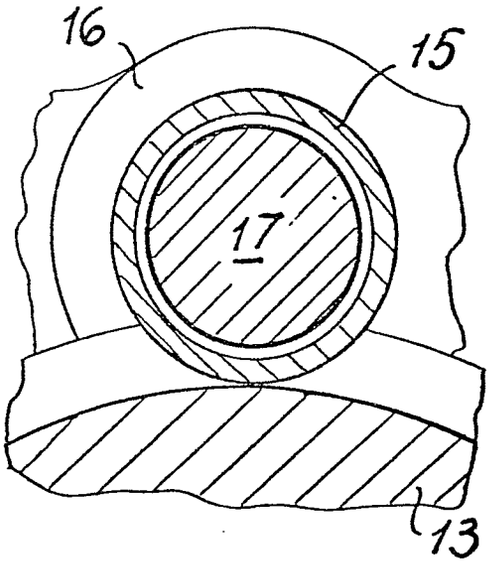

Fig.3

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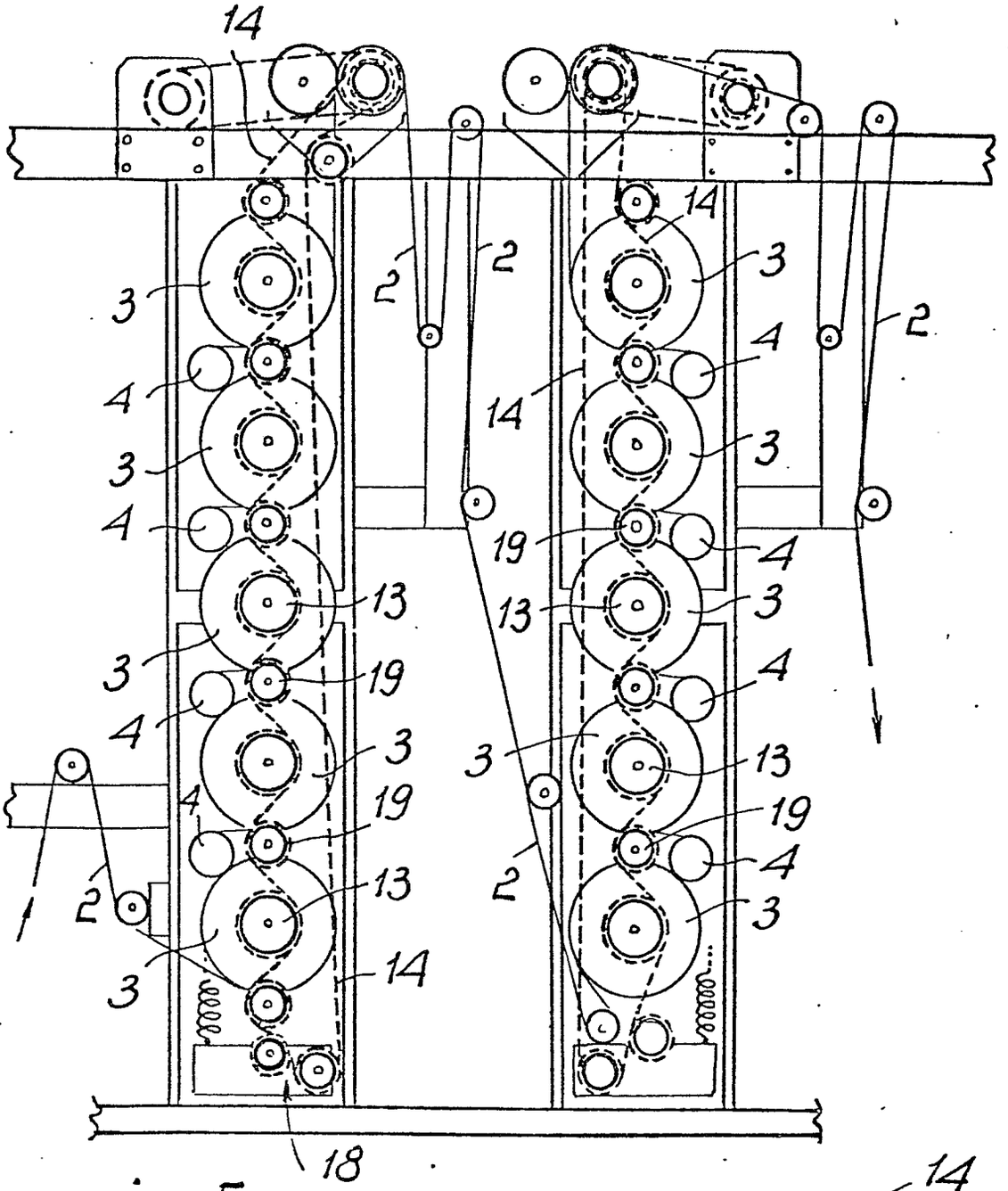

Fig.5

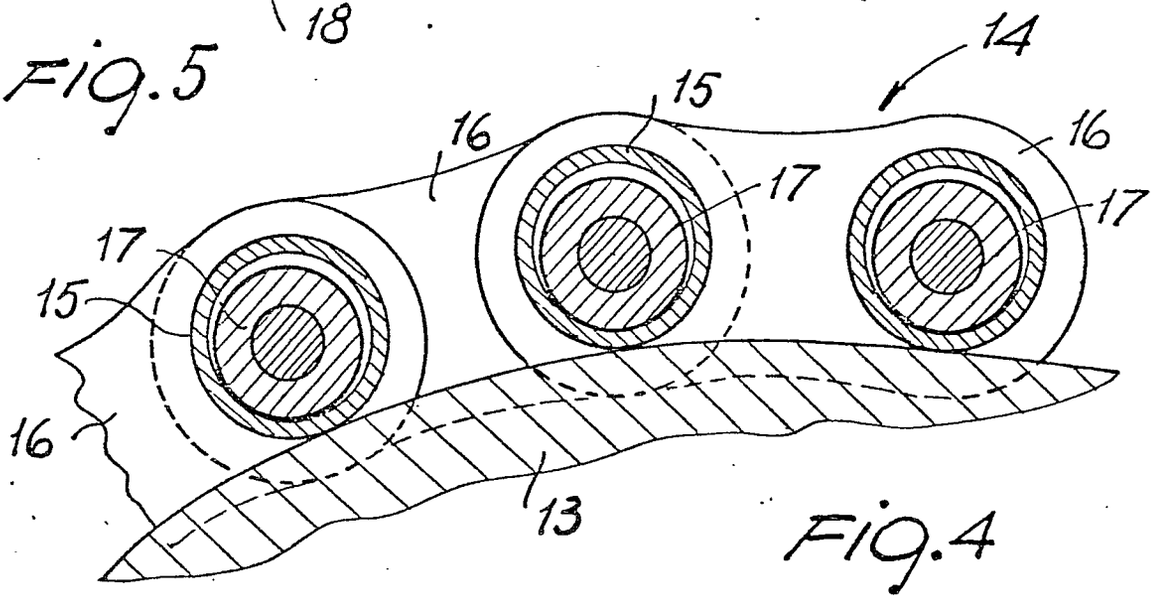

Fig.4

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EUROPEAN SEARCH REPORT

Application number EP 80 10 5735

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	FR - A - 2 272 214 (MEIER-WINDHORST) * Whole document * & US - A - 4 004 879 & US - A - 4 056 954	1-3, 5-8
X	FR - A - 2 320 379 (ARTOS) * Whole document *	1-3, 5-8
	GB - A - 2 009 268 (KLEINEWEFERS) * Whole document *	1-3, 8
	FR - A - 1 554 559 (VYZKUMNY...) * Whole document *	1, 2, 6-8
	US - A - 4 150 449 (MORRISON) * Whole document *	1, 2, 6-8
A	DE - A - 2 527 734 (VEPA) * Figure 4 *	
A	DE - A - 2 518 770 (VEPA) * Figures 1 et 2 *	

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

D 06 B 3/12
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TECHNICAL FIELDS SEARCHED (Int. Cl.³)

D 06 B

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	07-01-1981	PETIT