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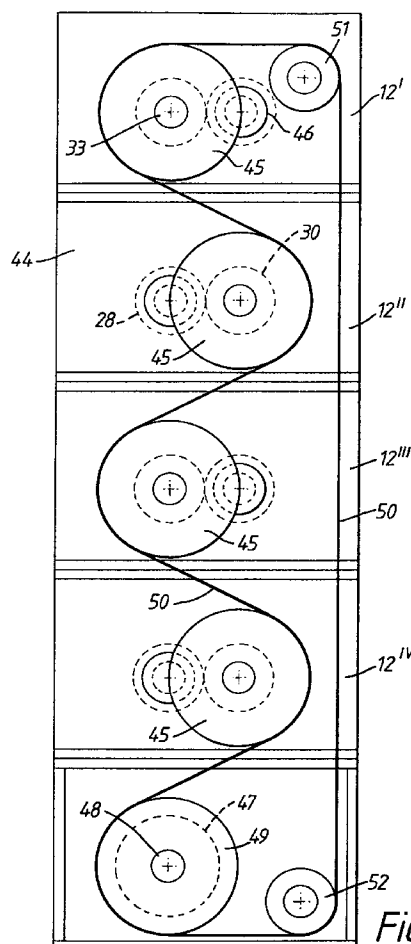
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(54) Photographic sheet material processing apparatus

(57) An apparatus for the processing of photographic sheet material comprises a number of treatment cells (12^I, 12^{II}, 12^{III}, 12^{IV}) positioned to define a sheet material path through the apparatus. At least one cell is in the form of a vessel (13) comprising a housing (14) for retaining treatment liquid (24) therein. The vessel comprises a drive roller (28) biased into contact with a reaction surface (30) to define a nip there-between through which the sheet material path extends. Each drive roller (28) is mounted on a respective drive roller shaft (33) which fixedly carries a drive wheel (45) positioned outside the housing (14). Drive is transmitted from a drive motor (47) to the drive rollers (28) in a simple and reliable manner by a drive belt (50) in engagement with the drive wheel (45). Any variation in the rotational speed of the rollers can be less than $\pm 0.5\%$.

**Fig.2****EP 0 779 546 A1**

Description

Field of the invention

The present invention relates to an apparatus for the processing of photographic sheet material, such as X-ray film, pre-sensitised plates, graphic art film and paper, and offset plates. In particular the invention is directed to such an apparatus comprising a number of treatment cells positioned to define a sheet material path through the apparatus.

Background of the invention

As a rule, a processing apparatus for photographic sheet material comprises several vessels each of which contains a treatment liquid, such as a developer, a fixer and a rinse liquid. As used herein, the term "sheet material" includes not only photographic material in the form of cut sheets, but also in the form of a web unwound from a roll. The sheet material to be processed is transported through these vessels in turn, by transport means such as one or more pairs of drive rollers, and thereafter optionally to a drying unit. The time spent by the sheet material in each vessel is determined by the transport speed and the dimensions of the vessel in the sheet feed path direction.

European patent application EP-A-613049 (EPA93200502.8 Agfa-Gevaert NV) describes an open-topped apparatus for the processing of photographic sheet material, comprising a number of treatment compartments positioned to define a substantially horizontal sheet material path through the apparatus. The compartments each comprise a drive roller pair biased into contact with each other to define a nip there-between through which the sheet material path extends. The drive rollers are mounted on drive roller shafts which each carry a drive wheel. The apparatus includes a drive motor and a worm drive for transmitting drive from the drive motor to the drive wheel.

The use of a worm drive for transmitting drive to the drive rollers is convenient, especially where, as in the apparatus described in EP 613049, the drive rollers are carried in racks which can be removed from the apparatus for cleaning purposes. However, we have found that when the components of the worm drive are produced from plastics materials by moulding, which is the cheapest and most convenient method of producing such components, the best dimension tolerances which can be achieved are such that variations in the rotational speed of the drive rollers in use, as measured on the surface of the rollers while the drive motor runs at a constant speed, can be as much as $\pm 3\%$, or even more, which can amount to a variation of $\pm 6\%$ or more from one roller pair to another. Such variations in the rotational speed of the drive rollers introduce vibrations within the treatment liquid in contact with the photographic sheet material and this in turn will lead to a variation in the shear tension at the contact point of the

sheet material with the roller surface which may lead to uneven treatment thereof. Where an apparatus includes a number of drive rollers which act in sequence on the photographic sheet material as it passes through the apparatus, it is important that any variation in the rotational speed of the drive rollers is as small as possible.

Not only is this variation in rotational speed of the drive rollers a problem with horizontal processing apparatus as described in EP 613049, where the sheet material path through the apparatus is not straight, it is even more of a problem where the sheet material path is substantially straight, as is the case in a processing apparatus which has a substantially vertical configuration.

Summary of the invention

It is an object of the present invention to provide a processing apparatus in which drive is transmitted from the drive motor to the drive rollers in a simple and reliable manner. We have discovered that this objective may be achieved by the use of transmission means which comprises a drive belt in engagement with the or each drive wheel.

According to the invention there is provided an apparatus for the processing of photographic sheet material, comprising a number of treatment cells positioned to define a sheet material path through the apparatus, at least one such cell being in the form of a vessel comprising a housing for retaining treatment liquid therein and a drive roller biased into contact with a reaction surface to define a nip there-between through which the sheet material path extends, the drive roller having a drive roller shaft which fixedly carries a drive wheel, the apparatus including a drive motor and transmission means for transmitting drive from the drive motor to the drive wheel, characterised in that the drive wheel is positioned outside the housing and the transmission means includes a drive belt in engagement with the drive wheel.

By the use of a drive belt to transmit drive to the drive wheels, the variation in the rotational speed of the rollers can be significantly less than with other transmission means of comparable cost and complexity, such as the use of worm drives, and may be less than $\pm 0.5\%$. If only one roller is a driven roller, this measurement is carried out on the driven roller.

The reaction surface towards which the roller is biased to define the nip will usually be the surface of another roller, or the reaction surface may be in the form of a belt or a fixed surface with a low friction coefficient.

However, according to a preferred embodiment of the invention, the reaction surface is constituted by a second drive roller mounted on a second drive roller shaft. While the second drive shaft may fixedly carry a second drive wheel engaged by the first drive wheel to transmit drive thereto, we prefer that the second drive roller is driven by frictional engagement with the first drive roller, or that drive is transmitted from the first to

the second roller by separate transmission means which may, for example, be located on the opposite side of the apparatus. For example, the second drive wheel is coupled to said first drive wheel by a gear connection to transmit drive to said second drive roller. Alternatively or additionally, the second drive wheel may be in engagement with the drive belt to transmit drive thereto.

The invention is applicable to a conventional processing apparatus in which the sheet material is transported along a generally horizontal feed path, the sheet material passing from one cell to another usually via a circuitous feed path passing under the surface of treatment liquid in each cell and over dividing walls between the cells. However, the invention has particular benefit for processing machines having a substantially vertical orientation, in which a plurality of cells are mounted one above the other, each cell having an opening at the top acting as a sheet material inlet and an opening at the bottom acting as a sheet material outlet or *vice versa*. In the present context, the term "substantially vertical" is intended to mean that the sheet material moves along a path from the inlet to the outlet which is either exactly vertical, or which has a vertical component greater than any horizontal component. The use of a vertical orientation for the apparatus leads to a number of advantages. In particular the apparatus occupies only a fraction of the floor space which is occupied by a conventional horizontal arrangement. Furthermore, the sheet transport path in a vertically oriented apparatus may be substantially straight, in contrast to the circuitous feed path which is usual in a horizontally oriented apparatus. As a consequence of the straight path, the sensitivity of the sheet material to scratches is independent of the stiffness and thickness thereof.

In a preferred embodiment of the invention therefore, the treatment cells are arranged one above another in a stack to define a substantially vertical sheet material path. In an alternative arrangement, a some of the treatment cells are arranged one above another in a stack to define a substantially vertical sheet material path, while the remaining treatment cells are arranged one beside another in a sequence to define a substantially horizontal sheet material path, continuous with the vertical sheet material path. Further treatment cells may follow arranged in a second vertical configuration, i.e. the arrangement comprises a first vertical apparatus, followed by a horizontally configured apparatus, which in turn is followed by a second vertically oriented apparatus. In this arrangement, the first vertical processing apparatus may be adapted for the development of images on the photographic sheet material, the horizontal processing apparatus may be adapted for the fixing of developed images on the photographic sheet material and the second vertical processing apparatus may be adapted for the cascade washing of the photographic sheet material.

By the use of a vertical configuration, the cross-section of the cell can be low, such as less than 3 times the roller diameter. The volume of the cell can therefore be

low. Indeed, for a given sheet material path length, the volume of one cell of a vertical processing apparatus can be many times smaller than the volume of an equivalent treatment cell in a horizontal processing apparatus. This has advantages in terms of the volume of treatment liquids used and the efficiency of their interaction with the sheet material.

At least one of the cells of the apparatus is in the form of a vessel comprising a housing for retaining treatment liquid therein, the drive wheel of the drive roller being positioned outside the housing. That is, the drive wheel is located on the dry side of the housing wall, thereby avoiding the difficulties of establishing a reliable transmission of the drive from the belt to the drive wheel if the latter were to be immersed, or partially immersed in treatment liquid. This construction requires that the drive roller shaft passes through the housing wall, where a suitable gas-tight and liquid-tight seal needs to be provided.

Typical rollers preferably have a circular cross-section and comprise a core provided with a covering of elastomeric material, although it is possible for the roller to be elastomeric throughout its cross-section. As the sheet material leaves a given liquid treatment vessel it is necessary to remove any liquid carried on the sheet material as efficiently as possible, to prevent carry-over of liquid into a next treatment cell and to reduce edge effects which arise from non-homogeneous chemistry on the sheet material after squeegeeing. It is important that the force between the rollers is sufficient to prevent leakage when no sheet material is passing through. However, the force must not be so high as to risk physical damage to the sheet material as it passes through the nip.

The elastomeric material covering preferably has a thickness of between 1 mm and 30 mm. The elastomeric material may be selected from ethylene/propylene/diene terpolymers (EPDM), silicone rubber, polyurethane, thermoplastic rubber such as Santoprene (Trade Mark for polypropylene/EPDM rubber), styrene-butyl rubber and nitrile-butyl rubber. The hardness of the elastomeric material may be between 15 Shore (A) and 90 Shore (A), as measured on the roller surface. In one embodiment of the invention, the diameter of the elastomeric material covering is constant along the length of the roller. Alternatively the roller may have a radial dimension profile which varies along the length thereof. In a preferred embodiment, such a roller comprises a non-deformable core, the thickness of the elastomeric material covering varying along the length thereof. Alternatively or additionally, the diameter of the core varies along the length thereof.

Ideally, the radial dimension profile of such a roller is such in relation to the force applied by the roller to sheet material passing through the flip as to be substantially even over the width thereof.

The radial dimension of the roller ideally decreases towards the ends thereof i.e. a convex profile, especially a parabolic profile.

Preferably, the core has a flexural E-modulus of between 50 GPa and 300 GPa. Suitable materials for the rigid core include metals, such as stainless steel, non-ferrous alloys, titanium, aluminium or a composite thereof.

In one embodiment of the invention, the core is hollow. Alternatively the core may be solid.

Each roller is secured to a roller shaft. The roller shaft may be integral with the core of the roller. Alternatively the roller shaft may be separately mounted in an end flange of the roller. In the case of a roller having a hollow core, one end of the roller shaft may be securely retained within one end of the core.

The rollers may be biased together by a variety of methods. The rollers may be biased together for example by making use of the intrinsic elasticity of the elastomeric material, by the use of fixed roller bearings. Alternatively, use may be made of resilient means such as springs which act on the ends of the roller shafts. The springs may be replaced by alternative equivalent compression means, such as e.g. a pneumatic or a hydraulic cylinder.

In the apparatus of the invention, the drive roller shaft fixedly carries a drive wheel. By "fixedly carries" we mean either that the drive wheel is integral with the drive shaft or that it is connected thereto by a play-free coupling, ideally a coupling which transmits the drive at a 1:1 ratio. It may for example be advantageous to connect the drive wheel to the drive shaft via a releasable coupling, enabling the roller with its associated drive shaft to be removed from the apparatus for cleaning purposes, without having to disturb the drive wheels and the remainder of the transmission. The releasable coupling is preferably located outside the housing.

Suitable releasable couplings are known. In one embodiment the roller shaft is of two parts, the first part being secured to the associated roller and the second part extending through an aperture in the end wall of the cell housing. The first and second parts of the drive shaft are coupled together by the releasable coupling, which comprises a cylindrical sleeve which is slidable in a direction of the shaft axis. The sleeve is slidable between the coupled position and an uncoupled position. In the coupled position, projections carried at the end of the first shaft part engage in grooves located inside the cylindrical sleeve. In the uncoupled position, the sleeve is slid in the axial direction, releasing the annularly disposed projections from the grooves, thereby enabling the first shaft part and its associated roller to be removed from the apparatus, for example for cleaning purposes.

In an alternative embodiment of the releasable coupling, a so-called "dove-tail" coupling may be used, such a coupling having the additional advantage of allowing limited lateral movement of one part of the shaft relative to the other, while retaining a play-free rotational connection between them.

The drive belt preferably engages the drive wheels over a contact angle of at least 45°, such as up to 210°.

The size of the contact angle partially determines the maximum torque which is applied to the drive wheel, and from there to the associated drive roller. The required torque will depend upon the manner in which the drive roller is mounted in the cell, the nature of the drive roller, for example the elasticity of its elastomeric covering where present, the nature of the reaction surface, the presence or absence of associated sealing means in contact with the roller surface and whether the drive roller is immersed in treatment liquid or not. In a given apparatus having a number of cells adapted to perform different tasks, different torques may be applied to different drive wheels.

Usually, a plurality of the cells each comprise a drive roller and associated drive shaft and drive wheel. It is possible that all the drive wheels lie in substantially the same plane, for example in a plane extending along one side of the apparatus. This enables all the drive wheels to be engaged by the same drive belt.

Alternatively more than one drive belt may be used, at least one roller shaft fixedly carrying two or more drive wheels, to enable drive to be transmitted from one drive belt to another. In this arrangement, it may be convenient to arrange that a first sub-set of drive wheels lie in a first plane to be engaged by a first drive belt, while a second sub-set of drive wheels lie in a second plane to be engaged by a second drive belt. In order to provide a compact arrangement, all the drive wheels may be substantially in line with each other. To ensure that the drive belt engages each drive wheel over the desired contact angle, the drive belt may engage one or more guide wheels positioned intermediate the drive wheels. Alternatively or additionally, opposite faces of the drive belt engage alternately with sequential drive wheels, the drive belt thus passing in a substantially sinusoidal path through the apparatus.

The drive belt may be formed for example of a metal such as steel or an elastomer with fibre reinforcement. Preferably the profile of the belt matches that of the belt-engaging surface of the drive wheel. Thus, the drive belt may be a toothed or non-toothed belt or in the form of a cable. It should be noted that the use of a drive chain in place of a drive belt does not give successful results. To reliably transmit the required torque to the drive wheels, the drive belt should be under tension, at least between the drive motor and the drive wheels. This tension may be generated by passing the belt over a spring loaded tensioning wheel.

The drive wheels should preferably be formed with a belt-engaging surface which is formed of, or coated with, a high friction material or otherwise treated to increase friction. Thus the drive wheels may be formed for example of moulded plastics material or of a metal such as steel, the wheels carrying a belt-engaging surface covering of natural or synthetic rubber. Additionally the belt engaging surface may be so shaped to assist the engagement of the drive belt thereon, for example by being provided with a concave surface and/or with side flanges.

The drive from the drive motor to the drive belt may conveniently be achieved by the engagement of the drive belt with a further drive wheel fixedly carried on the driven shaft of the drive motor. Suitable drive motors include DC stepping motors.

Preferred embodiments of the invention

The invention will now be further described, purely by way of example, by reference to the accompanying drawings in which:

Figure 1 is a cross-sectional view of one cell of a vertical processing apparatus according to the invention, with adjacent cells being partly shown;

Figure 2 is a side view of a stack of cells, showing their associated drive mechanisms; and

Figure 3 is a cross-sectional view of part of one cell, showing details of the end wall sealing and drive shaft coupling.

Although only one specific embodiment of a treatment vessel according to the invention is shown in the Figures, the invention is not restricted thereto.

The apparatus for the wet processing of photographic sheet material such as X-ray film as shown in the Figures comprises a plurality of treatment cells 12^I , 12^{II} , 12^{III} mounted one above another. These cells may be arranged to provide a sequence of steps in the processing of sheet photographic material, such as developing, fixing, rinsing and drying. The cells may be of a modular structure as shown or may be part of an integral apparatus.

Figure 1 shows that the cell 12^{II} is in the form of a vessel 13 which is of generally rectangular cross-section comprising a housing defined by a housing wall 14 so shaped as to provide an upper part 15 having an upper opening 17 and a lower part 16 having a lower opening 18. The upper opening 17 constitutes a sheet material inlet and the lower opening 18 constitutes a sheet material outlet. The inlet and outlet define therebetween a substantially vertical sheet material path 20 through the vessel 13, the sheet material 22 moving in a downwards direction as indicated by the arrow A. Mounted within the cell 12^{II} are a pair of rotatable drive rollers 28, 30. The vessel 13 contains treatment liquid 24, a passage 26 through the housing wall 14 being provided as an inlet for the treatment liquid 24. The distance H between the surface 25 of the liquid 24 and the nip of the rollers of the next upper cell 12^I is as low as possible.

Each roller 28, 30 is of the squeegee type comprising a stainless steel hollow core 32 carrying an elastomeric covering 34. The core 32 is in cylindrical form having constant internal and external diameters along the length thereof. The rollers 28, 30 are biased towards each other with a force sufficient to effect a liquid tight

seal but without causing damage to the photographic sheet material 22 as it passes there-between. The line of contact between the roller surfaces 29 and 31 defines a nip 36. The sheet material preferably has a width which is at least 10 mm smaller than the length of the nip, so as to enable a spacing of at least 5 mm between the edges of the sheet and the adjacent limit of the nip 36, thereby to minimise leakage. The rollers 28, 30 constitute drive rollers for driving the sheet material 22 along the sheet material path 20.

Each roller 28, 30 is in sealing contact along its length, with a respective stationary sealing member 38, 39 carried on a sealing support 40, which in turn is secured to the housing wall 14 of the vessel 13, the sealing members 38, 39 serving to provide a gas- and liquid-tight seal between the rollers 28, 30 on the one hand and the housing wall 14 on the other.

The treatment liquid 24 is therefore retained in the vessel 13 by the rollers 28, 30 and the sealing members 38, 39. The sealing members 38, 39 are formed of PTFE and have a composite structure. The sealing members 38, 39 are secured to the sealing support 40 by a suitable, water- and chemical-resistant adhesive, such as a silicone adhesive.

The upper and lower housing wall parts 15, 16 are provided with flanges 19, 21 respectively provided with bolts indicated by broken lines 23 to enable the cell 12^{II} to be mounted directly above or below an identical or similar other cell 12^I , 12^{III} , as partly indicated Figure 1. In the illustrated embodiment, the adjacent cells 12^I and 12^{III} are non-liquid containing cells. The upper housing wall part 15 is so shaped in relation to the lower housing wall part 16 as to provide a substantially closed connection between adjacent cells. Thus, treatment liquid from vessel 13 is prevented from falling into the lower cell 12^{III} by the rollers 28, 30 and sealing members 38, 39, while vapours from the lower cell 12^{III} are prevented from entering the vessel 13 or escaping into the environment.

This construction has the advantage that the treatment liquid in the vessel 13 is not contaminated by contents of the adjacent cells and that by virtue of the treatment liquids being in a closed system evaporation, oxidation and carbonization thereof is significantly reduced.

The lower part 16 of the housing wall 14 is so shaped as to define a leakage tray 42. Any treatment liquid which may pass through the roller nip 36, in particular as the sheet material 22 passes therethrough, drips from the rollers and falls into the leakage tray 42 from where it may be recovered and recirculated as desired.

Figure 2 is a side view of a stack of four cells, 12^I to 12^{IV} . Each roller 28, 30 is secured to a roller shaft 33, which extends through an end wall 44 of the housing 14. The roller shaft of one of each roller pair fixedly carries a moulded plastic drive wheel 45. The drive wheels 45 all lie in the same plane outside the housing 14.

The roller shaft of the other roller of each roller pair

is located in a bearing 46, which lies in a different plane to that of the drive wheels 45. The second roller of each drive roller pair is driven by frictional engagement with the first drive roller. This arrangement allows for the drive wheels 45 to have a larger diameter than the drive roller with which they are associated.

The apparatus includes a drive motor 47 located beneath the lowest cell 12^{IV} of the stack, the drive motor 47 having a drive motor shaft 48 on which is fixedly carried a drive wheel 49. Drive from the drive motor 47 is transmitted to the drive wheels 45 of each cell by a steel drive belt 50. The drive belt 50 passes over and is in engagement with each of the drive wheels 45 over a contact angle of about 100°.

In order to maximise the contact angle over which the drive belt 50 is in contact with each of the drive wheels 45, opposite faces of the drive belt 50 are in engagement alternately with sequential drive wheels 45. Freely rotating upper and lower guide wheels 51, 52 are engaged by the drive belt and define the return run for the belt. The lower guide wheel 52 may be tensioned by means not shown to provide the necessary tension in the drive belt 50.

Figure 3 is a cross-sectional view of part of one cell, showing details of the end wall sealing and drive shaft coupling according to one possible embodiment of the invention. As shown in Figure 3, the roller shaft 33 is of two parts, the first part 33a being secured to the associated roller and the second part 33b extending through an aperture 53 in the end wall 44 of the cell housing. A seal 61, held in position by a retaining plate 54, prevents the leakage of gas and treatment liquid through the aperture 53. The far end of the second part 33b of the drive shaft 33 carries the drive wheel 45 or is located in a bearing 46, as seen in Figure 2.

The first and second parts 33a and 33b of the drive shaft 33 are coupled together by a releasable coupling 55, which provides a play-free 1:1 drive connection between the roller and the associated drive wheel. In known manner, this releasable coupling 55 comprises a cylindrical sleeve 56 which is slidable in a direction of the shaft axis 57. The sleeve 56 is slidable between the coupled position as shown and an uncoupled position.

In the coupled position, annularly disposed projections 58 carried at the end of the shaft part 33a and annularly disposed projections 59 carried at the end of the shaft part 33b engage in longitudinally extending grooves 60 located inside the cylindrical sleeve 55.

In the uncoupled position, the sleeve 55 is slid to the right as seen in Figure 3, releasing the annularly disposed projections 58 from the grooves 60, thereby enabling the shaft part 33a and its associated roller to be removed from the apparatus, for example for cleaning purposes.

Claims

1. An apparatus for the processing of photographic sheet material, comprising a number of treatment cells (12^I, 12^{II}, 12^{III}, 12^{IV}) positioned to define a sheet material path (20) through the apparatus, at least one said cell being in the form of a vessel (13) comprising a housing (14) for retaining treatment liquid (24) therein and a drive roller (28) biased into contact with a reaction surface (30) to define a nip (36) there-between through which said sheet material path (20) extends, said drive roller (28) having a drive roller shaft (33) which fixedly carries a drive wheel (45), the apparatus including a drive motor (47) and transmission means for transmitting drive from said drive motor (47) to said drive wheel (45), characterised in that said drive wheel (45) is positioned outside said housing (14) and said transmission means includes a drive belt (50) in engagement with said drive wheel (45).
2. An apparatus according to claim 1, wherein said drive wheel (45) is connected to said drive roller shaft (33) via a releasable coupling (55), enabling said drive roller (28) with said drive shaft (33) to be removed from the apparatus for cleaning purposes.
3. An apparatus according to claim 1 or 2, wherein said reaction surface is constituted by a second drive roller (30).
4. An apparatus according to claim 3, wherein said second drive roller (30) is driven by frictional engagement with said first drive roller (28).
5. An apparatus according to claim 3 or 4, wherein said second drive roller is mounted on a second drive roller shaft fixedly carrying a second drive wheel in engagement with said drive belt to transmit drive thereto.
6. An apparatus according to claim 3, wherein said second drive roller is mounted on a second drive roller shaft fixedly carrying a second drive wheel coupled to said first drive wheel by a gear connection to transmit drive to said second drive roller.
7. An apparatus according to any preceding claim, wherein said treatment cells (12^I, 12^{II}, 12^{III}, 12^{IV}) are arranged one above another in a stack to define a substantially vertical sheet material path (20).
8. An apparatus according to any preceding claim, wherein some of said treatment cells are arranged one above another in a stack to define a substantially vertical sheet material path, while remaining said treatment cells are arranged one beside another in a sequence to define a substantially horizontal sheet material path, continuous with said vertical sheet material path.
9. An apparatus according to any preceding claim, wherein said drive belt (50) is in engagement with

said drive wheel (45) over a contact angle of at least 45°.

10. An apparatus according to any preceding claim, wherein a plurality of said cells (12^I, 12^{II}, 12^{III}, 12^{IV}) each comprise a drive roller (28) and associated drive shaft (33) and drive wheel (45). 5
11. An apparatus according to claim 10, wherein all said drive wheels (45) lie in substantially the same plane. 10
12. An apparatus according to claim 11, wherein said drive belt is in engagement with one or more guide wheels positioned intermediate said drive wheels. 15
13. An apparatus according to any one of claims 10 to 12, wherein opposite faces of said drive belt (50) are in engagement alternately with sequential drive wheels (45). 20
14. An apparatus according to any preceding claim, the arrangement being such that in operation, the rotational speed of said drive roller (28), as measured on the surface thereof, varies by less than $\pm 0.5\%$ when the drive motor runs at a constant speed. 25

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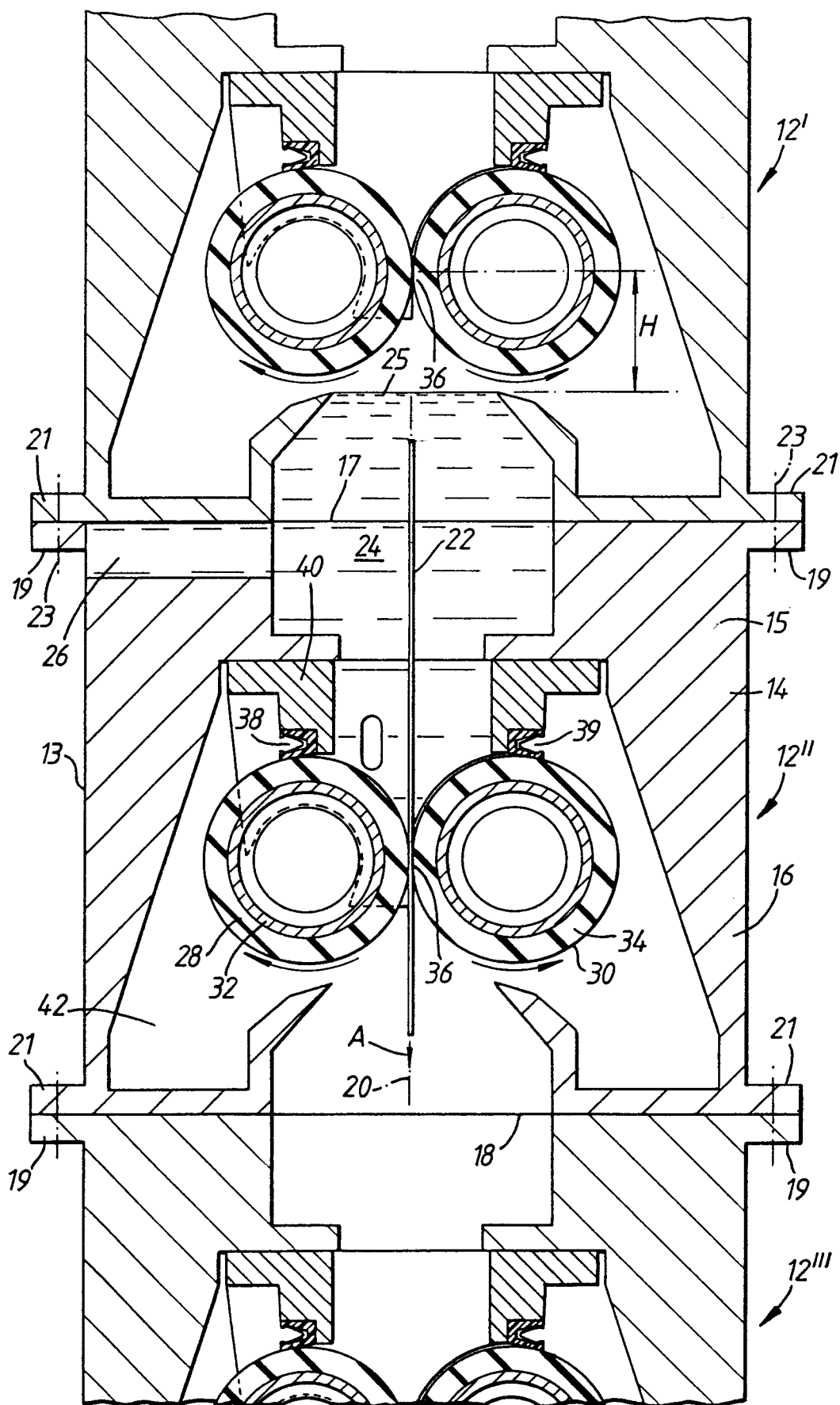


Fig.1

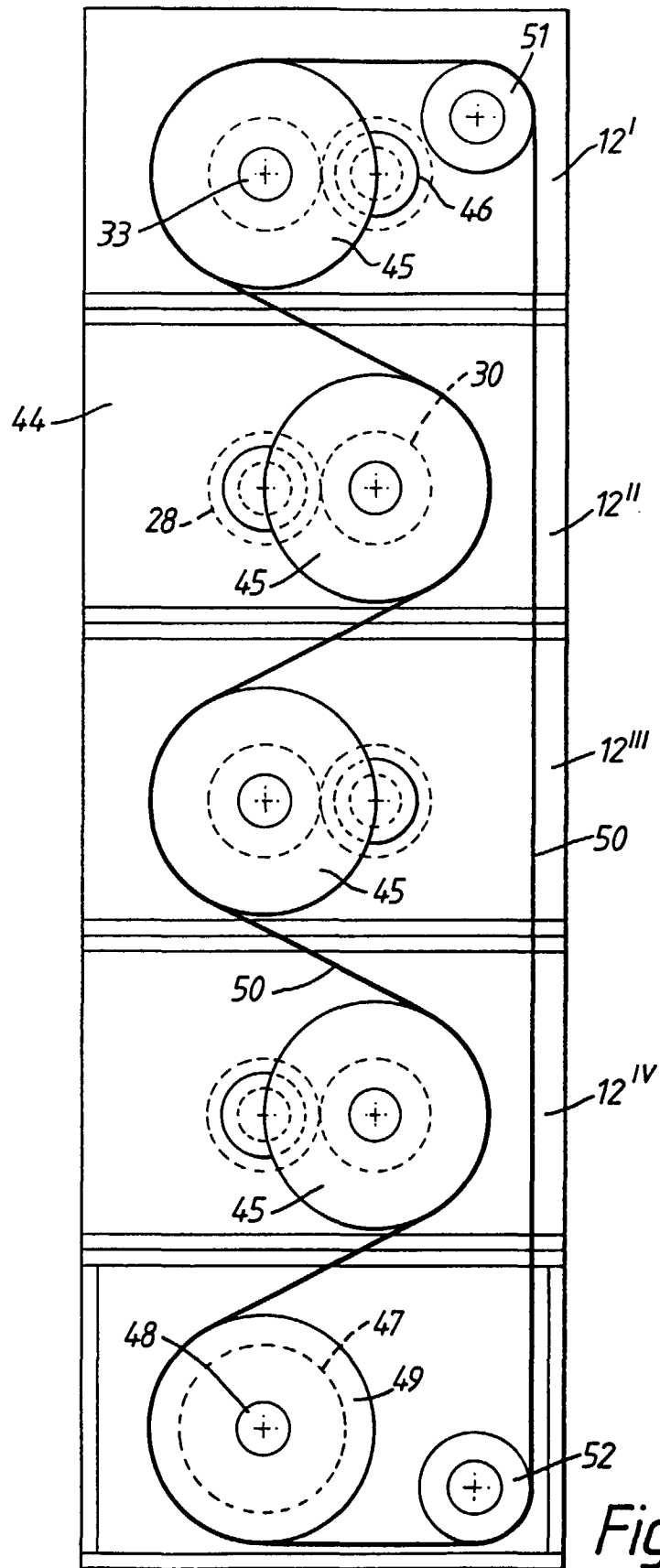


Fig. 2

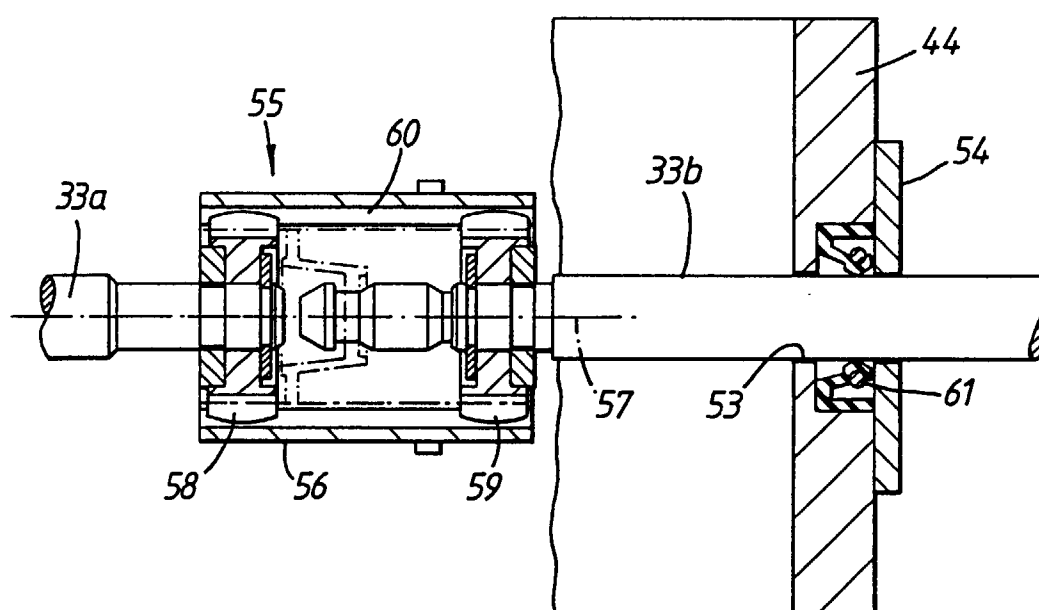


Fig. 3



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 95 20 3442

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.6)
X	DE-A-25 14 594 (HOPE) * page 19, paragraph 1; figure 9 *	1,3,4,9	G03D3/13
D,A	EP-A-0 613 049 (AGFA-GEVAERT) * abstract; figure 2C *	1	
A	US-A-5 108 878 (NAKAMURA) * abstract; figure 1 *	1,7	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			G03D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 9 May 1996	Examiner Romeo, V
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