PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 :		(11) International Publication Number:
D04H 1/70	A1	WO 87/ 06631
		(43) International Publication Date: 5 November 1987 (05.11.87)

(21) International Application Number: PCT/FI87/00054

(22) International Filing Date: 24 April 1987 (24.04.87)

(31) Priority Application Number: 861761

(32) Priority Date: 25 April 1986 (25.04.86)

(33) Priority Country: FI

(71) Applicant *(for all designated States except US)*: OY PARTEK AB [FI/FI]; SF-21600 Pargas (FI).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)* : LAURÉN, Henning, John, Emil [FI/FI]; Regnbågen 8, SF-21600 Pargas (FI). NURMI, Tom, Emil, Edgar [FI/FI]; Kvarnbacksvägen 5, SF-21600 Pargas (FI). MOISALA, Tapio, Olavi [FI/FI]; Brunnshöjden 1 A, SF-21600 Pargas (FI).

(74) Agent: BERGGREN OY AB; P.O. Box 16, SF-00101 Helsingfors (FI).

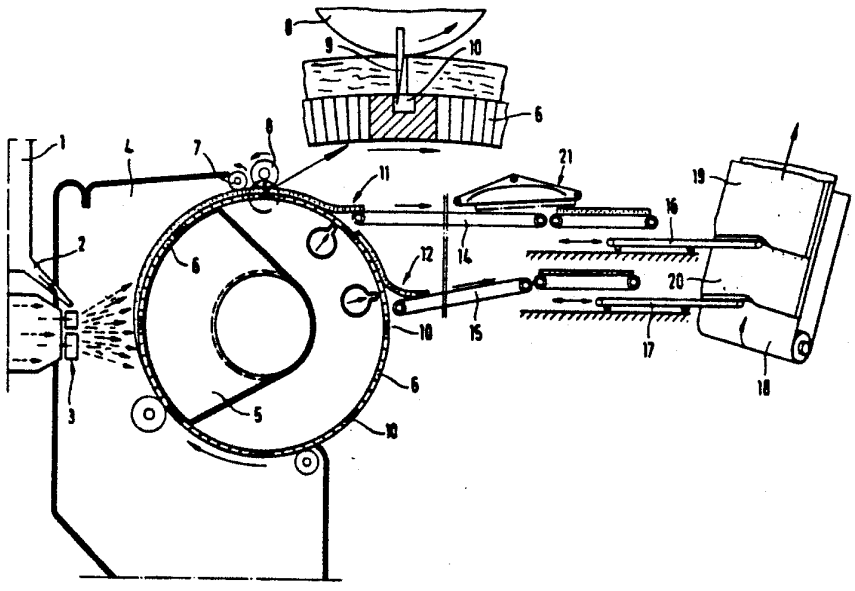
(81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), DK, FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), NO, SE (European patent), US.

Published
With international search report.

(54) Title: A METHOD AND DEVICE FOR MANUFACTURING A MINERAL WOOL WEB

(57) Abstract

Method and device for producing a mineral wool web from a thin primary web formed on a movable collecting surface (6). According to prior known methods, the primary web is folded on a receiving conveyor (18) in an overlapping configuration so that the desired thickness of the web is achieved. It is also known to combine two or several primary webs and to form the final mineral wool web by folding. The problem when producing mineral wool webs is the high rate of production of the primary webs and consequently, the high requirements on the devices in the further process and a great loss of material because of uneven edges which have to be cut down. According to the invention, the primary web is split into separate sheets before the deposit on the receiving conveyor (18), and the sheets are deposited by an oscillating distributing conveyor (16) in an overlapping configuration on the receiving conveyor, or, in case sheets are being produced, stacked on top of each other. The method offers several possibilities of reducing the feeding rate of the sheets and thus facilitating the deposit on the receiving conveyor. The flow of split sheets may for instance be separated (11, 12) into two or several flows to an intermediate conveyor each (14, 15) and the sheets may be stacked before the deposit. The cutting of the primary web may be performed on the collecting surface (6) or optionally after this on an intermediate conveyor.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**FR**	France	**ML**	Mali
AU	Australia	**GA**	Gabon	**MR**	Mauritania
BB	Barbados	**GB**	United Kingdom	**MW**	Malawi
BE	Belgium	**HU**	Hungary	**NL**	Netherlands
BG	Bulgaria	**IT**	Italy	**NO**	Norway
BJ	Benin	**JP**	Japan	**RO**	Romania
BR	Brazil	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CF	Central African Republic			**SE**	Sweden
CG	Congo	**KR**	Republic of Korea	**SN**	Senegal
CH	Switzerland	**LI**	Liechtenstein	**SU**	Soviet Union
CM	Cameroon	**LK**	Sri Lanka	**TD**	Chad
DE	Germany, Federal Republic of	**LU**	Luxembourg	**TG**	Togo
DK	Denmark	**MC**	Monaco	**US**	United States of America
FI	Finland	**MG**	Madagascar		

A method and device for manufacturing a mineral wool web

This invention relates to a method and a device for manufacturing a mineral wool web and more precisely to the methods and devices defined in the preambles of claims 1 and 16.

Mineral wool is a product having innumerable fields of application, of which the main field is the use as insulating material for heat and sound insulation.

Originally, mineral wool products consisted of an unorganized bundle of fibres, however, during the last 40 years they have been imparted a more or less solid shape by introducing a binding agent inbetween the fibres and by curig the composition, most frequently in the form of a mat which subsequently is sawn to the desired dimensions.

Usually the preparation of mineral wool products is carried out by melting mineral raw materials in a furnace, e.g. an electric furnace or a cupola furnace. The melt is allowed to flow continuously out of the furnace to a defibration assembly, usually consisting of a range of rapidly rotating cylinders, the melt flowing against the mantle surfaces of these. As the melt strikes the rotating mantle surfaces, it adheres and gains an accelerating rate which finally leads to the melt being successively flung out under the effect of the centrifugal force, whereby droplets of melt stretch out and form fibres. The fibres are primarily flung out in a plane normal to the axis of the defibration cylinders. Their flow web is deflected out of this plane by means of a directed flow of gas and is conveyed by this towards a collecting member, which may consist of a perforated conveyor belt, a net conveyor, a perforated apron conveyor or one or several perforated drums, through which the gas flow passes, while the fibres are deposited on the surface of the collecting conveyor.

In a conventional collecting process, the collection of fibres takes place in one step, obtaining the desired grammage directly on the collecting member. The adhesive has generally been introduced by spraying the deflected fibre flow with a liquid adhesive in a way to bring the fibres and the adhesive together towards the collecting member. The web with the desired grammage is subsequently lead to a tempering furnace in which the product gets the proper width and thickness, the adhesive being fixed simultaneously. This is followed by cooling, formating, possible surface treatment and packing.

Achieving a product which is as regular and homogenous as possible should be the aimed purpose, thus increasing the insulating capacity, as well as a product which is as elastic as possible, which requires the fibres to be stretched in the product plane, whereby the product may be compressed for the packing and conveying step.

In order to achieve this, only a relatively thin primary web is collected on the collecting surface, the grammage of which ranges from 100 to 450 g/m^2. Thus, the fibres get a regular and satisfactory orientation and the adhesive is equally distributed in the web. In order to maintain the capacity on the desired level and making the primary web thin at the same time, the rate of the primary web has to be high, like the rate of subsequent devices.

According to proceedings used up till now, the primary web is transformed by a folding process into a final web having the desired grammage. The folding may be performed in one or several steps and results in a final web having from 6 to 20 layers. The primary web may also be doubled before the folding. According to another known process, primary webs from several collecting members are superposed and folded simultaneously.

According to all the proceedings used until today, the primary webs obtained have always been handled as coherent mats, which have been superposed by doubling, folding and/or laminating.

When folding the primary web, reversible conveyors have usually been used, feeding down the primary web between each other, while the conveyor output ends move to and fro at a rate essentialy equal to the feeding rate of the primary web, in order to avoid folding or stretching of the mat in the output step. The reversible mechanics has most frequently been realized by disposing the end positions highest above the receiving conveyor and the lower dead position of the pendulum closest to the receiving conveyor. This technique appears for instance from the patent application SE 8403519-5. There are also constructions in which the folding process is carried out in a way to deposit all the parts of the primary web right above the base, at a constant height. Such a procedure is shown e.g. in the application SE 8403520-3.

The inconvenients of previously used processes are as follows:

- The weight of the reversible conveyors is relatively high, whereby the accelerating and decelerating forces cause great stress in the stands and the crank mechanisms running the pendulums.
- The oscillating surfaces of the reversible conveyors are large and bring great masses of air into movement during their oscillation. The air resistance against these surfaces cause great mechanical stresses in the pendulum mechanism.
- Since mineral wool fibres tend to float in air streams the oscillating movement of the pendulums raise considerable dust problems.

The edges of the final web comprise all the folds and irregularities arisen during the folding partly because of irregularities and irregular movements in the primary web as it leaves the re-

versible conveyors, in particular at the turning points, and partly because of the forward motion of the receiving conveyor, the rate of which varies according to the desired grammage of the final web. In order to obtain satisfactory end products, the edges have to be sawn down over a large area, which signifies a loss of c.5 to 6%.

- An additional problem is that the pendulums do not cope with the high rates of the primary web, being possibly up to 200 m/min if the grammage is 100 g/m^2 and the capacity ought to be 3 to 5 ton/h. The folding result gets poor and the pendulums do not resist the dynamic stresses.

The object of the present invention is thus to achieve a method and a device by means of which the collection of a thin primary web may be perfomed at a rate required for yeilding a desired capacity and the primary web deflected from the collecting member may be transferred to a final web without imparting the web forming process the above inconvenients.

The invention relates to the portion of the web forming process situated between the very defibration and the finished mineral wool web. The main characteristics of the method and the device according to the invention appear from the characterizing part of claims 1 and 16.

Thus, the invention consists in separating the continuous primary web into separate sheets before the deposit on the receiving conveyor, where the final mineral wool web is formed. The sheets are deposited by means of an appropriate conveyor on the receiving conveyor in an overlapping configuration so as to obtain the desired grammage. It is obvious that the problems caused by the reversed motion are totally eliminated since the deposit is done in the form of separate sheets. The folding irregularities are eliminated, and at the same time the deposit may be controlled so as to achieve completely even edges.

The splitting of the primary web may take place directly on the collecting surface or after this on an intermediate conveyor or between two intermediate conveyors.

The splitting taking place on the collecting surface, a perforated drum is preferably used as collecting surface, although the splitting may take place also on plane collecting surfaces, like perforated conveyor belts of various kinds. The perforated mantle surface is supplied with counter-surfaces or grooves evenly distributed over the mantle surface and against which a cutting device is disposed to cut the primary web. The spacing of the tracks corresponds to the desired sheet length. The cutting device may be of guillotine type or mounted onto a roll, rotating preferably in contact with the collecting drum so that the cutter strikes the drum at each groove. The drum may also have a greater diameter so that the peripheral surface corresponds e.g. to five sheet lengths and thus comprises five cutters striking the counter-surfaces of the drum.

The cutting devices and the parallel counter-surfaces on the drum are either parallel to the drum axis or form a small angle with this. In the former case, the split sheets get a square or rectangular configuration and in the latter case that of a parallelogram.

The splitting of the primary web into sheets may also take place wihtout cutting devices, but usually a cutting device is used in order to assure a previously established distribution of the web. Such a splitting process is done by preventing a fibre accumulation at the points where a splitting of the web is desired. For this purpose, the perforated web is shaped with seamless drawn gaps as described above or form a small angle with this. The suction power operating inside the drum then only affects the perforated surfaces aspirating fibres to these surfaces, whereas the unperforated gaps remain essentially free of fibres.

The separation of the split sheets is done in any known manner, preferably by exhaust. The cutting device being disposed on a roll of which the periphery corresponds to a sheet length, the sheets are continuously conveyed on the drum mantle surface, until they reach an exhaust device disposed beneath the mantle. The cutting device being disposed on a roll of which the periphery corresponds to several sheet lengths, the exhaust device may be disposed to separate sheets onto the cutting roll, from where they are separated by exhaust onto one or several intermediate conveyors, which transfer them to the receiving conveyor.

The process according to the invention being applied by carrying out the splitting after the collecting surface, the cutting into sheets is performed on an intermediate conveyor or between two conveyors. The cutting device may advantageously consist of a cutter of guillotine type.

In particular when applying the process in connection with collecting on a drum, there are several possibilities of reducing the rates of the intermediate conveyors with regard to the collecting rate of the primary web, which is one of the main objects of the invention.

The separation from the drum may be disposed to take pace at two several points to an intermediate conveyor each, which one at a time transmit the sheets to the receiving conveyor. The rate of the intermediate conveyors then increases to half or one third or one fourth of the peripheral rate of the drum. The separation may be disposed to take place by means of alternating exhaust devices.

To each intermediate conveyor, a distributing conveyor is connected, which consists of a conveyor oscillating in the horizontal plane, to which the intermediate conveyor transfers a sheet or stacked sheets and from which the same sheets are transferred onto the receiving conveyor.

The receiving conveyor preferably runs transversely to the conveying direction of the distributing conveyor, i.e. normal or in a small angle to the production direcion of the sheets. For the event that the direction of the receiving conveyor deviates somewhat from 90^{0} with regard to the direction of motion of the intermediate conveyor, the sheets advantageously have the configuration of a parallelogram.

The receiving conveyor may have the same direction of motion as the distributing conveyor. The fibre direction of the finished mineral wool web will then be longitudinal, being transverse in the previous case.

One further manner of reducing the rate of the distributing conveyors is disposing a stacking device which piles sheets on top of each other during the conveyance from cutting to distribution, i.e. from the transfer to the receiving conveyor. This may be done in several ways, among which may be mentioned the method of absorbing by means of a perforated conveyor, mounted above an intermediate conveyor, for instance every second sheet momentarily, for subsequent deposit on the following sheet, or optionally the preceding sheet, in case the absorbing device by revolving or moving reaches right above the preceding sheet. Another method consists in conducting every second sheet over a conveyor, which again leads the sheets down to a subsequent sheet. Such stacking devices are, however, known per se.

By making the stacking device revolve, the fibre direction may vary in the finished web. Every second sheet may for instance turn 90^{0}, whereby half of the sheets have a longitudinal fibre direction, and half a transverse fibre direction. This results in an extremely homogenous mineral wool web.

The process according to the invention may also be utilized for continuous production of laminated mineral wool webs. By means of one or several additional distributing conveyors, one may in a

manner known per se bring sheets or layers of various material, e. g. net, braided glass fibre weave, and similar, directly onto a mineral wool sheet, whereby the different material enters the web as an overlapping sheet together with the other sheets.

The process according to the invention may naturally also be utilized for the production of mineral wool plates, whereby the cut sheets are superposed directly in the desired amount, the receiving conveyor being at a standstill. This procedure is particularly suited for the production of sandwich elements, in which sheets of a different material are brought by means of a separate distributing conveyor onto sheets placed on an intermediate conveyor or on the receiving conveyor.

The invention will be described in detail below as preferable embodiment examples and referring to the enclosed drawings, in which

figure 1 shows a vertical section of a device for carrying out the process according to the invention,

figure 2 shows a modification of the device according to figure 1, also as a vertical section, from which the devices subsequent to the intermediate conveyor have been eliminated, and

figure 3 shows a rough vertical section of a modification of the device according to the invention, in which the collecting surface consists of a triangular net web and in which the devices subsequent to the intermediate conveyor have been eliminated.

In the different figures the same reference numerals refer to the same matter.

The reference numeral 1 refers to a melting furnace from which the melt obtained flows through a flute, indicated by the number 2, to a defibration assembly, indicated by 3. The number 4 denotes the so-called wool chamber, 5 a suction box, which is mounted inside the collecting conveyor 6. The melt flows down on the defibration assembly, which flings melt droplets stretched to fibres by the centrifugal force. A gas flow deflects the fibre flow towards the collecting conveyor 6, which here consists of a perforated drum. The suction box fitted tight against the inner surface of the drum attracts the fibre stream, whereby the fibres are deposited on the rapidly rotating drum and form a thin primary web. The reference numeral 7 denotes a sealing device consisting of a rotating roll. The number 8 indicates antoher roll rotating in contact with the peripheral surface of the drum, which forms a cutting roll and thus is provided with a cutting blade 9 for cutting off the primary web. The cutting base, i.e. the counter-surface of the cutter, is a slot or a track 10 consisting of a break in the perforation. Thus the primary web receives an indication of fracture or a disrapture at this point. In case the track 10 only produces an indication of fracture, the cutting blade is needed to finish the cutting off of the web. If the track leads to a disrapture of the mat, the cutting device may be disconnected. The reference numerals 11 and 12 denote exhaust points for the primary web. They alternate, leading to every second cut off sheet being separated to an intermediate conveyor 14 and every second to another intermediate conveyor 15. The intermediate conveyors, indicated with the numbers 14 and 15, are of a conventional type. From the intermediate conveyors, the sheets are conducted to a distributing conveyor each 16 an 17, consisting of oscillating horizontal cconveyors. The distributing conveyors receive a sheet from the intermediate conveyor in their left-hand position and deposit it in their right-hand extreme position onto the receiving conveyor, indicated by 18. In this embodiment, the receiving conveyor runs transversely to the distributing conveyor, resulting in a substantially transverse fibre direction in the finished mineral wool web. The conveying rate of

the intermediate conveyors is the same as the rate of motion of the primary web on the drum, whereas the rate of the distributing conveyors is only half of this, since the sheets are fed out on two distributing conveyors. The overlapping sheets fed out on the distributing conveyors are indicated by 19 and 20. The rate of the distributing conveyor is adapted to the distribution rate of the sheets, thus obtaining the desired overlapping, and consequently also the desired web thickness.

It is evident that the deposit on the receiving conveyor 18 may be gradually performed so as to deposit the desired number of sheets on each other and a multi-layer plate of the desired thickness is obtained, after which the distributing conveyor moves one step forwards and the deposit on the following multi-layer pate may be started. This process may advantageously be utilized when producing sandwich elements, whereby the desired separated material is added to the sheet pile preferably by means of anoher distributing conveyor. The sandwich elements may be continuously produced, having the different layers superposed in whatever order.

The reference numeral 21 indicates a stacking device which advantageously is disposed to cooperate with one of the intermediate conveyors, in this case the conveyor 14. The stacking device 21 is a perforated conveyor absorbing every second sheet momentarily, and depositing it subsequently on the following sheet. Thus, the feeding rate of sheets fed out decreases and the rate of the distributing conveyor may be correspondingly reduced.

Figure 2 only shows the collecting drum 6 on which the fibre flow hurled out from the defibration assembly accumulates, and a cutting and suction roll 22 rotating in contact with the drum. The collecting drum is provided with unperforated slots resulting in fracture indications or fractures. The final separation of the sheets is ensured also in this embodiment by cutters 23. The cutters are equally spaced over the periphery of the roll 22, the distance between the cutters corresponding to a sheet length plus the length of the fracture indcation. After the cutting off at the tangential point of the roll and the drum, the cut off sheet is blown off to the roll 22 by means of an exhaust device 24 and the suction box 25 installed in the roll. The sheet is preferably separated immediately after the suction box to an intermediate conveyor, after which the continued process corresponds to the embodiment described in connection with figure 1. The cutting and suction roll 22 may also have a greater diameter, comprising for instance four of five cutters disposed on the mantle surface. The sheet flow is then advantageously separated to two intermediate conveyors as shown in figure 1, to allow the rate of the distributing conveyor to be reduced.

Figure 3 shows schematically a deposit of a fibre flow on a collecting surface of a triangular web. Having left the sealed chamber 4, the primary web is conveyed on a horizontal conveyor, on which the cutting into sheets takes place. The cutting is done by means of a cutter of guillotine type 26, a cutting roll like the ones described above, or any other appropriate prior known cutting device.

Here too, the further process is performed according to the embodiment of figure 1.

The invention is not restricted to the described embodiments, but may be modified within the limits of the following claims.

Claims

1. A method for forming mineral wool webs from several layers of a primary web, formed of mineral fibres hurled out from a defibration assembly (3) and guided to a collecting surface (6), whereby the primary web, to which a binding agent has been added, is separated from the collecting surface and transferred to a receiving conveyor (18) as overlapping layers up to the desired web thickness and is subsequently cured, **characterized** in that the primary web is split into separate sheets (19, 20) while forming a flow of sheets before the deposit on the receiving conveyor (18).

2. A method according to claim 1, in which the collecting surface consists of devices known per se, such as a perforated drum, a perforated conveyor belt, a perforated apron conveyor or a net conveyor, **characterized** in that the splitting is performed on the collecting surface (6).

3. A method according to claim 1, in which the collecting surface consists of devices known per se, such as a perforated drum, a perforated conveyor belt, a perforated apron conveyor or a net conveyor, **characterized** in that the splitting is performed after the collecting surface (6).

4. A method according to claim 1 or 2, **characterized** in that the splitting is performed by the forming of fracture indications or fractures in the primary web by means of unperforated surfaces in the collecting surface (6) which prevent the deposit of web-forming fibres on these surfaces, after which the splitting is possibly performed by cutting off by means of a cutting device (9) cutting against an unperforated surface.

5. A method according to any of claims 1, 2 and 4, **characterized** in that the split sheets are separated from the collecting surface by means of a drum (22) operating by suction (25) from which the sheets are transferred in a known manner to the intermediate conveyor (14, 15) and further transmitted to the receiving conveyor (18).

6. A method according to any of claims 1, 2, 4 and 5, **characterized** in that the separation of the sheets from the collecting surface is done at one, two or three points (11, 12) by means of alternating exhaust devices or similar to be transferred to one, two or three intermediate conveyors (14, 15) and further transmitted to one single receiving conveyor (18).

7. A method according to claim 1 or 2, in which the collecting surface consists of a perforated drum (6) **characterized** in that the splitting is carried out by cutting off by means of a cutting device (9) disposed to cut against a counter-surface, for instance tracks or gaps, equally spaced in the mantle of the collecting drum, the distance corresponding to the desired sheet length.

8. A method according to any of the preceding claims, **characterized** in that the splitting is performed along parallel lines normal to the edges of the primary web or forming an oblique angle with the said edges.

9. A method according to any of the preceding claims, **characterized** in that the sheet receiving conveyor moves in the direction of production of the sheets, whereby the fibre direction of the sheets in the finished web is the same as the fibre direction in the primary web.

10. A method according to any of claims 1 to 8, **characterized** in that the sheet receiving conveyor (18) moves transversely to the sheet production direction, whereby the fibre direction of the sheets in the finished web has turned 90^{o} to the fibre direction in the primary web.

11. A method according to any of the preceding claims, **characterized** in that the sheets are deposited on the reciving conveyor (18) in the direction in which they are produced.

12. A method according to any of claim 1 to 10, **characterized** in that part of the sheets, for instance every second sheet, turns 90^{0} before being deposited on the receiving conveyor.

13. A method according to any of the preceding claims, **characterized** in that part of the sheets, preferably every second sheet, is lifted from the intermediate conveyor (14) to a position above this and is lowered back on this onto another sheet present on the intermediate conveyor, which superposed sheets are deposited on the receiving conveyor (18) as one single sheet.

14. A method according to any of the preceding claims, **characterized** in that on top of sheets of the primary web on the intermediate conveyor (14) or the receiving conveyor, sheets or layers of a different material, a different quality or a different fibre structure are placed in order to impart the mineral wool mat new properties.

15. A device for carrying out the method according to any of the preceding claims, comprising a furnace (1) for melting mineral mass, a defibration assembly (3) for hurling out mineral fibres and devices for producing a gas flow and a suction (5) for guiding the fibres towards a movable collecting surface (6), as well as devices for introducing a binding agent inbetween the fibres, devices for separating the primary web formed on the collecting surface and for transferring this to intermediate conveyors as well as a furnace for curing the mineral wool web, **characterized** in a device (9; 23; 26) disposed before the receiving conveyor for splitting the primary web into separate sheets (18, 19) and for forming a flow of sheets.

16. A device according to claim 15, in which the collecting surface consists of devices known per se such as a perforated drum, a perforated conveyor belt, a perforated apron conveyor or a net conveyor, **characterized** in that the cutting device consists of a cutter (9) disposed on the mantle surface of a roller (8) rotating in contact with the collecting surface and in that the periphery of the roller corresponds to the distance between the counter-surfaces.

17. A device according to claim 15, in which the collecting surface consists of devices known per se, such as a perforated drum, a perforated conveyor belt, a perforated apron conveyor or a net conveyor, **characterized** in that the cutting device consists of cutters (23) equally spaced on the mantle surface of a roller (22) rotating in contact with the collecting surface, whereby the distance between the cutters corresponds to the distance between the counter-surfaces.

18. A device according to claim 17, **characterized** in that the roller receives by suction (25) the cut off sheets on its mantle, from where the sheet is separated to an intermediate conveyor (14).

19. A device according to claim 15 having a perforated drum as collecting surface, **characterized** in that a cutting device is disposed to cut against a counter-surface, for instance tracks or gaps, which are parallel and equally spaced in the mantle of the collecting drum (6), whereby the distance corresponds to the desired sheet length.

20. A device according to claim 15 having a perforated drum as collecting surface, **characterized** in unperforated, parallel and equally spaced gaps, which prevent the deposit of fibres on the gap surface and thus produce fractures or fracture indications in the primary web formed on the drum.

21. A device according to any of claims 15 to 19, **characterized** in that the parallel tracks or gaps are also parallel to the axis of the drum or form a small angle with this direction.

22. A device according to any of claims 15 to 22, **characterized** in one or several, preferably two separation points (11, 12) operating by exhaust for the sheets split on the collecting drum (6), whereby the separation points are disposed to alternate and separate the sheets to an intermediate conveyor each (14, 15).

23. A device according to claim 15, **characterized** in that the splitting device consists of a cutter which is disposed to cut off at specific intervals the primary web moving forwards on an intermediate conveyor, whereby the interval corresponds to the time required by the primary web for moving the length of a sheet.

24. A device according to any of the preceding claims 15 to 23, **characterized** in that the intermediate conveyor transferring to the receiving conveyor consists of a conveyor (16) oscillating in the horizontal plane.

25. A device accroding to any of claims 15 to 24, **characterized** in that above one intermediate conveyor (14) has been disposed a stacking device (21), for instance a suction box or a combination of a conveyor and an exhaust device disposed in the intermediate conveyor, which is able to lift a sheet and deposit it on another sheet present on the intermediate conveyor, whereby the double sheet is deposited on the receiving conveyor (18) as one single sheet.

26. A device according to claim 25, **characterized** in that the stacking device (21) is turnable 90^{o} or 180^{o}.

27. A device according to claim 25 or 26, **characterized** in that the stacking device (21) is removable.

28. A device according to any of claims 15 to 27, **characterized** in that the receiving conveyor (18) is disposed to move transversely to the production direction of the primary web.

29. A device according to any of claim 15 to 27, **characterized** in that the receiving conveyor (18) is disposed to move in a the same direction as the production direction of the primary web.

30. A method for producing mineral wool sheets from several layers of a primary web formed on a movable collecting surface of mineral fibres hurled out from a defibration assembly and guided to a collecting surface, **characterized** in that the primary web is split into separate sheets while forming a flow of sheets on the collecting surface or on a subsequent intermediate conveyor, from where the sheets are transferred in a manner known per se to a receiving conveyor (18) in a superposed desired amount and are subsequently cured.

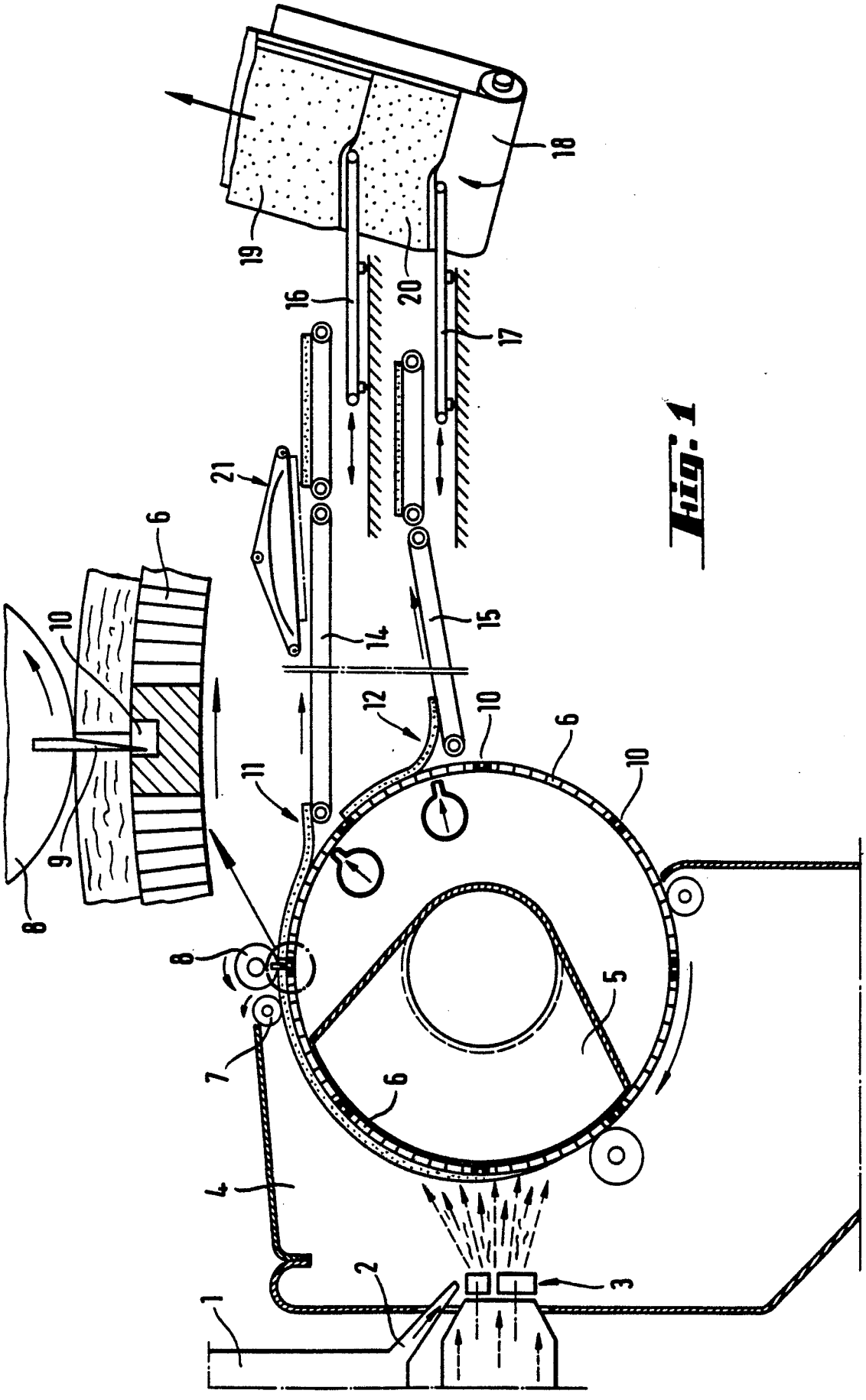


Fig. 1

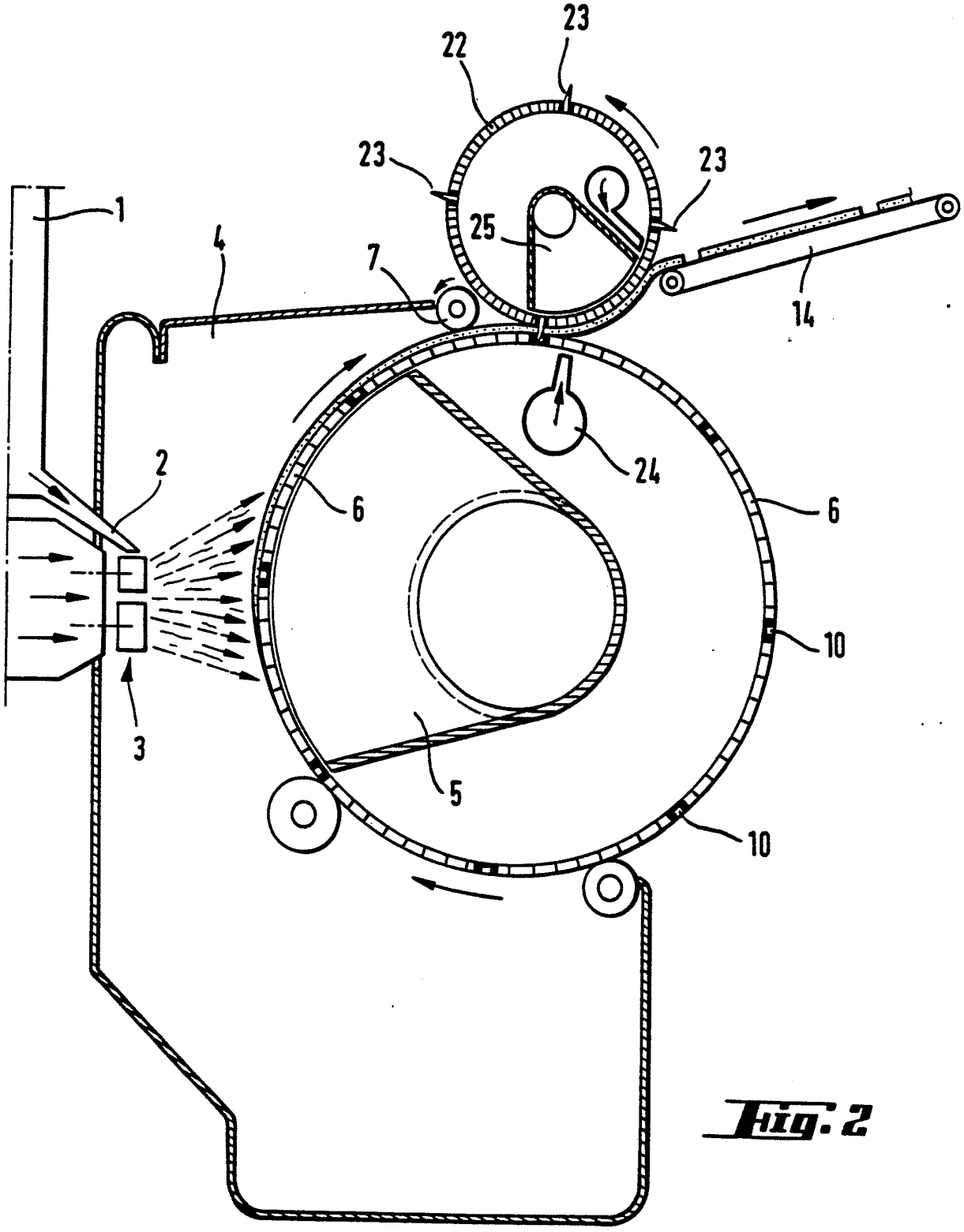


Fig. 2

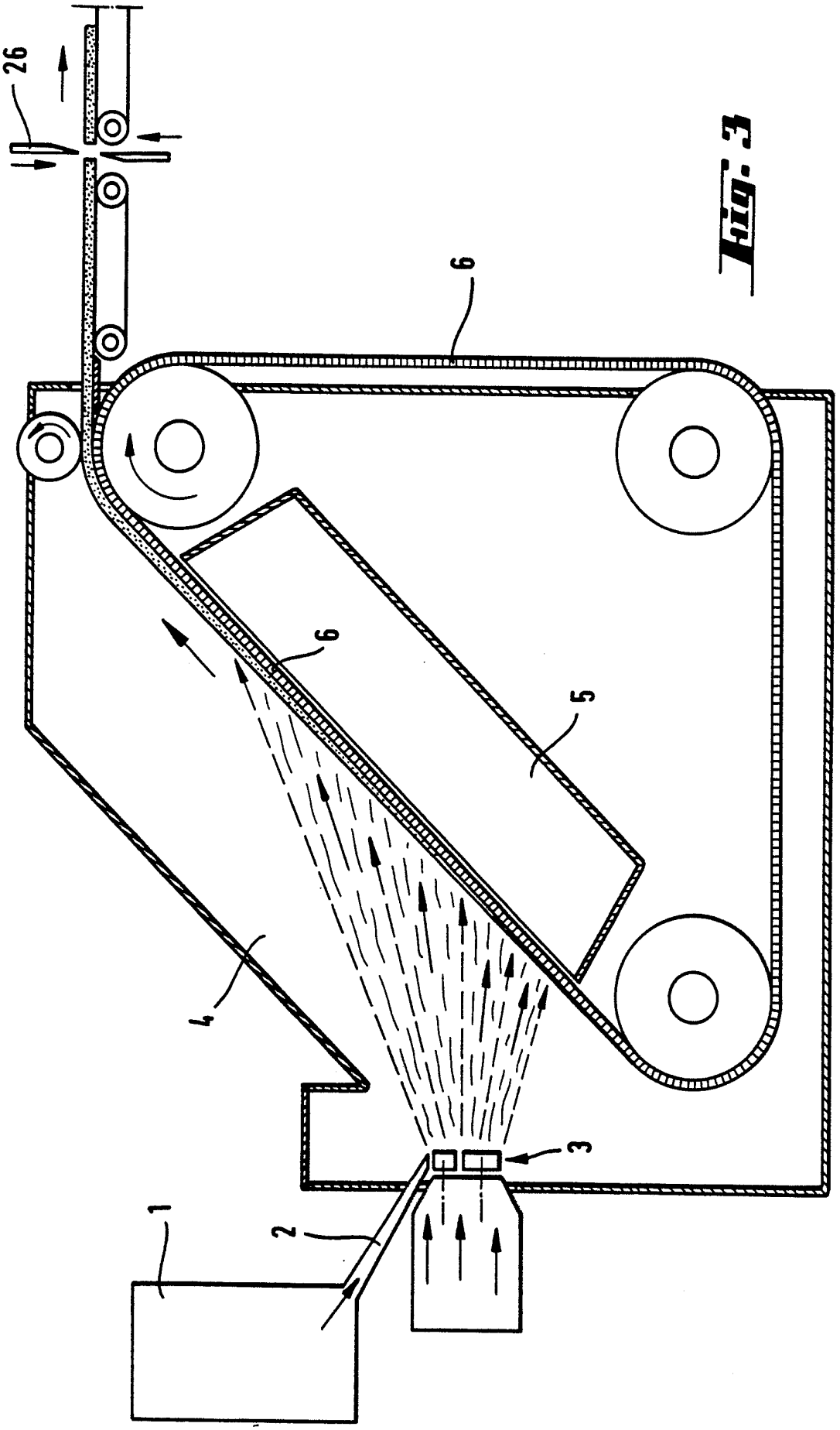


Fig. 3

INTERNATIONAL SEARCH REPORT

International Application No PCT/FI87/00054

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

D 04 H 1/70

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	D 04 H 1/00, /40-/44, 1/54-/64, 1/70-/74 D 01 G 25/00
IPC 3	C 04 B 43/02 .../...

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	AT, C, 310 045 (E. FEHRER) 10 September 1973	
A	US, A, 2 889 583 (W. WACKER et al) 9 June 1959	
X	GB, C, 1 396 786 (WYZKUMNY USTAV MECHANIZACE, AUTOMATIZACE A TECHNOLOGIE VYROBY STAVEBNICH DILCU) 4 June 1976 & DE, 2223201	15, 30

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1987-06-26	1987 -07- 03
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Liisa Hyrkäs

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II Fields searched (cont)

US Cl 19: 144-163, 296-308
425: 80-83, 80.1-83.1

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [1]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers....., because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim numbers....., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim numbers....., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [2]

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.