

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number: **85630036.3**

(61) Int. Cl.⁴: **B 27 B 31/00**

(22) Date of filing: **27.03.85**

(30) Priority: **29.03.84 ZA 842324**
29.03.84 ZA 842327

(43) Date of publication of application:
16.10.85 Bulletin 85/42

(84) Designated Contracting States:
AT DE FR SE

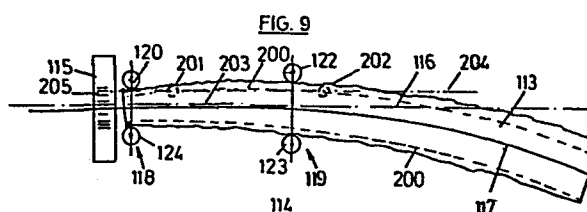
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(54) **Timber production.**

(57) A process and apparatus for use in wet mill sawing in which a log or cant (flitch) (113) is oriented with its main longitudinal curvature in a horizontal plane on the in-feed table to the gang saw (115) and is sawn around the curve centered on the centre line (117) of the log or cant (113) in double taper sawing to produce boards or deals which can afterwards be straightened in the kiln. Automated detection of the edge (200) of the flat surface of a cant is used to align this edge with a saw blade (205) to ensure the cutting of a full deal. These techniques are optimised for timber production gains over conventional practice.



This invention concerns improvements in and relating to timber production, more particularly to wet mill production.

The invention provides a process of wet mill sawing and apparatus for use in wet mill sawing in accordance with the
5 process.

This invention concerns more particularly the sawing of logs and cants into timber in the wet mill, generally the sawing of logs into lumber or rough timber. In the wet mill logs are sawn into scantlings, boards, planks and
10 deals. In view of its nature as will be described below this invention may be of especial interest in the sawing of fast grown timber, for example, such as occurs in the Southern Hemisphere including countries such as Southern Africa, South America and Australasia. Similarly the
15 invention may be of especial significance in sawing of boards, that is thin planks.

The invention provides primarily a process of sawing timber and in addition apparatus for sawing timber.

In the art of sawing timber a perennial problem arises in
20 that the timber, which is of regular and rectangular shape, has to be sawn from logs which are in general of irregular cylindrical shape, and more especially so in the case of fast grown timber. The most important characteristics of this irregularity for present purposes are the taper of the
25 logs and the curvature of the logs. The irregular cylindrical shape of the logs makes it impossible to convert

the entire volume of the log into regular sawn timber and in South African conditions it has been calculated that on average not more than seventy percent of logs can theoretically be converted into timber.

5 In practice it is found that on average only approximately fifty percent is converted into sawn timber, and a continuing endeavour of the art is to improve the percentage figure attained in practice to a figure nearer to the theoretical maximum.

10 In the art the general process of sawing timber is to feed the log through a gang saw so as to cut off at least two sideboards leaving a flitch (or cant); the flitch is then transported to a second gang saw, being rotated through 90° on its longitudinal axis, and sawn into deals and
15 sideboards. The sideboards are then transported to edging saws which are gang saws which saw the edges true and square. This timber or lumber produced in the wet mill is then usually transported to the drying kilns.

In the first sawing the log is fed into the gang saw
20 generally by means of an in-feed carriage which may be remote controlled by an operator but which is more usually controlled by an operator seated on the carriage, and it is essential that the log be rotated on its axis by the operator so that the major curvature of the log lies in a
25 vertical plane. It is here that heavy reliance is placed on human judgement and to the extent that accurate alignment is not achieved losses in the percentage utilisation of the log

volume results.

In an alternative to the in-feed carriage, an automatic feeding apparatus, which employs pairs of rollers running on vertical axes have been employed and here again it is most
5 important that the log be orientated with its major curvature lying in a vertical plane, generally with the concave surface facing upwards.

When the flitch is rotated through 90^0 and cut in a second
10 sawing operation into boards and planks this is most commonly done in straight cuts, these, primarily as a result of the curvature of the flitch, resulting in considerable losses due to poor usage of the volume in the flitch and in uneconomical cuts; sometimes to reduce these problems the flitch is cut into two halves lengthwise. In Southern
15 Africa where curvature presents an aggravated problem a technique has been used to cut the flitch around the curve, guiding the flitch on one side edge of the flitch, preferably the concave curved side edge. This produces the cuts which form the deals or planks and boards parallel to
20 one side of the flitch.

Although cutting around the curve of the flitch has improved the wet mill yield as compared with straight cutting, the results still fall very far short of the theoretically attainable maximum. Furthermore, since some planks have
25 partly heart timber and partly side timber, losses occur in the dry timber due to warpage, and the quality of the timber

is reduced, especially with fast grown timber, so that any gain this technique may achieve in the wet mill is offset by warping in the dry mill and a reduced quality product.

A process of wet mill sawing in accordance with this invention comprises locating a log at the in-feed side of a gang saw, orientating the log around its longitudinal axis so that its maximum overall longitudinal curvature lies in a horizontal plane, aligning the log so as to be fed longitudinally into the saw with the longitudinal centre line of the log intersecting at two positions with a line on the in-feed side of the saw and parallel with a longitudinal centre line of the saw, a first position being adjacent the saw and a second position being a distance from the first which is less than half the overall length of the log, and feeding the log through the saw so that the log is sawn into boards and/or planks, along saw lines parallel to the curve of the longitudinal centre line.

This process of wet mill sawing in accordance with the invention can be applied to a cant instead of a log, provided that the two flat surfaces of the cant are parallel with a (imaginary) plane in which the main longitudinal curvature of the cant lies. Thus with the cant orientated around its longitudinal axis so that its main longitudinal curvature lies in a horizontal plane its two flat surfaces are horizontal and the cant can lie naturally on a flat table or in-feed conveyor.

Applying the process to a log, the line with which the

curved centre line of the log intersects can preferably coincide with the longitudinal centre line of the saw.

However, in applying the process to a cant, preferably an edge of one (or both) of the two flat surfaces is aligned
5 with a "saw line" parallel with the longitudinal centre line of the saw. The "saw line" is a line extended parallel to the centre line on the in-feed side of the saw from a saw blade, which is thus suitably set to cut on the edge of the flat surface of the cant. This achieves the advantage that
10 a full deal is cut, that is having a full rectangular cross section.

Aligning an edge of a flat surface of a cant with a saw line is preferably achieved by feeding the cant towards the saw in a position in which the flat surface is intersected by a
15 saw line, detecting the surface and edging the cant across until an edge of the surface is detected to intersect the saw line. The detection is preferably carried out in positions in advance of each of the two positions at which the curved longitudinal centre line of the cant intersects
20 with a line parallel with the longitudinal centre line of the saw.

In accordance with an extension of the "edge alignment with a saw line" principle, the process is adapted to select any
25 one particular saw line from a plurality of options. This selection is made in accordance with the invention by detecting the size of the cant flat surface (that is,

- 6 -

the width of the flat surface) and from this information making a decision of which saw line to align on. (This is best done by a programmed computer). This allows the gang saw blades to set up in anticipation of the range of cant sizes to be dealt with in the course of sawing, and the saw line selection is made to give an optimum sawing pattern for each size of cant encountered in the range. The range can be defined by the sorting criteria implemented in the mill ahead of the saw.

- 10 In operating the process preferably once the leading end of the log or cant enters the saw blades the aligning control is removed at the second position.

Apparatus for use in wet mill sawing in accordance with this invention comprises two log or cant guidance stations located at the in-feed side of a gang saw, a first station adjacent the saw and the second being a distance from the first which is less than half the overall length of logs for which the saw is to be used, each guidance station located with respect to a longitudinal centre line of the saw extended on the in-feed side, each guidance station comprising pairs of guidance elements, preferably rollers rotated or rotatable on upright axes, movable towards and away from each other transversely to the feed direction of the log, synchronised to be always moved by equal magnitude and in opposite directions.

Preferably the apparatus is provided with a locating mechanism at one or each guidance station, each mechanism adapted to locate the guidance station in transversely adjustable positions with respect to the saw centre line
5 which positions include a position centred on the centre line and a range of positions offset from the centre line.

Another preferred feature of apparatus is that the rollers, in at least one of the two stations, preferably that station nearest the saw, comprise a tandem set of rollers. In a
10 tandem set of rollers there are four rollers in total at the station; the four rollers are arranged in two opposite pairs, each pair mounted on a bogie which is pivotally supported at a pivot point equidistant between the rollers. This arrangement reduces the effect of knobs and bumps on
15 the log or cant.

A further preferred feature of apparatus is that the locating mechanisms for transversely adjusting the guidance stations are adapted to shift the guidance stations by a limited distance, typically by a distance no more than a
20 fraction of the smallest cant width to be sawn. This preferred mechanism is preferably used in a preferred refinement of the process to shift the position of saw cuts in the cant for boards, deals or other cuts transversely by a small amount, for example, no more than the thickness of a
25 deal or board, to optimise yield of boards or deals at the expense of sideboards. Reference is made to the description

of the preferred process above referring to a "saw line" to cut a full cross-section deal, and with reference to figures 7 and 8 to explain this aspect more fully.

However, in another preferred aspect of the invention, the
5 locating mechanisms for transversely adjusting the guidance stations are adapted to shift the guidance stations by a distance related to one or more spacings between saw lines, sufficient to bring the cant to any one selection of alternative sawing patterns. Preferably means is adapted
10 to control the selection according to a detection of the size of the cant. For example, such detection can be done by means of the clamping rolls which clamp onto the cant, or by time base integrating signals from a photodetector, etc. With a known ratio of distance between cant surfaces to
15 diameter the surface width can be derived from diameter detected by the rolls. The saw blades can then be set up in a pattern of varying widths between saw blades spread over a width greater than a cant width and by thus moving the cant to one side or the other a cutting pattern selected
20 (computer controlled) according to cant size.

The or each guidance station locating mechanism comprises detection means, located with respect to a saw line which is parallel with the longitudinal centre line of the saw and passes through a saw blade, and which detection means is
25 adapted to detect the flat surface of a cant. The detection means can then be used to control the locating

mechanism in such a way that the edge of the flat surface is brought into alignment with the detection means.

Since the typical cant will taper, preferably the detection means has offset means, adapted to permit an offset with
5 respect to the saw line by an amount which bears a relation to the taper of the cant and distance of the station from the saw. This then provides that the end of the cant engages the saw blade with the edge of the flat surface in line with the saw blade. Where the thin end enters first
10 the detection means would be offset from the saw line outwardly of the cant, and where the thick end enters first the offset would be inwardly.

This invention will now be more fully described by way of examples with reference to the accompanying six sheets of
15 drawings, in which :-

Figures 1 to 8 are schematically drawn cross sectional end elevations of logs and cants sawn in various ways for the sake of elucidating terminology used in the specification and aspects of the process of this invention,

20 Figure 8a is a similar schematic view showing another aspect of the process and apparatus,

Figure 9 is a plan view again schematically indicated for purposes of illustrating the main principles underlying the present invention,

- 10 -

Figure 10 is a plan view of a wet mill arrangement in accordance with the preferred embodiment of the invention,

Figure 10A shows side and end elevations and plan of a cant to be passed through the mill,

5 Figure 11 is a side elevation, part sectioned, of the wet mill in figure 10,

Figure 12 is an end elevation , part sectioned, on section XII - XII of figure 10, of the second guidance station in the mill of figure 10,

10 Figure 13 is a plan of a wet mill in accordance with a preferred embodiment of the invention,

Figure 13A shows side and end elevations and a plan of a log to be sawn into a cant in the figure 13 mill,

Figure 13B shows side and end elevations and a plan of a
15 cant to be sawn into deals and sideboards in the mill of figure 13, and

Figure 14 is a plan of a wet mill in accordance with another embodiment of the invention.

Reference will now be made to figures 1 to 8. Figures 1 and
20 2 illustrate one process of sawing timber in the wet mill within the scope of the invention and applied in particular to the sawing of a log.

Figures 3 to 8 show another process of sawing timber in the

wet mill within the scope of the present invention and applied in particular to the sawing of a cant. For convenience terminology usage herein will now be clarified with respect to these views.

5 In figure 1 a log 100 is shown sawn into a number of boards (thin planks) 101, cuts made by the saw blades of the gang saw being shown by the lines 102. The longitudinal curvature of the log is kept in a horizontal plane, for example, by putting the log on a flat table conveyor on the
10 in-feed side of the gang saw so that the saw cuts 102 are cut around this curve, parallel to the curved centre line of the log. In this specification the expression parallel to the curved centre line of the log or cant means separated at all points along each saw line by a constant distance from
15 the centre line. This of course gives curved boards but because of their thinness their curvature can be straightened out in the drying kilns. The term thin in the context of boards and planks thus means such a thickness which still permits satisfactory straightening after
20 cutting, e.g. in the drying kilns. The advantage of cutting them parallel to the centre line of the log is that any single board is consistently either heart timber along its full length or edge timber along its full length.

Figure 2 shows how each board 101 is then edged in a second
25 gang saw with its blades set at the positions indicated by lines 103 to provide the optimum board width.

In figures 3 to 8 an alternative way of cutting a log is

shown. First, the log 100 is cut into a cant 104 and sideboards 105, the blades of the first gang saw being appropriately set to positions indicated by the lines 106. The cant 104 is sometimes herein referred to as a "flitch".

5 The log in this case is, however, sawn with its principal radius of curvature in the longitudinal direction in a vertical plane which can be achieved either with a suitable in-feed table allowing the log to take up this position, possibly assisted with side positioning rollers, or the log
10 can be rotated by a suitable in-feed device.

The cant is then rotated through 90° to fall on one of its flat surfaces and can then be fed on a flat table on the in-feed side to a second gang saw at which the cant 104 is sawn into a number of deals 107 with sideboards 108, the
15 positions of the saw cuts which are produced by the blades of the gang saw being indicated by the lines 109. Once again, as in the cutting operation shown in figure 1, the saw cuts are kept parallel to the centre line of the cant, thereby cutting around the curve of a cant, and again the
20 deals and sideboards can be straightened in the drying kilns.

Occasionally as an alternative to cutting deals a scantling 110 may be cut from the cant, together with sideboards 108. In accordance with the invention it would be necessary to
25 feed the cant with the guidance means which cause the saw cuts to run parallel to the curved centre line of the cant instead of feeding the cant straight into the gang saw, for

- 13 -

example, by horizontal feed rollers so that the scantling is straight cut.

Again figure 6 shows the edging of the sideboards 108 with saw cuts 111 in a second gang saw having its blades set up
5 for this purpose.

Figures 7 and 8 illustrate an important preferred feature of the invention to improve the yield. In this context it must be appreciated that whereas the present feature which is about to be described is estimated to be likely to achieve
10 only a 2% improvement in yield, at a typical large sawmill a mere 2% may represent a money value in rands of six figures per annum. Figure 7 is a view which corresponds to the view of figure 4 and it shows that four deals 107 are produced together with four sideboards 108. In such a cut, however,
15 if the cant is shifted slightly to the left as indicated by the arrow 112, the distance of shift being equal to half the width of one deal, so that a saw cut is exactly at the edge 170 of the flat surface 171 of the cant, the same saw cuts, that is with the blades of the gang saw still in the same
20 setting, will produce not four deals but five deals here marked 107' and only three sideboards here marked 108'. This improvement of yield is achieved by means of the preferred operating process with preferred apparatus which is described further below.

25 Figure 8a shows how the saw blades can be set up to allow for optimum cutting of two different size cants (and sizes

in between). The incoming cant 104 is size detected optically and under computer control the larger cant is moved to the position 104" shown and cut to five deals 38mm wide; a smaller cant is moved to the position 104' and so
5 cut into three deals 38mm wide and two deals 25mm wide. This gives full deals (the view shows the cant small ends) even on the small cant, whereas retaining the saw blade pattern used for the larger cant would have produced only three full 38mm deals and two sideboards (incomplete,
10 unsaleable as 38mm deals). This example of saw blade settings would then be applied with 2cm on diameter sorting categories for the 250mm to 270mm diameter category.

Figure 9 shows a log or cant 113 located on the in-feed side 114 of a gang saw 115, the longitudinal centre line 116 of
15 the gang saw 115 being shown extended on the in-feed side 114. The curved longitudinal centre line 117 of the log or cant 113 is also shown. Two guidance stations for the cant or log are shown at 118 and 119, the station 118 being adjacent to the gang saw 115 on the in-feed side and the
20 station 119 being a distance from the station 118 which is not more than 50% of the length of the log or cant 113. In fact this length may be reduced to about 25% of the length of the log or cant in suitable circumstances in order to optimise the process. Each guidance station comprises
25 guidance elements here in the form of two rollers, each roller means here being shown simply as a cylindrical roller 120, 121, 122 and 123 respectively. Each pair of rollers is

inter-connected in their mountings in such a way that they always move by the same amount in opposite directions, being centred on the centre line 116. Thus the rollers 120 and 121 are movable from a position touching each other to a fully opened position, but always being the same distance on either side of the centre line 116, and the same applies to the pair of rollers 122 and 123. When the log or cant is thus gripped between the two pairs of rollers the centre line 117 of the log or cant intercepts with the centre line 116 of the gang saw extended on the in-feed side 114 at the positions of the two guidance stations. The log or cant rests, for example, on a flat table so that its principal radius of curvature in the longitudinal directions lies then in the horizontal position.

The broken lines 200 show the edges of the flat surface in the case of a cant. Detection means in the form of retroreflective photocells are provided at 201 and 202, associated with locating mechanisms for rolls 120, 121 and 122, 123 respectively. The locating mechanisms (see figs 11 & 12) for rolls 120, 121 and 122, 123 are mounted on transverse slides so that they can be centred on any line parallel with the saw centre line 116 such as the line 203. The detectors 201 and 202 are mounted in a plane passing through a saw blade 205, or a position offset to one side to allow for log taper, for example, 8mm to 10mm per metre is typical for certain South African woods. With the detection means 201 and 202 on the right of the saw centre line as

facing the saw on the in-feed side, the offset is to the right for thin end first feeding and to the left for thick end first feeding. Preferably the detectors are mounted so that offset can be adjusted as required. Alternate sets of
5 detectors can be mounted with switches to allow switching from one set of detectors to another according to thin end or thick end infeeding, e.g. in mills where both are used. The locating mechanism locates the cant so that saw 205 cuts on the edge of the flat surface of the cant, the cant curved
10 centre line then intersecting with same line 203 parallel to and offset from the saw centre line 116.

It will be appreciated that centre-line-of-log or cant-guided cutting, which then follows, provides so called double taper cutting.

15 The log or cant 113 is shown in figure 9 being fed into the gang saw with the small diameter end first, the larger diameter end trailing. Whereas this is perhaps commoner practice today, facilitating judgement of the sideways positioning of the log or cant, especially for manually
20 controlled in-feeding, preferable feeding of logs and sideboards operation can be achieved by feeding the thick end of the log or cant first and may be made practicable with the means of this invention, particularly in automated in-feeding arrangements.

25 Figures 10, 11 and 12 show a sawing arrangement in the wet mill, comprising the gang saw 160, an in-feed side 161 and an out-feed side 162. The in-feed side 161 has two guidance

stations 163, located adjacent to the gang saw 160 and 164. some distance therefrom, which may be made adjustable, according to the length of logs or cants to be sawn. Each guidance station may be of the kind described with reference to figures 11 and 12. The numeral 116 is also used to show
5 the longitudinal centre line of the frame saw extended on the in-feed side.

Guidance station 164 comprises a pair of rollers 124 and 125, herein (loosely) described as being mounted for rotation on an upright axis, and of cylindrical form. Each
10 is pivotally mounted on a horizontal, longitudinally orientated shaft 126 and 127 respectively, by means of suitable intermediate cranks 128 and 129. The cranks 128 and 129 are fixed to gear wheels 128A and 129A respectively which mesh with each other in the region 130 so that the
15 rollers 124 and 125 always move equal distances inwardly or outwardly, centred on the centre line 131. The crank 128 has in this case a bell crank 132 which depends downwardly and to which the piston rod 133 of a hydraulic (or pneumatic) cylinder 134 is connected, the cylinder 134 being
20 anchored at 135. The cylinder 134 is thus supplied with a control fluid by means of which the rollers 124 and 125 may be moved inwardly and outwardly for guidance of a log or cant in such a manner that it maintains the centre line of the log or cant coincident with the centre line 131 of the
25 guidance station which itself is located with respect to a centre line of the gang saw extended on the in-feed side.

Other aspects of this guidance station will be apparent from a perusal of the drawings.

Guidance station 163 is similar to guidance station 164 but shows the use of tandem sets of rollers in the guidance means which is located adjacent the frame saw. Here the pair of roller means operates in the self centering manner but the roller means comprises two rollers 150 and 151 and 152 and 153 respectively mounted on bogies 154 and 155 respectively, each bogie being pivotally mounted on pivots 156 and 157 respectively. The pivots 156 and 157 are mounted on the cranks 128 and 129 as shown in figures 10 to 12 for the self centering action. The rollers can be brought somewhat closer together as shown by reducing the lengths of the bogies 154 and 155. This type of arrangement is perhaps more important in the guidance position close to the frame saw so that knots or other bumps on the side of the log or cant will be less inclined to jink the log and cause kinks in the saw cuts as the log is fed longitudinally.

Other parts similar to those in station 164 are given the same reference numerals and the description with respect to these is referred to. Both guidance stations have the important mechanical feature of transverse adjustability for the purpose which has been described above with reference to figures 7 and 8 of the drawings. Each guidance station is mounted on a movable platform 136 which has lugs 137 which

are mounted on transversely orientated horizontal worm screws 138 and rods 139 to give transverse adjustability of the guidance stations. The transverse position taken up by the guidance station is controlled by the worm screws 138 which
5 screw into threaded lug 137 mounted on the platform 136, the worm screw 138 being driven by an electric motor 143 with suitable coupling 144.

Motors 143 are reversing motors and are thus able to drive adjustment of the guidance stations to left or right on the
10 in-feed of the saw. These motors are controlled by a signal processor receiving signals from the detectors 210 and 211, mounted under the cants which will pass towards the saw. These are retroreflective photocells, located, as seen in plan view, offset from a saw line 300 extending from a saw
15 blade 301 by the distance 302 of taper of a cant over the distance from the detector to the saw, to the right for thin-end-in feeding, to the left for thick-end-in feeding. The detectors are mounted on transversely mounted screws 212 which are hand adjustable with a crank, to permit refinement
20 of the offset according to the typical taper of timber being sawn so that the saw cut is on the edge of the flat surface of the cant. The signal processor is a computer central processor unit, C.P.U., programmed to handle the control of the guidance central means during a whole cycle. Further
25 detectors (not shown) are mounted in the in-feed side to detect arrival of the leading end of a cant and the passing of the trailing end of the log. On open in-feed the

guidance means are opened wide, set somewhat to the right of centre. As soon as the leading end of a cant is detected coming in by a detector at position 213 the guidance rollers 124 and 125 and 150, 151 and 152, 153 close on the cant, moving equidistantly. They now hold the cant with its longitudinal centre line intersecting a longitudinal line on the in-feed bed parallel to the saw centre line but offset to the right. The detectors 210 and 211 then "see" the flat undersurface of the cant.

Guidance rollers 124, 125 and 150, 151, 152 and 153 then edge the cant towards the left until detectors 210, 211 detect a drop in reflection which signals the edge of the cant flat surface, where they hold the cant in this position and its leading end enters the gang saw. In-feed speeds of the cant may range between 7 metres per minute and 40 metres per minute. As soon as the leading end enters the saw blades, as signalled by a detector, the guidance means 124, 125 open wide, pressure on 150, 151 152, 153 is reduced, and the cant is sawn around the curve of its centre line in double taper sawing since the rollers 150, 151, 152, 153 adjust for the changing cant diameter equally thus centering on the cant centre-line. As the trailing end of the log passes through the saw the rollers 150, 151, 152, 153 open wide and are ready for another cycle of the next cant. The detectors 211 are two detectors, slightly offset with respect to each other and the detection may be switched from one to the other in mixed thick end or thin end first in-feeding

situations.

Guidance rollers 124 - 125 and 150, 151, 152 and 153 can also be computer controlled to operate the process described above with reference to figure 8a. Cant size detection can
5 be achieved for this purpose by use of the photodetectors 210 and/or 211 by transversing the cant across the sight line of the detector and so recording the width of the cant flat surface. Other cant size detection methods can be adopted, one of which has been referred to above, namely use of the
10 rollers themselves when they clamp the cant. The transverse movement required of the rollers will in this method be more than is needed in the method described immediately above, to select the required pattern of the saw blade setting according to log size.

15 Figure 13 shows an apparatus which can be used to saw logs and/or cants in accordance with this invention.

The apparatus comprises a first gang saw 16 and a second gang saw 17 and advancing conveyor 18, a transporting table 19, an advancing device 20, and in-feed surface 21 with two
20 pairs of in-feed rollers 23a, 23b and 24a, 24b. The apparatus further comprises an out-feed table 25, a transporting table 26, a conveyor 27, an in-feed surface 28 and three pairs of in-feed rollers 30a, 30b and 31a, 31b. At the out-feed side of the gang saw 17 an out-feed conveyor
25 32 is provided.

The table 20 can be adapted to provide either a flat surface so as to orientate a log with its major curvature horizontal in accordance with this invention or the table 20 can be adjusted to provide a concave surface so as to orientate a log with its major curvature vertical in accordance with conventional practice. The feed roller pairs 23a, 23b and 24a, 24b in conjunction with the conveyor surface 21 provide an in-feed and centering function for cutting by the gang saw 16 with cuts parallel to the centre line of the log, either along the curve of the log if it is fed in accordance with this invention or in substantially straight cuts if in accordance with conventional practice or if to produce a cant which can thereafter be sawn in accordance with this invention.

The incoming log at 33 is transported at 19 to the table 20 which is adjusted to have a concave surface so that the log takes up the position oriented as shown in figure 7 in which its major longitudinal curvature is located in a vertical plane. This prepares the log for sawing into a cant and sideboards. The log is advanced by the advancing and centering means comprising the table 21 and roller pairs 23a, 23b and 24a, 24b into the gang saw 16 which produces the cant and sideboards. The sideboards are transported on by the conveyor 27 for further processing. The further processing of the sideboards may comprise edging, cutting of their lengths to economical lengths or cutting in half or other steps to optimise use of the timber, the balance being

discarded. The cant is then transported on the table 26 to prepare it for feeding into the gang saw 17 by the in-feed means including the table 28 and paired rollers 30a, 30b and 31, 31b, after rotating through 90^0 around its longitudinal axis. The paired rollers are again adapted to execute a centering function and also to be capable of guiding the cant for cutting around the curve, the cuts being parallel to the centre line of the cant. For this purpose the roller pairs 30a, 30b are adapted for their pressure to be reduced or removed when the leading end of the cant reaches the out-feed side of the gang saw 17.

In both figures 13A and 13B the dotted lines show the cuts which are executed respectively by the gang saw 16 and the gang saw 17.

The roller pairs at the in-feed sides of both the gang saws 16 and 17 are adapted for both centering and cutting round the curve functions; this apparatus which is in accordance with this invention, may be employed to operate in accordance with the process of this invention in two independent simultaneously effected processes. In this alternative the logs which are supplied from 33 are alternately transported by the table 19 and thence to the gang saw 16 or by the conveyor 18, transport table 26 to the gang saw 17. At the table 20 the support surface is made flat so that the log is orientated to a position in which its maximum longitudinal overall curvature lies in a

horizontal plane and similarly at the table 26 the log is orientated so that its maximum overall longitudinal curvature lies in a horizontal plane. The log thus takes up the position as shown in figure 1 and is fed into the gang saw 16 on the one hand and in a simultaneously operating process a further log is fed into the gang saw 17. At both the gang saws 16 and 17 the logs are sawn immediately into boards as shown in figure 5 in the manner in accordance with this invention sawing around the curve parallel with the log centre line.

The sawn boards then proceed on by the conveyors 27 and 32 to edging saws which are required in any case for the conventional operation of the mill for edging the sideboards which are cut from the flitches (or cants) and from the logs in the conventional operation.

This capability for alternative operation provides the mill with considerable flexibility. Broadly speaking very large diameter logs can, for example, be handled by the gang saw 16 either in a conventional sawing technique or in the sawing process in accordance with this invention. The smaller diameter logs can be handled directly by the gang saw 17 in the process according to this invention and the gang saw 17 will saw flitches produced by the gang saw 16, also around the centre line curve.

The table 20 can for example be a chain advanced table which can either be supported only at opposite ends and thereby

have a sag if preparation of a cant is desired or underneath support rollers can be raised up along the whole length of the chain table so as to support it in a flat condition if operation in accordance with the process of this invention
5 is chosen.

Figure 14 shows a further wet mill apparatus adapted to be selected for operation either in accordance with the process of this invention to saw a log or in accordance with the process of the invention to saw a cant. The apparatus
10 comprises an advancing conveyor 34, an in-feed table 35, in-feed and guide roller pairs 22a, 22b, 36a, 36b, a gang saw 37, an out-feed roller pair 38a, 38b, an out-feed advancing table 39, transporting tables 40 and 41, a storage carrier 42 and a conveyor 43. An edging saw or saws are also part
15 of this wet mill but are not shown, being located in a position supplied by the conveyor 43. Logs supplied at 44 are advanced by the conveyor 34.

If operation in accordance with the process of the invention to saw logs into boards is chosen conveyor 34 is adapted to
20 orientate the log with its maximum longitudinal overall curvature in a horizontal plane and in this orientation the log is fed by the means 35, 22a, 22b, 36a, 36b into the gang saw 37. The log is then sawn around the curve with saw cuts parallel to the log centre line as shown in figure 13B,
25 producing boards which are then moved by the out-feed table 39, then transported by the table 41 and then moved by the conveyor 43 to edging saws where each board is edged to

achieve the optimum use of the timber. This means that the width of each board must be selected and cut accordingly.

If, however, the mill is to be used in a process to cut deals from cants, the advancing table 34 is adapted to allow the log to take up an orientation with its maximum longitudinal overall curvature in a vertical plane and the log is fed in this orientation through the gang saw 37 which is adapted to cut sideboards and a flitch (or cant). The sideboards then pass by conveyor 39 and transport table 41 to conveyor 43 where they are further processed by the edging saw.

The flitch is transported by the transporting table 40 to the storage area 42. From the area 42 the flitches are then taken as indicated by the arrow 45 back to the advancing conveyor 44 where the flitches are orientated as shown in figure 19 and cut by the gang saw 37 (with saw blades suitably reset) to deals or planks and sideboards and/or scantlings. In the first pass of a log through the gang saw 37 in order to produce a flitch the log is orientated as shown in figure 13A.

Thus again the table 34 is adapted to provide either orientation as shown in figure 13A or as shown in figure 13B in the case of the log, while in the case of the flitch the table is set to give orientation as shown in figure 13B.

CLAIMS

1. A process of wet mill sawing of a log which comprises locating a log at the in-feed side of a gang saw, orientating the log around its longitudinal axis so that its maximum overall longitudinal curvature lies in a horizontal plane, aligning the log so as to be fed longitudinally into the saw with the longitudinal centre line of the log intersecting at two positions with a line on the in-feed side of the saw and parallel with a longitudinal centre line of the saw, a first position being adjacent the saw and a second position being a distance from the first which is less than half the overall length of the log, and feeding the log through the saw so that the log is sawn into boards and/or planks, along saw lines parallel to the curve of the longitudinal centre line.
2. A process of wet mill sawing as claimed in claim 1, in which the boards and/or planks are edged in a subsequent sawing step.
3. A process of wet mill sawing of a cant which has its faces parallel to an imaginary plane in which the main longitudinal curvature of the cant lies, which comprises locating the cant at the in-feed side of a gang saw, orientating the cant around its longitudinal

axis so that its maximum overall longitudinal curvature lies in a horizontal plane, aligning the cant so as to be fed longitudinally into the saw with the longitudinal centre line of the cant intersecting at two positions with a line on the in-feed side of the saw and parallel with a longitudinal centre line of the saw, a first position being adjacent the saw and a second position being a distance from the first which is less than half the overall length of the cant, and feeding the cant through the saw so that the cant is sawn into deals, sideboards and/or scantlings along saw lines parallel to the curve of the longitudinal centre line.

4. A process of wet mill sawing as claimed in claim 3, in which the sideboards are edged in a subsequent sawing step.
5. A process of wet mill sawing as claimed in either one of claims 3 or 4, in which an edge of one (or both) of the two flat surfaces is aligned with a saw line which passes through a saw and is parallel with the longitudinal centre line of the saw.
6. A process of wet mill sawing as claimed in claim 5, in which aligning an edge of a flat surface with a saw line is achieved by feeding the cant towards the saw in a position in which the flat surface is intersected by a saw line, detecting the surface, edging the cant across until an edge of the surface is detected to

intersect the saw line.

7. A process of wet mill sawing as claimed in claim 6, in which the detection is carried out in positions in advance of each intersecting position.
8. A process of wet mill sawing as claimed in claims 1 to 7, in which once the leading end of the log or cant enters the saw blades the aligning control is removed at the second position.
9. A process of wet mill sawing as claimed in any one of claims 3 to 7, in which the size of the cant is detected and the cant is moved transversely to select a pattern of saw blades which is adapted to cut full deals from that particular size of cant.
10. A process of wet mill sawing substantially as herein described.
11. Apparatus for use in wet mill sawing which comprises two log or cant guidance stations located at the in-feed side of a gang saw, a first station adjacent the saw and the second being a distance from the first which is less than half the overall length of logs for which the saw is to be used, each guidance station located with respect to a longitudinal centre line of the saw extended on the in-feed side, each guidance station comprising pairs of guidance elements which are movable towards and away from each other transversely

to the feed direction of the log, synchronised to be always moved by equal magnitude and in opposite directions.

12. Apparatus for use in wet mill sawing as claimed in claim 1, which is provided with a locating mechanism at one or each guidance station, each mechanism adapted to locate the guidance station in transversely adjustable positions with respect to the saw centre line, which positions include a position centred on the centre line and a range of positions offset from the centre line.
13. Apparatus for use in wet mill sawing as claimed in either one of claims 10 or 11, in which the guidance elements are rollers rotated or rotatable on upright axes.
14. Apparatus for use in wet mill sawing as claimed in claim 12, in which the rollers, at least at the station nearest the saw, comprise a tandem set of rollers, being four rollers arranged in two opposite pairs, each pair mounted on a bogie which is pivotally supported at a pivot point equidistant between the rollers.
15. Apparatus for use in wet mill sawing as claimed in any one of claims 11 to 13, in which the mechanisms for transversely adjusting the guidance stations are adapted to shift the guidance stations by a limited distance, typically by a distance no more than a

fraction of the smallest cant width to be sawn.

16. Apparatus for use in wet mill sawing as claimed in any one of claims 11 to 14, in which the or each guidance station locating mechanism comprises detection means, located with respect to a saw line which is parallel with the longitudinal centre line of the saw and passes through a saw blade, and which detection means is adapted to detect the flat surface of a cant.
17. Apparatus for use in wet mill sawing as claimed in claim 15, in which the detection means has offset means adapted to permit an offset with respect to the saw line by an amount which bears a relation to the taper of the cant and distance of the station from the saw
18. Apparatus for use in wet mill sawing substantially as herein described and as illustrated in the accompanying drawings.

FIG. 1

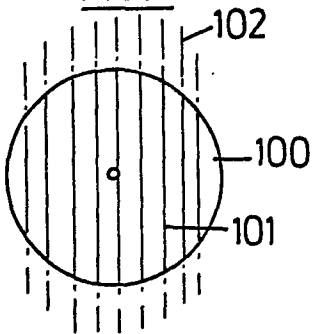


FIG. 2

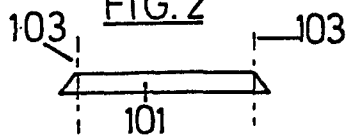


FIG. 7

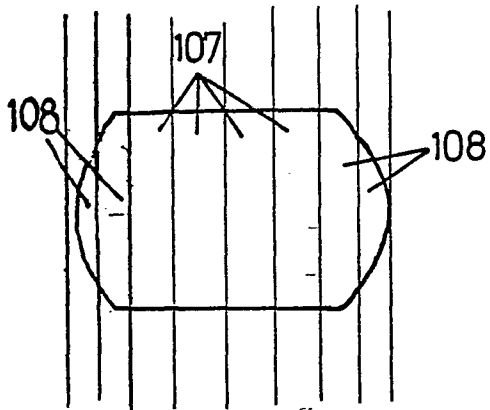


FIG. 8

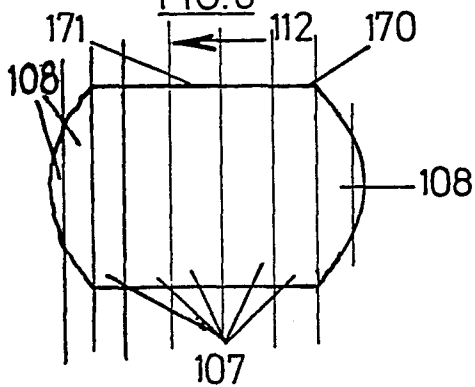


FIG. 3

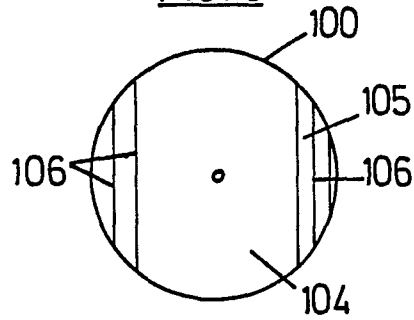


FIG. 4

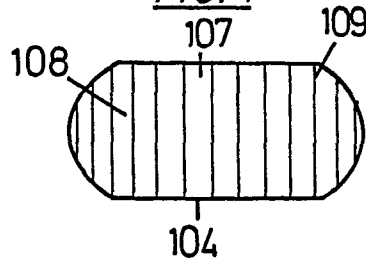


FIG. 5

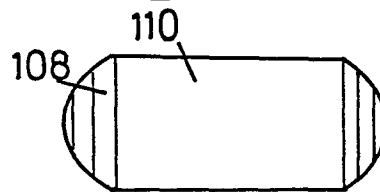


FIG. 6

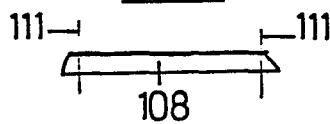


FIG. 9

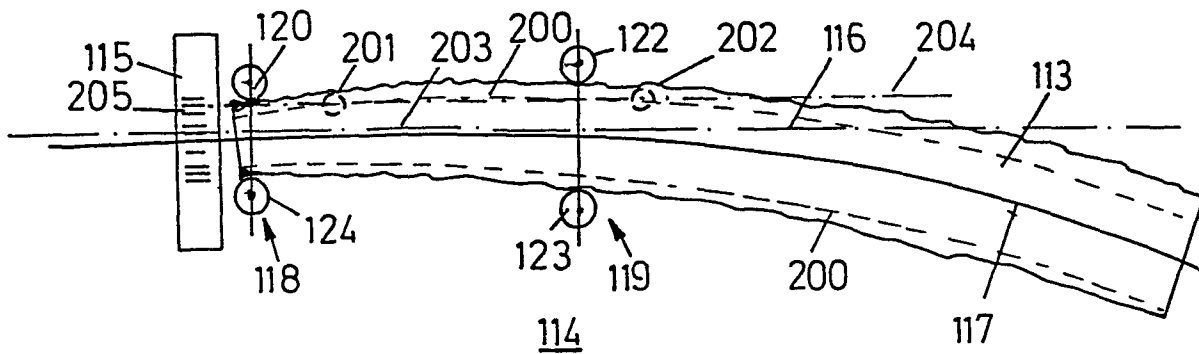


FIG. 10

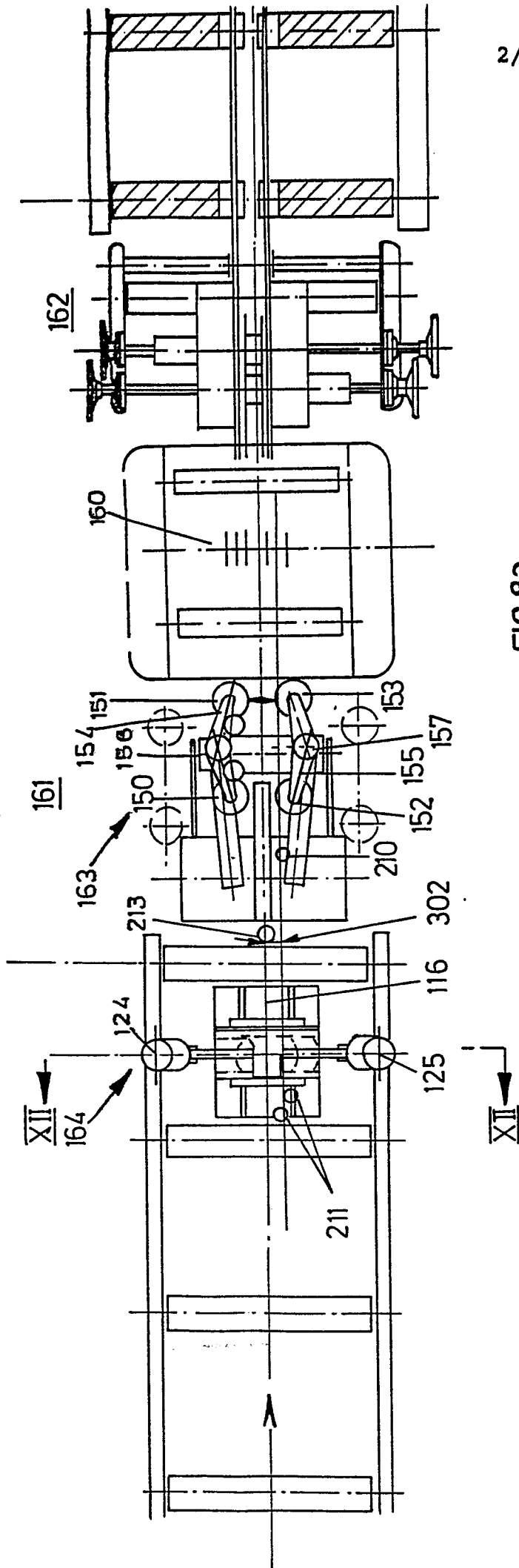


FIG. 8a

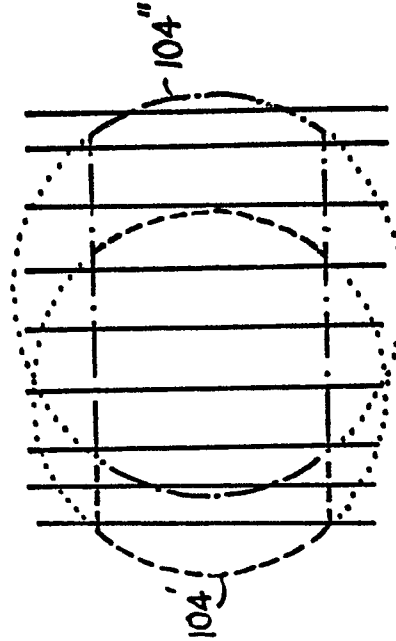
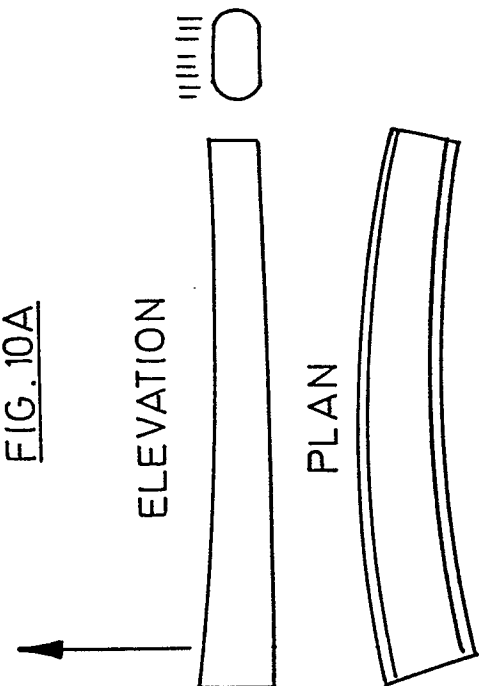


FIG. 10A



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FIG. 11

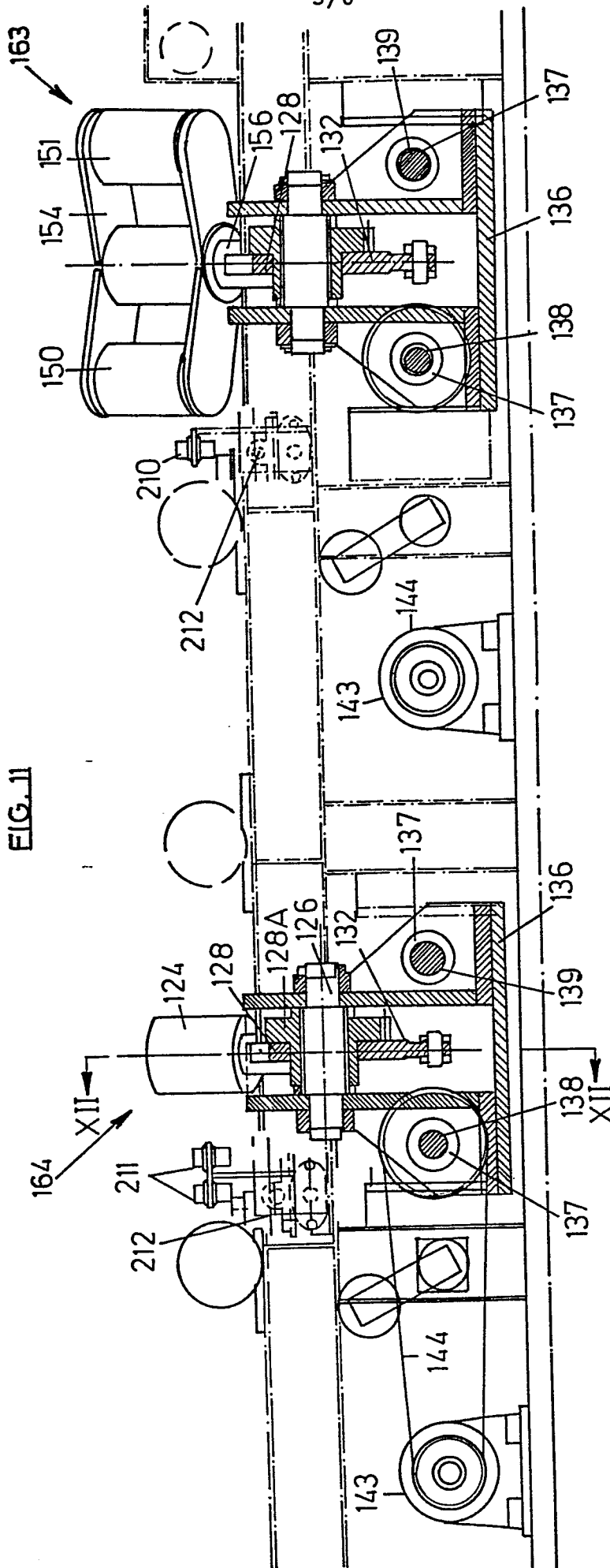


FIG. 12

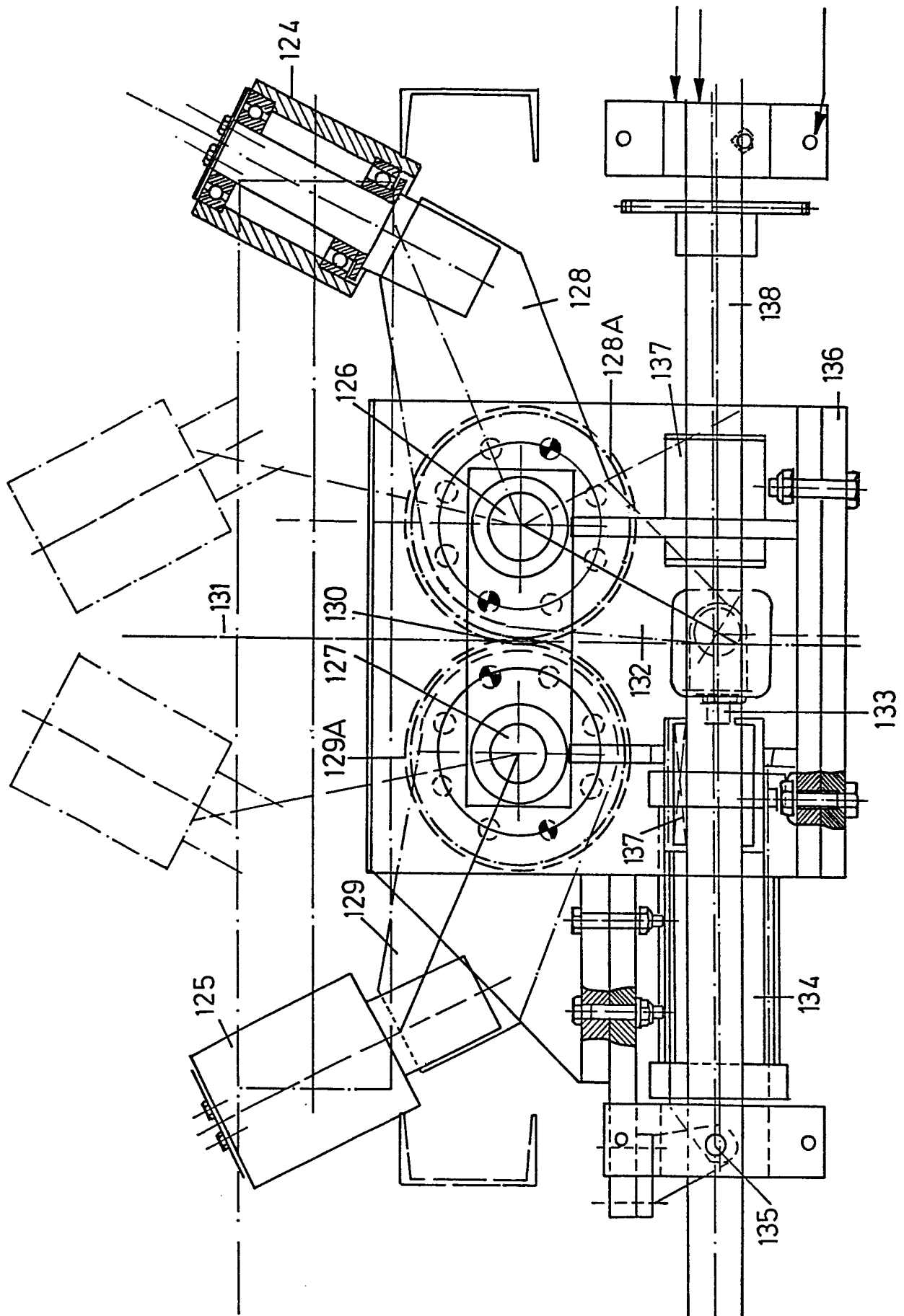


FIG. 13

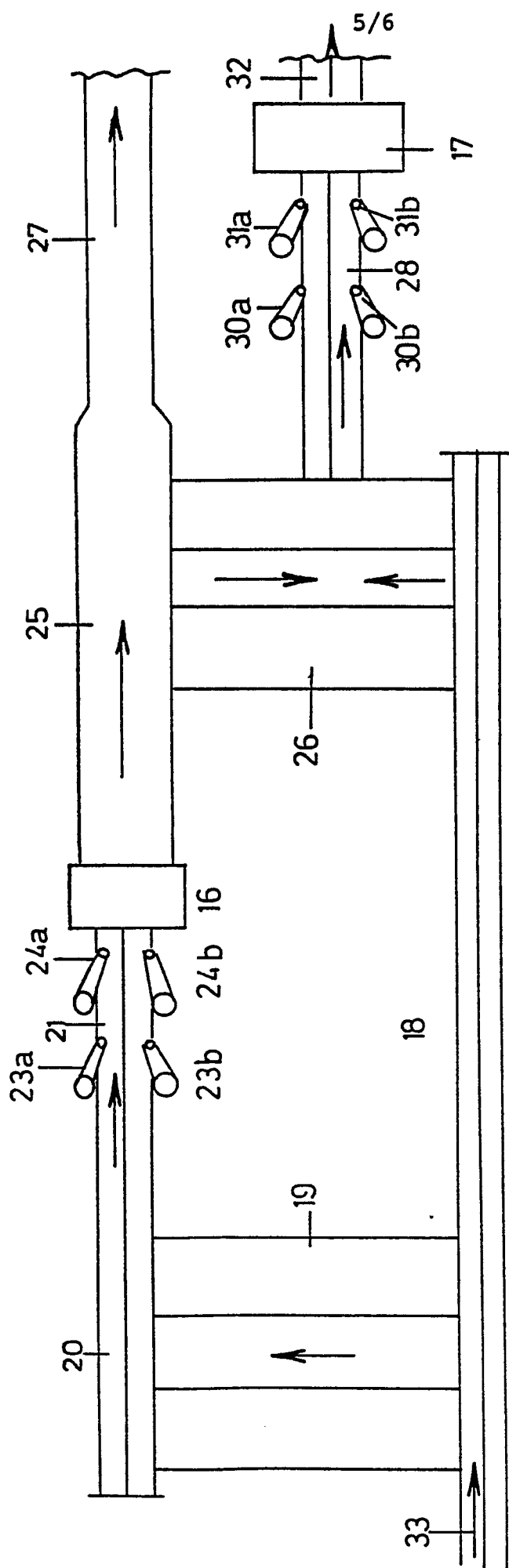


FIG. 13A

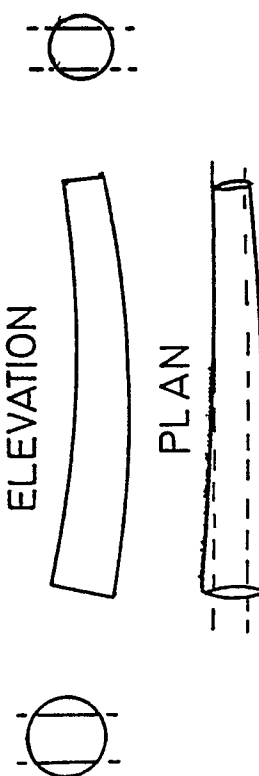


FIG. 13 B

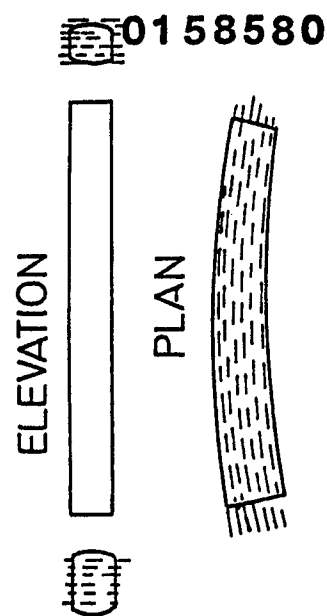
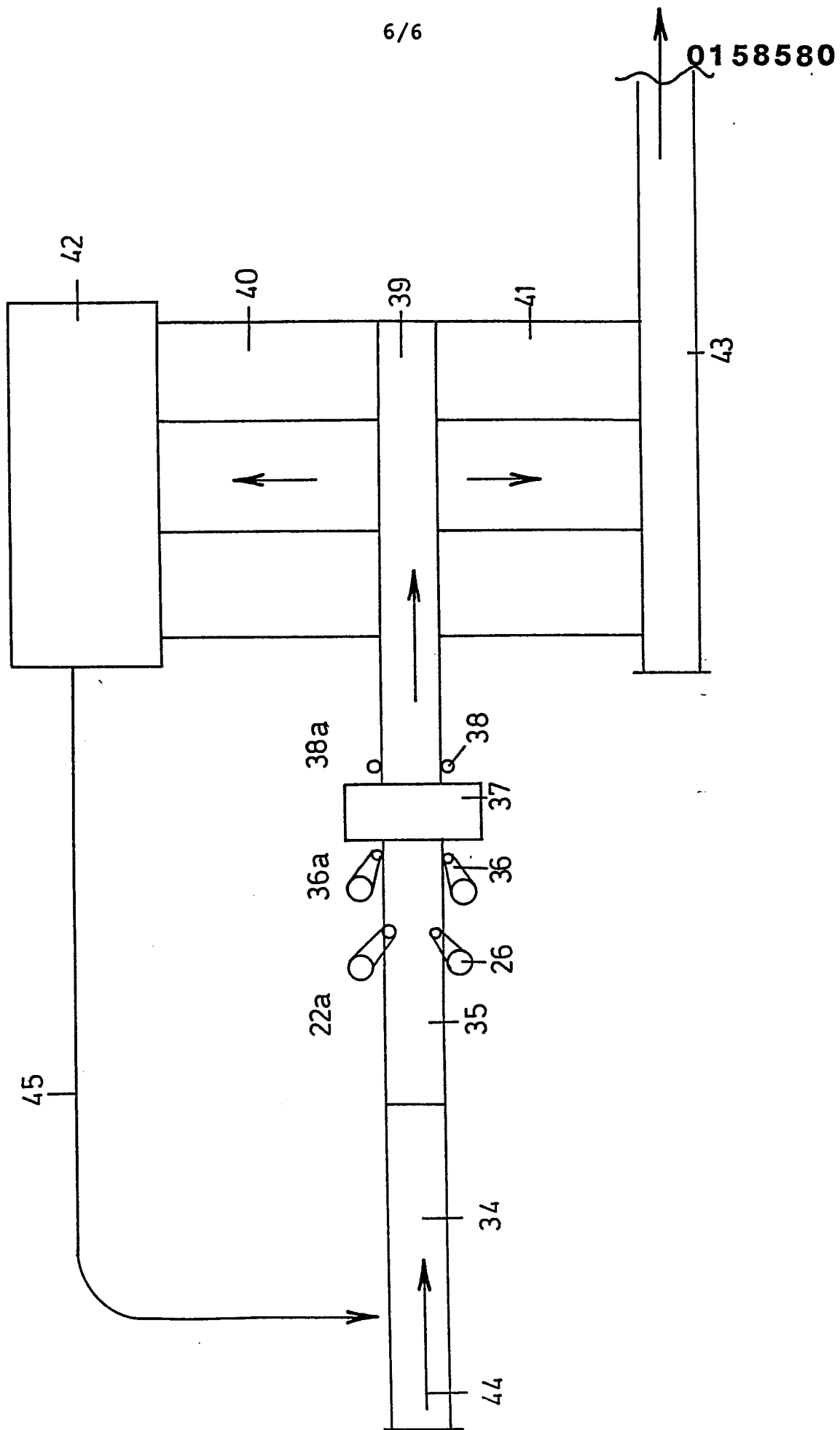


FIG. 14





European Patent
Office

EUROPEAN SEARCH REPORT

0158580

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 85630036.3
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US - A - 4 144 782 (LINDSTROM) * Fig. 3 * --	1, 3, 5, 6, 9-13, 15	B 27 B 31/00
X	AT - B - 357 329 (ACME)	11, 13	
A	* Fig. 1, 5 * -----	12, 14	
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 18-06-1985	Examiner TRATTNER
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	