

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 500 161 A2

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **92200356.1**(51) Int. Cl.⁵: **B27L 5/08, B27G 1/00**(22) Date of filing: **10.02.92**

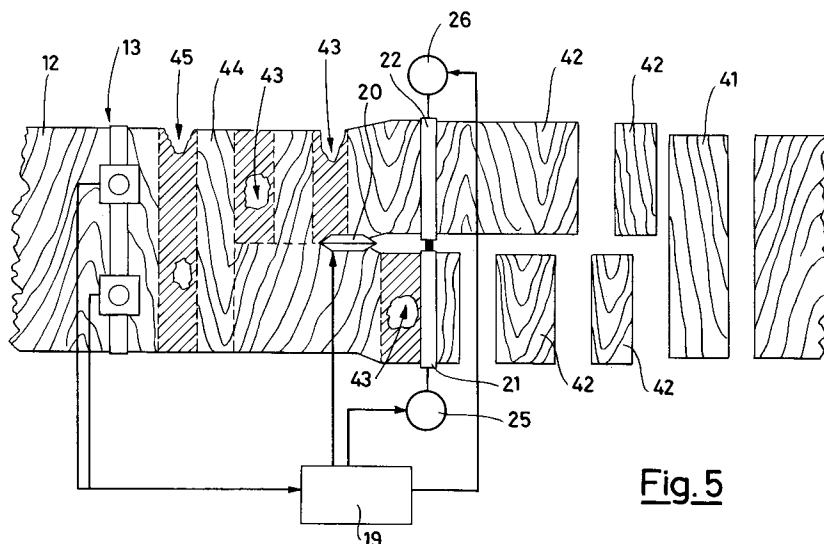
Priority 120291 IT MI91000354.

(30) Priority: **12.02.91**(43) Date of publication of application:
26.08.92 Bulletin 92/35(84) Designated Contracting States:
AT BE DE ES FR SE(71) Applicant: **ANGELO CREMONA & FIGLIO S.p.A.**
Viale Lombardia, 275
I-20052 Monza Milano(IT)(72) Inventor: **Cremona, Lorenzo**
Via Ramazzotti, 9
I-20052 Monza, Milan(IT)(74) Representative: **Faraggiana, Vittorio, Dr. Ing.**
Ingg. Guzzi e Ravizza S.r.l. Via Boccaccio, 24
I-20123 Milano(IT)(54) **Sheet cutting station for rotary cut wood veneer.**

(57) Method for cutting sheets from a strip of wood veneer (12) comprising the phases of detecting the presence of a plurality of specific zones of the strip and cutting the strip transversely on command or, in combination, longitudinally and transversely, to circumscribe specific zones of said plurality in strips as wide as the entire strip or a fraction thereof.

In accordance with this method a station (10) for cutting in sheets a strip of wood veneer (12) comprises transverse cutting means (15) for the strip

controlled by control means to obtain sheets of a length falling within preset ranges and sensor means (13) for detection of a plurality of specific zones of the strip upstream and downstream of which is performed a transverse cut. The cutting means (15) comprise blade units for performing a complete transverse cut of the strip or cuts of half strips obtained by longitudinal cutting means (20) to obtain sheets (41), (42) sent to stacking (18).

**Fig. 5**

Production of wood sheets by transverse cutting performed by special automatic cutters from a continuous sheet of veneer is known. The cutter is usually commanded to cut sheets in preset dimensions or transverse strips to be eliminated because they contain defects of the wood, e.g. holes.

With this procedure it is obvious that the waste of material is quite high since it is necessary to cut a strip of material as long as the longitudinal dimension of the defect and as wide as the entire veneer strip even if the transverse width of the defect is very limited. In addition, because of the repeated defects the possibility of obtaining long sheets is compromised.

Despite said disadvantages, a method of cutting as mentioned above is substantially the only one used at present and the only palliative found in the known art is reuse of the large quantity of strips of scrap for low quality applications or production of chipboard or the like.

The general purpose of the present invention is to obviate the above mentioned shortcomings by supplying a method and a machine for cutting veneer in sheets which would reject defective parts with minimal wood waste.

In view of said purpose it has been sought to provide in accordance with the present invention a method of cutting a continuously fed wood veneer strip into sheets comprising the phases of detecting the presence of a plurality of specific zones of the strip, completely cutting the strip transversely on command to obtain sheets of a length included in preset ranges and strips of strip circumscribing specific zones of said plurality such as those containing defects and characterized in that at least in portions of the strip constituting specific zones of said plurality is performed a continuous longitudinal cut to divide it in half strips each cut transversely in predetermined positions to obtain portions of strip circumscribing specific zones or said plurality having a width equal to a fraction of the width of the strip.

In addition it has been sought to provide in accordance with said method a sheet cutting station for rotary cut wood veneer fed continuously thereto and comprising in combination means of transverse cutting of the strip commanded by control means to obtain sheets of lengths falling within preset ranges and sensor means for detecting a plurality of specific zones of the strip upstream and downstream of which is performed a transverse cut and characterized in that the cutting means comprise a blade unit designed to perform a complete transverse cut of the strip and individual blade units operated by said control means at strip zones cut longitudinally in half strips by longitudinal cutting means and said individual blade units being designed to cut each half strip.

To further clarify the explanation of the innovative principles of the present invention and its advantages as compared with the known art there is described below with the aid of the annexed drawings a possible embodiment as a nonlimiting example applying said principles. In the drawings:-

- FIG. 1 shows a schematic side view of a veneer cutting station provided in accordance with the present invention,
- FIG. 2 shows a plan view of the station of FIG. 1,
- FIG. 3 shows a schematic partially sectioned front view of a cutting part of the station of FIG. 1,
- FIG. 4 shows a schematic partial cross section view of a disengageable joint of the part of FIG. 3,
- FIG. 5 shows a schematic plan view of an example of a cutting sequence performed by the station of FIG. 1,
- FIG. 6 shows a schematic side view partially sectioned along plane of cut VI-VI of FIG. 7 of a possible variant of the station of FIG. 1, and
- FIG. 7 shows a cross section view along line of cut VII-VII of FIG. 6.

With reference to FIGS. 1 and 2 a cutting station indicated as a whole by reference number 10 comprises in accordance with the present invention conveyor belts supplying a veneer strip 12 (arriving from veneer cutting machines of known type and hence not shown) in front of known systems 13 of detection of specific zones of the strip such as those containing defects. Said defect detection systems can for example comprise telecameras, transparency or reflection sensors or the like, as easily imagined by those skilled in the art, to supply information on the presence and position of defects such as for example holes in the veneer transiting opposite them. Such systems of defect detection of the known art being well known to those skilled in the art they are not described further.

Downstream from said detection systems 13 are placed means 14 of controlled longitudinal cutting of the veneer and, next, selective transverse cutting means 15.

The means 14 comprise a circular shear 20 driven to cut the veneer in two parallel strips while the means 15 comprise, as better seen in FIG. 3, a rotary-blade cutter made up of blade units consisting of two blades 21 and 22 arranged side by side to rotate coaxially between bucking rollers 23 and 24 by motors 25 and 26 respectively having position sensors.

While the blade 21 is supported at the motor end to rotate without axial sliding, the blade 22 is supported at the end near its own motor by an

axially sliding support 27.

Axial sliding is controlled by a double action piston 28 driven hydraulically through the ducts 40, 54 by a hydraulic control unit 29 connected to electronic processing and control means 19.

Between the two blades 21 and 22 is placed an axially sliding clutch 30 having a spring 31, e.g. the Melville type, which usually holds it in engagement of the two blades (blades brought near). Another spring 32, weaker than the spring 31, placed in the piston 28, maintains axial tension of the blades.

FIG. 4 shows schematically an example of an embodiment of the axial clutch 30. As may be seen in the figure, integral with the blade 21 is a supporting and containing structure 46 in which is inserted in a sliding manner a shaft 47 integral with the blade 22. Reciprocal rotation between the structure 46 and the shaft 47 is permitted by bearings 48 and 49.

The spring 31 pushes between an element 50 integral with the shaft 47 and an element 51 rotating with the shaft 47, sliding coaxially thereto and butted axially on the structure 46 with an interposed bearing 52.

The bearing 48 is of known type permitting mutual axial translation of the parts between which it is placed.

In this manner is assured firm coaxial alignment of the rotation axles of the blades 21 and 22, allowing simultaneously their reciprocal axial sliding away against the action of the spring 31.

Between the structure 46 and the element 50 are arranged facing rings with frontal teeth 53, 55 for engagement between the parts brought together by the thrust of the spring 31.

Thus the axial traction of one of the blades (in this specific case the blade 22 by means of the piston 28) to permit disengagement and independent rotation.

Referring again to FIGS. 1 and 2, at the outlet of the cutter 15 are placed selection means 16 selectively sending the cut sheets to an automatic stacker 18 and to a scrap bin 17. Advantageously the selection means 16 are the vacuum type with top conveyor belt 33. Selection is performed separately in front of each blade 21 and 22 and is actuated by suckers 34 and 35. When one of the suckers is operated the wood sheet passing under it after leaving the cutter remains in adherence to the top belt 33, which deposits it on a double belt 36 for conveyance to the stacker 18. On the contrary, if the sucker is not operated the corresponding product leaving the cutter falls freely in the scrap bin 17. Said selectors are of the known art and therefore not further described nor shown.

The stacker 18 can be of any type of the known art. For example, in the figures is shown a stacker comprising a top belt 37 which, by a vacu-

um method of the type described for the selector 16, conveys the wood sheets to deposit them in piles selected in accordance with the dimensions of the sheets and which form on the vertically movable tables with full width 38 or halved width 39 for the full width sheets 41 or half width sheets 42 respectively.

All the various parts of the station are controlled and commanded to operate substantially as described below by electronic processing and control means 19, e.g. provided by programmed logics such as a microprocessor of the known art programmed in accordance with the description given below and optionally interconnected to a personal computer or the like.

Such a device, especially in the light of the following operation description, can readily be imagined by those skilled in the art and therefore is not further described here.

The control device 19, in addition to processing the data from the sensor and synchronizing the movements of the various devices, commands coupling or not of the two blades of the transverse cutter depending on requirements.

In particular, if independent operation is necessary, the device 19 commands the control unit 29 to supply fluid to the piston through the duct 54. In this manner the piston moves the blade 22 axially away from the blade 21, thus disengaging the clutch 30 and permitting the two motors 25 and 26 to rotate the respective blade independently with independent speeds.

To again engage the blades so that they behave substantially as a single blade the control device 19 first resynchronizes them electronically, putting the motors in step (by means of the signals emitted by their position sensors), so that the blades are rearranged as much as possible with parallel faces, and then commands the control unit 29 to supply the piston 28 with a fluid counterpressure through the duct 40, thus reconnecting the mechanical clutch 30 between the blades.

In use the cutting station described above receives on its conveyors 11 an unbroken strip 12 of wood veneer. The sensor 13 scans the veneer in transit beneath it and sends corresponding signals to the control device 19. For each scan of the veneer the possible conditions which can occur are 'no defect', 'defect on the right half of the veneer', 'defect on the left half of the veneer', 'defect on both halves of the veneer'. The distance between the vertical line of the sensor and the shear 14 permits the processing system 19 to select the best plan for minimizing wood scrap before the zone involved reaches said shear.

Briefly, on the basis of the data from the sensor and the cuts already performed the system decides whether to start the longitudinal cut or not

and whether to perform a transverse cut on the entire width of the veneer or only on one half of it.

By way of example of the operation of the station described here, FIG. 5 shows schematically a possible cutting situation in which the parts of the veneer to be scrapped are identified by oblique lines.

Essentially, until the sensor 13 detects unacceptable defects the blades 21 and 22 work in a pair and the shear 20 is deactivated so that the station produces full width wood sheets as indicated for example by reference number 41. When the sensor 13 detects defects which require scrapping of the material but affect only half the width of the strip as indicated by 43, the control means 19 activate the longitudinal shear 20 and remove the defect, commanding the blade 21 or 22 corresponding to the defective half so as to remove a strip with the defect, which will be scrapped by the selector means 16. In this manner the half free of defects is not uselessly scrapped as would happen by the known art but there is produced a wood sheet of half width as indicated by 42.

The longitudinal cut can be maintained until a defect free section of wood is detected for a length of veneer sufficient to justify obtaining a full width sheet without creating a preceding half sheet too short. For example, the section of veneer indicated by 44 in FIG. 5 would be acceptable.

If during the full width transverse cut the sensor detects defects affecting both halves of the veneer, e.g. as indicated at 45, the entire defective strip is removed by a double paired cut of the blades 21 and 22.

Naturally, even in the absence of defects, the blades 21 and 22 are commanded by the device 19 at intervals so as to always obtain sheets, halved or not, of a length not exceeding a preset value. The control system can also be programmed to optimize the positions of the transverse cuts so as not to obtain, as far as possible, sheets shorter than a preset value.

It is now clear that the proposed purposes are achieved, providing a cutting station minimizing wood scrap.

As another example of embodiment of the invention, FIGS. 6 and 7 show schematically a different transverse cutter 15' usable in place of the cutter 15.

As may be seen in said figures, the cutter 15' comprises a shaft 56 on which are supported independently in a rotating manner two blade holder units each with a plurality 50, 60 of equally spaced radial blades as may be seen well in FIG. 7.

Parallel to the shaft 56 is a bucking roller 61 on which slides the veneer 12.

Each blade holder 57 and 58 is rotated by a motor 62 or 63 through a kinematic transmission,

e.g. with a chain, 64 and 65. The motors are mechanically engaged together through an electro-mechanical joint of the known art, e.g. the electromagnetic type controlled by the device 19. In use the cutting station operates as described above.

When cuts are to be made on half strips the joint 66 is disengaged and the motors drive the blade holders independently. When a full transverse cut is required, the device 19 first synchronizes the blades by controlling the motors 62, 63 through position sensors, similarly to the motors of the cutter 15, and then operates the clutch 66 so that the blades of the two blade holders rotate integrally and with mated cutting edges.

Naturally the above description of an embodiment applying the innovative principles of the present invention is given merely by way of example and therefore is not to be taken as a limitation of the patent right claimed here.

For example, although FIG. 7 shows three blades for each blade unit, as a compromise between cutting speed and manufacturing cost it is also possible to use cutters with a different number of blades.

In addition the connection means between the blades of the cutters 15 or 15' can be provided differently than described schematically or could even be replaced by only electronic synchronization of the rotation of the respective motors.

The sheets emerging from the cutters can be accumulated in a manner different from that shown in the stacker 18, e.g. by selecting them in larger piles.

Lastly, as may readily be imagined by those skilled in the art, the actual cutting plan can vary depending on which cutting parameter it is intended to favour. For example, it may be preferred to maximize the length of the sheets, even if they are half width, rather than the number of full length but shorter sheets, etc.

Claims

1. Method of cutting sheets from a continuously fed wood veneer strip comprising the phases of detecting a plurality of specific zones of the strip, cutting the strip completely transversely on command to obtain sheets of lengths falling within predetermined ranges and strips of strip circumscribing specific zones of said plurality such as those containing defects and characterized in that at least in portions of the strip constituting specific zones of said plurality a continuous longitudinal cut is made to divide it in half strips, each cut transversely in predetermined positions to obtain portions of strip circumscribing specific zones of said plurality

having a width equal to a fraction of the width of the strip.

2. Station for cutting sheets from a strip of wood veneer continuously fed thereto and comprising in combination means for cross cutting the strip controlled by control means to obtain sheets of a length falling within predetermined ranges and sensor means for detection of a plurality of specific zones of the strip upstream and downstream of which is performed a transverse cut and characterized in that the cutting means comprise a blade unit to perform a complete transverse cut of the strip and individual blade units operated by said control means even with zones of strip cut longitudinally in half strips by longitudinal cutting means and said individual blade units being designed to cut each half strip.
3. Station in accordance with claim 2 characterized in that the individual blade units are arranged side-by-side on the same line across the strip.
4. Station in accordance with claim 3 characterized in that the individual blade units have operating means comprising means of synchronization to perform jointly a continuous cut along the entire width of the strip in such a manner as to also provide said blade unit designed to perform the complete transverse cut.
5. Station in accordance with claim 2 characterized in that the longitudinal cutting means comprise at least one rotary shear.
6. Station in accordance with claim 2 characterized in that the blade unit designed to perform the full transverse cut has an axle rotating longitudinally.
7. Station in accordance with claim 6 characterized in that the blade units have a rotating blade with axle in a median position and with two opposing edges to rotate between bucking rollers, the strip to be cut passing between one bucking roller and said blade.
8. Station in accordance with claim 2 characterized in that the individual blade units have rotating longitudinal axle.
9. Station in accordance with claim 8 characterized in that the blade units have a rotating blade with axle in a median position and with two opposing edges to rotate between bucking

rollers, the half strip to be cut passing between one bucking roller and said blade.

10. Station in accordance with claims 4 and 8 characterized in that the synchronization means comprise a mechanical clutch for mutual coupling of the rotation axles of the individual blade units.
11. Station in accordance with claim 10 characterized in that the mechanical clutch comprises teeth on the facing ends of the individual blade knits to engage mutually upon mutual axial approach of the blade units.
12. Station in accordance with claim 11 characterized in that the individual blade units are held in mutual nearness by elastic means, disengagement means controlled by said control means causing selectively axial withdrawal of the individual blade units against the action of said elastic means.
13. Station in accordance with claim 12 characterized in that the disengagement means between two individual blade units comprise a hydraulic piston for movement against the action of a spring placed at one end of one of the two individual blade units.
14. Station in accordance with claims 3 and 9 characterized in that the individual blade units have bucking rollers in common.
15. Station in accordance with claim 2 characterized in that downstream from the cutting means are placed selector means shunting selectively toward a scrap path or toward an outlet path for cut strip parts.
16. Station in accordance with claim 2 characterized in that the selector means comprise a conveyance device with top vacuum belt conveying to said outlet path.
17. Station in accordance with claim 15 characterized in that at the end of said outlet path are placed stacker means for stacking wood sheets in separate piles depending on the dimensions of the sheets.
18. Station in accordance with claim 2 characterized in that specific zones of said plurality contain unacceptable defects of the strip.
19. Station in accordance with claim 6 characterized in that the blade units have a plurality of blades arranged radially around said longitudi-

nally rotating axle to move sequentially with the edge even with a bucking roller, the strip to be cut passing between the blade and the roller.

- 5
20. Station in accordance with claim 8 characterized in that the individual blade units have a plurality of blades arranged radially around said longitudinally rotating axle to move sequentially with the edge even with a bucking roller, the strip to be cut passing between the blade and the roller. 10
21. Station in accordance with claims 3 and 20 characterized in that the individual blade units have common bucking rollers. 15
22. Station in accordance with claims 3 and 20 characterized in that the synchronization means comprise a disengageable mechanical clutch between the shafts of rotation motors of each individual blade unit. 20
23. Station in accordance with claim 22 characterized in that the disengageable mechanical clutch is an electromechanical coupling. 25

30

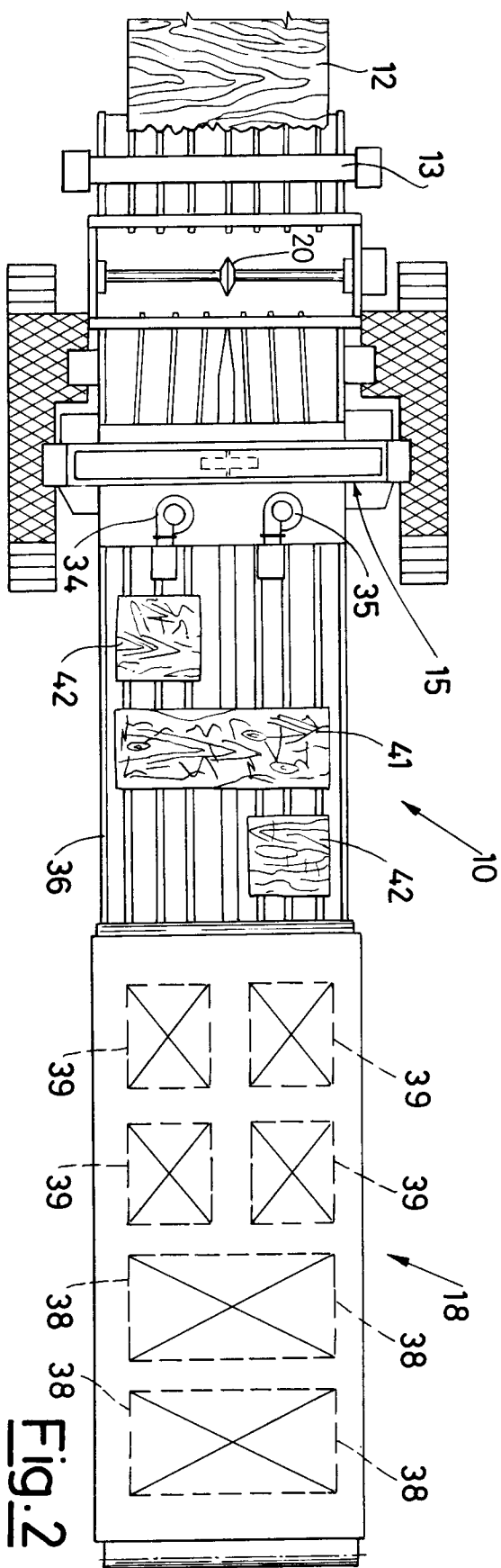
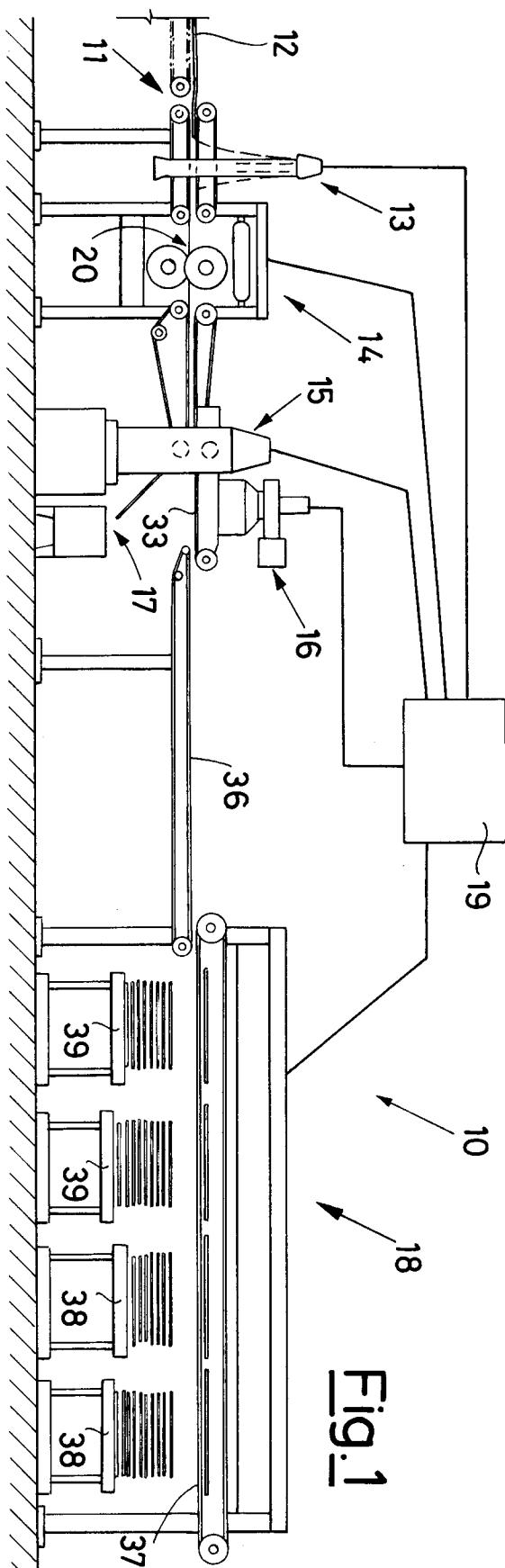
35

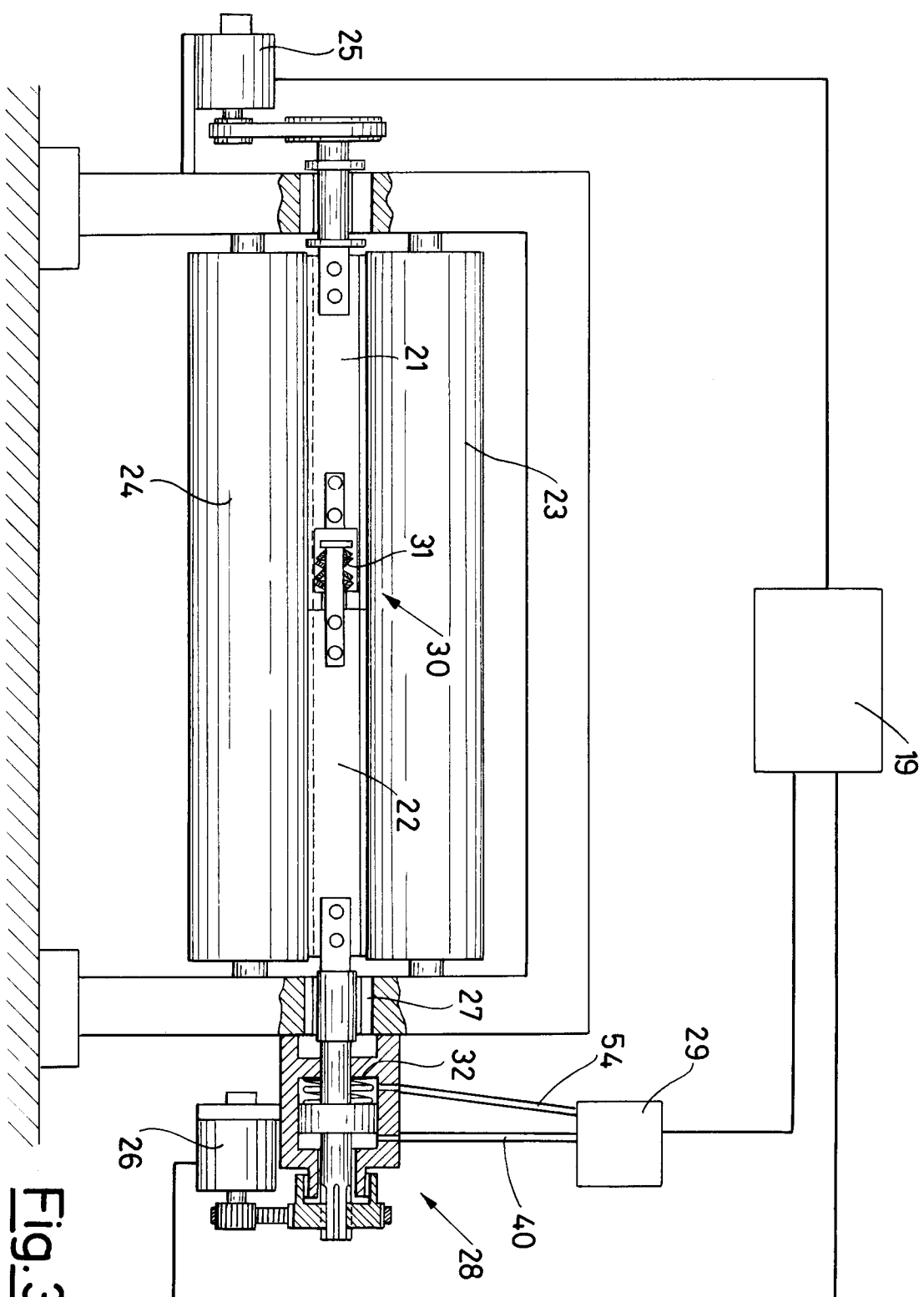
40

45

50

55





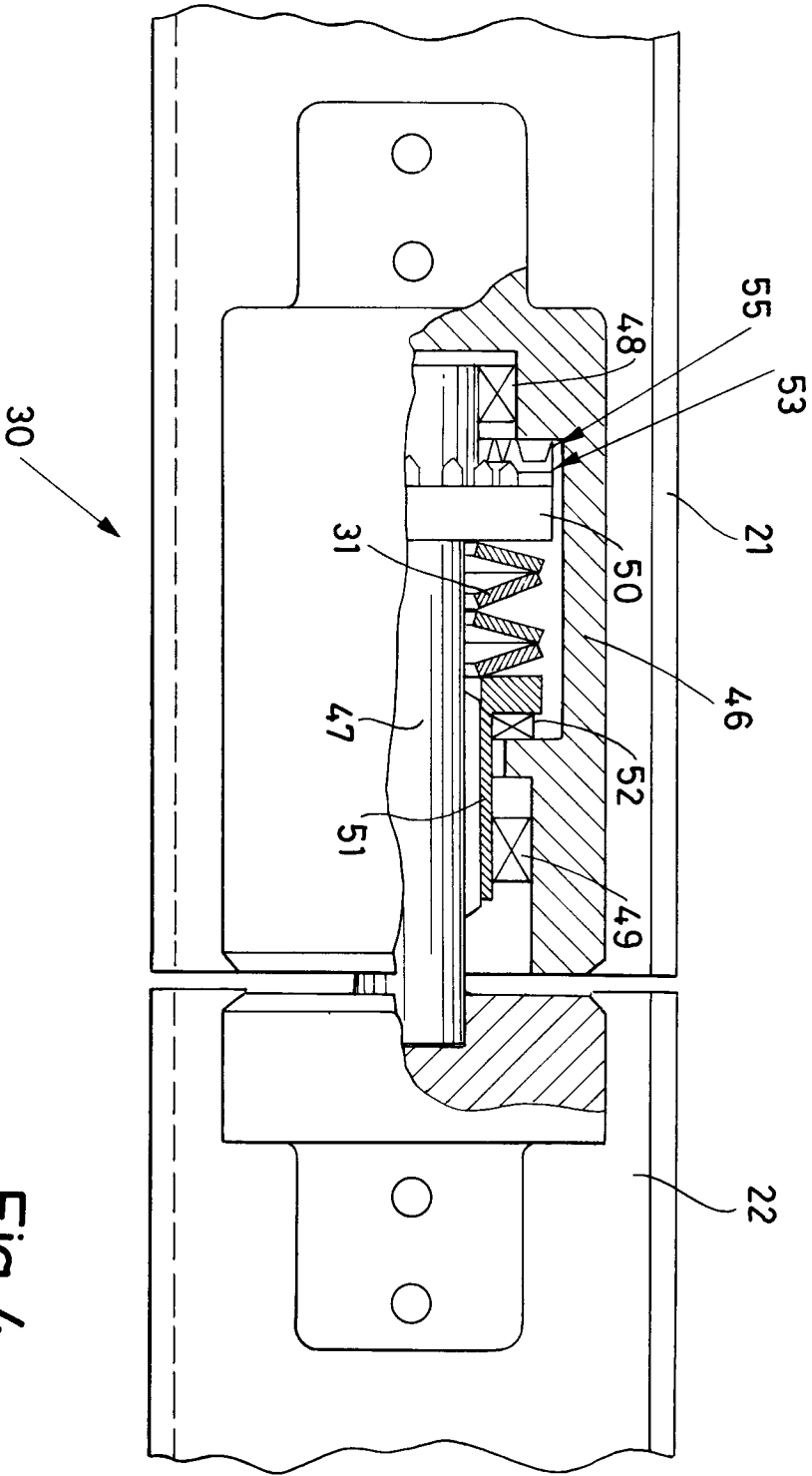


Fig. 4

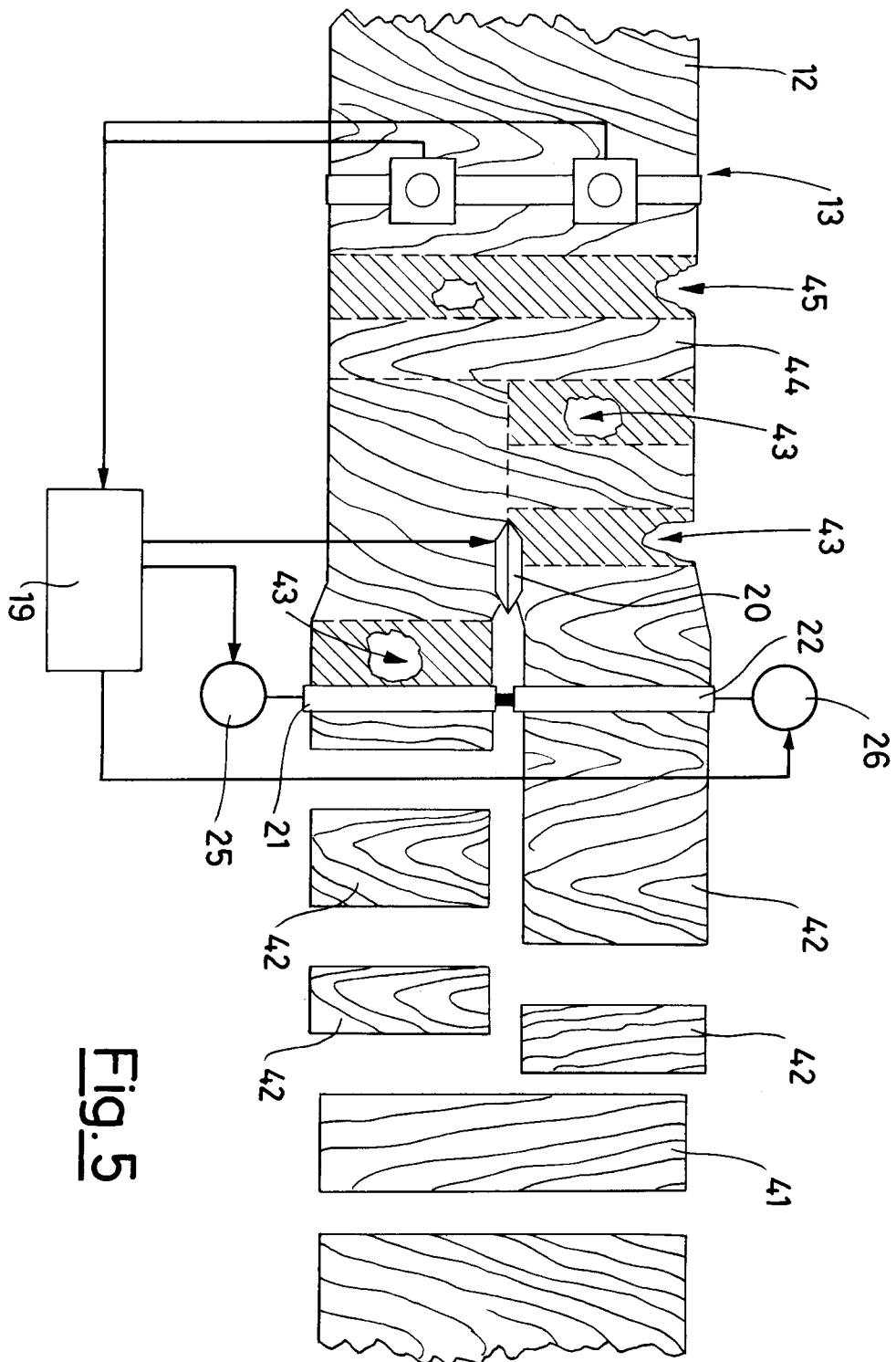


Fig. 5

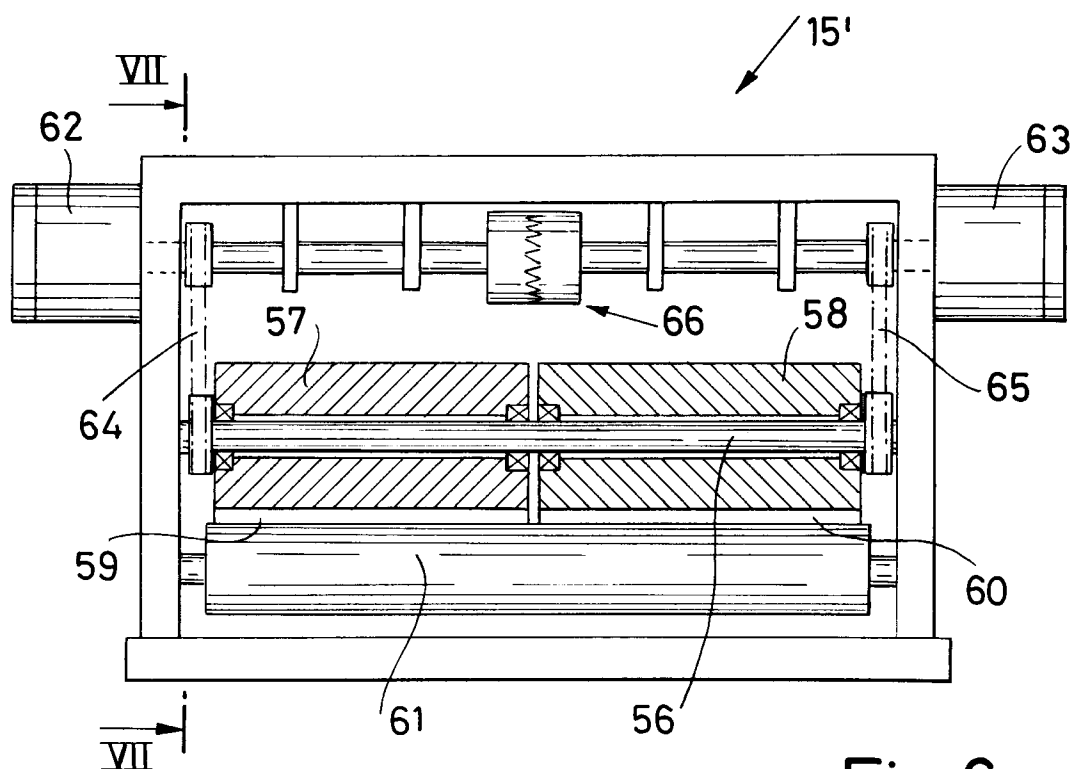


Fig. 6

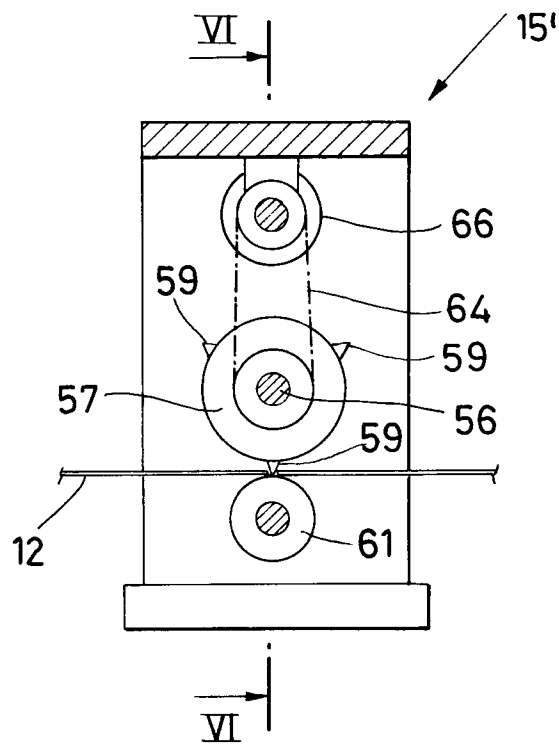


Fig. 7