Jan. 14, 1969 N. C. SPRINGATE 3,421,560

BACK-UP ROLLS FOR VENEER LATHES

Filed June 27, 1966 Sheet 1 of 5

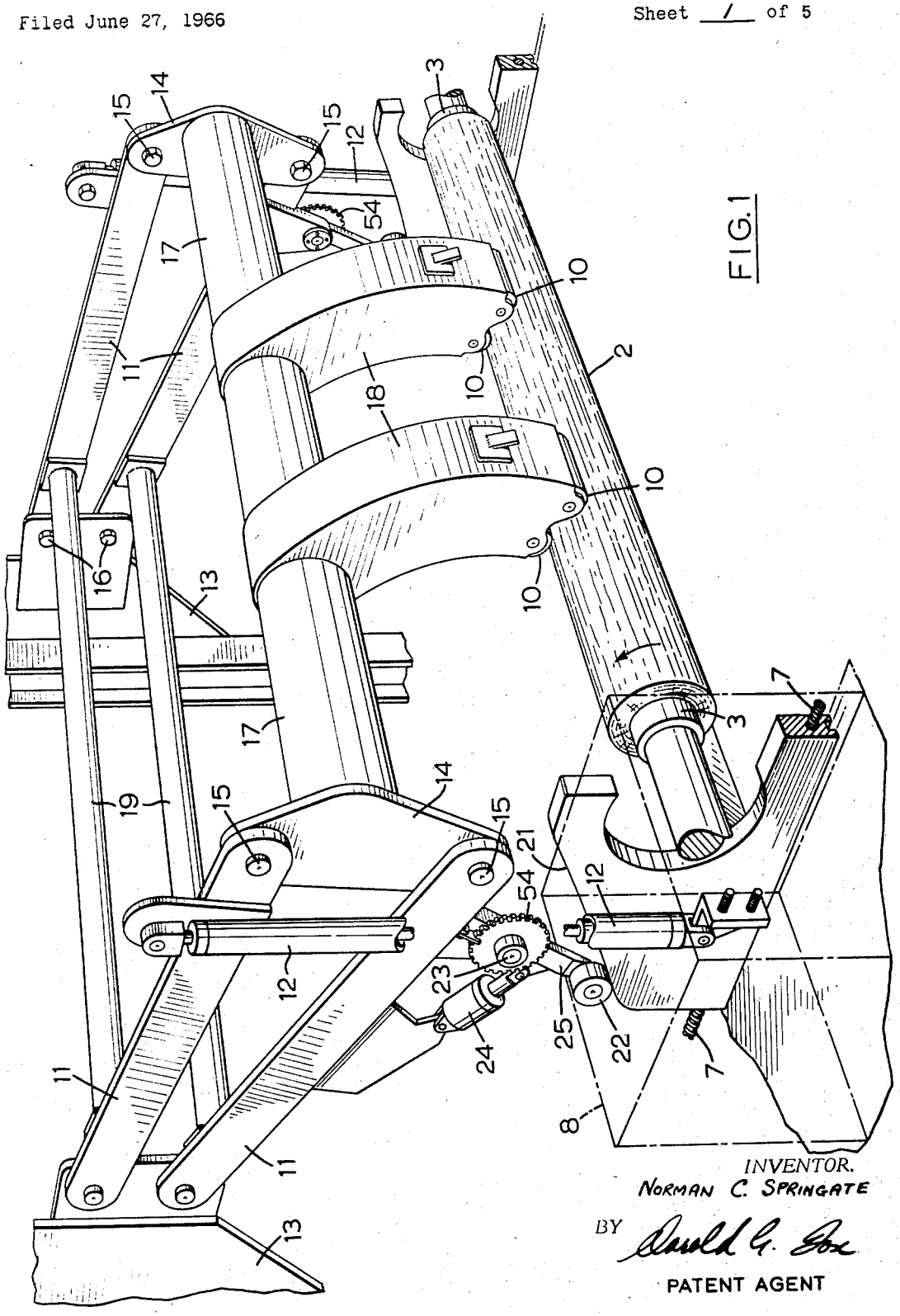


FIG. 1

INVENTOR.
NORMAN C. SPRINGATE

BY Donald G. Ebe

PATENT AGENT

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BACK-UP ROLLS FOR VENEER LATHES

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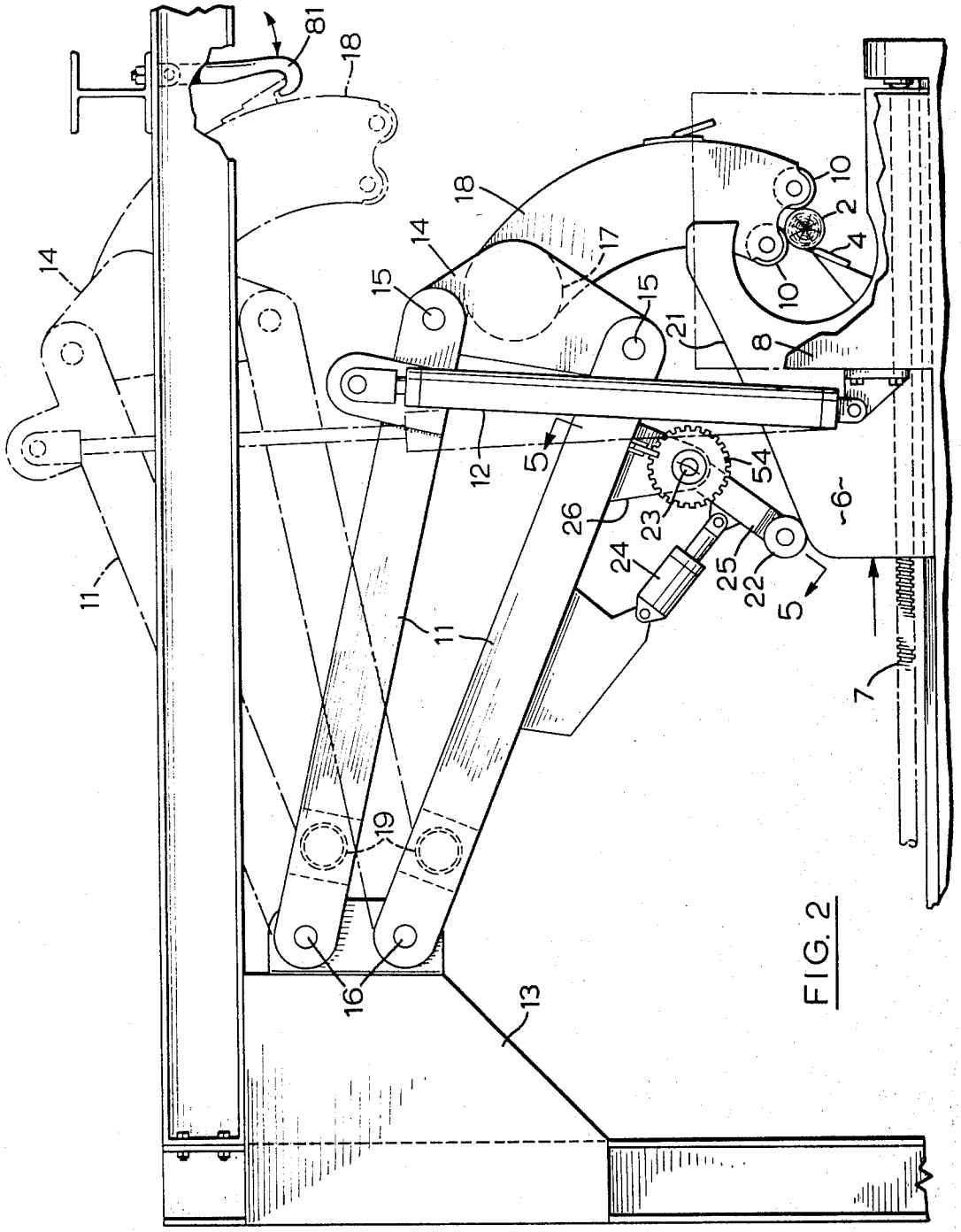


FIG. 2

INVENTOR.
NORMAN C. SPRINGATE
BY Harold G. Fox
PATENT AGENT

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BACK-UP ROLLS FOR VENEER LATHES

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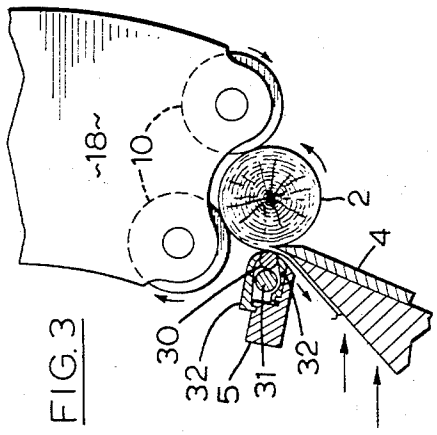


FIG. 3

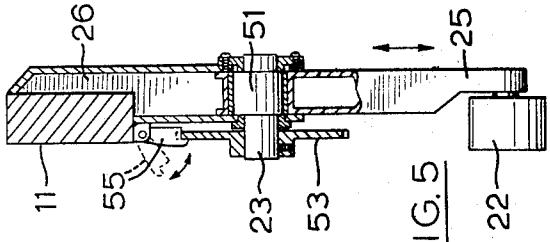


FIG. 5

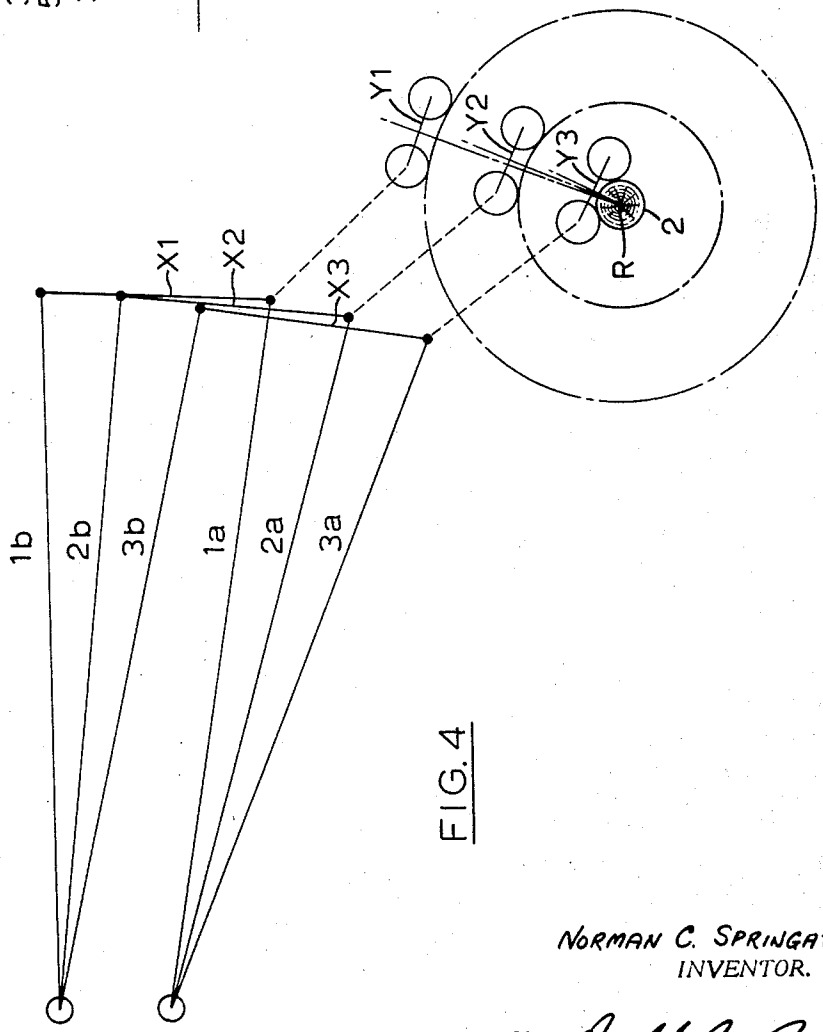


FIG. 4

NORMAN C. SPRINGATE
INVENTOR.

BY Harold G. Fox

PATENT AGENT

BACK-UP ROLLS FOR VENEER LATHES

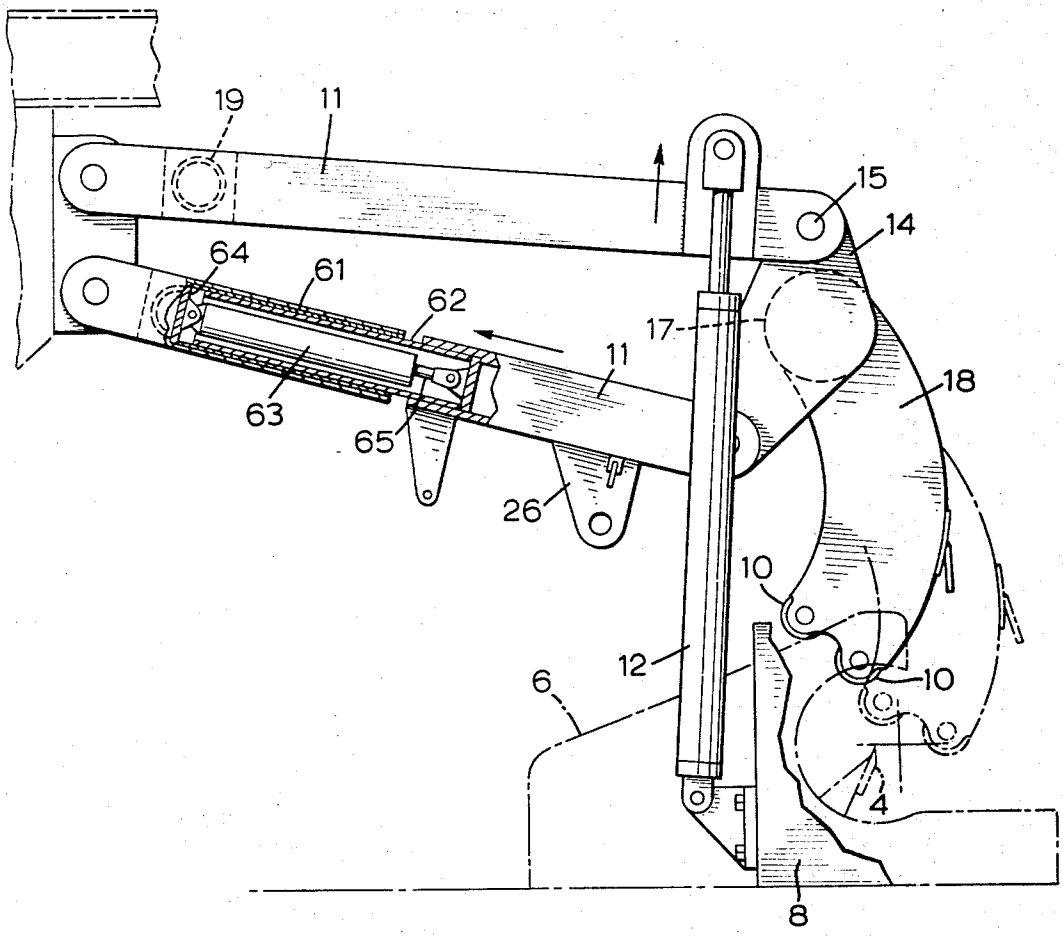


FIG. 6

NORMAN C. SPRINGATE
INVENTOR.

BY Harold G. Fox
PATENT AGENT

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BACK-UP ROLLS FOR VENEER LATHES

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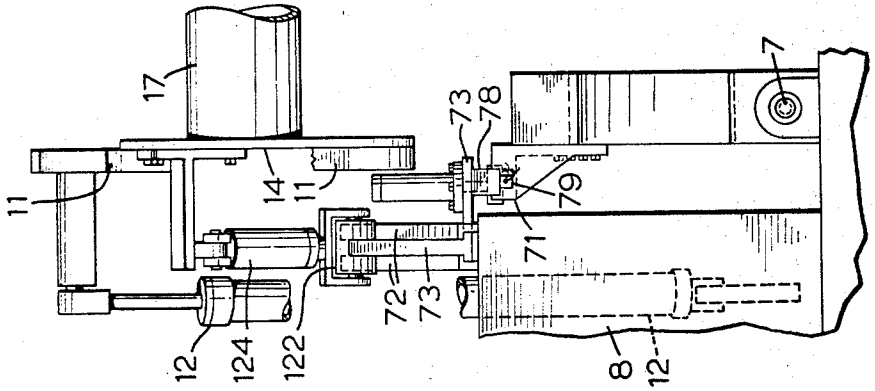


FIG. 8

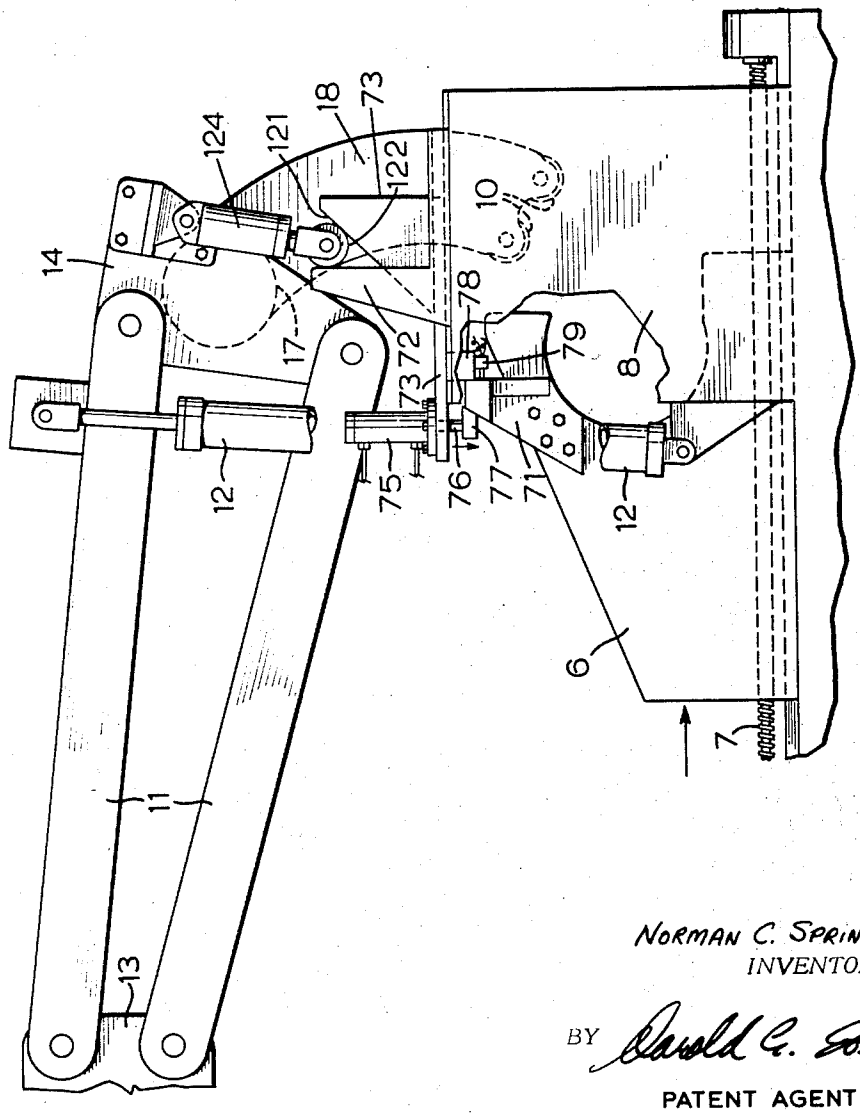


FIG. 7

NORMAN C. SPRINGATE
INVENTOR.

BY Harold G. Cox
PATENT AGENT

United States Patent Office 3,421,560 Patented Jan. 14, 1969

3,421,560

BACK-UP ROLLS FOR VENEER LATHES

Norman C. Springate, New Westminster, British Columbia, Canada, assignor to Lamb-Cargate Industries Limited, New Westminster, British Columbia, Canada

Filed June 27, 1966, Ser. No. 560,523
U.S. Cl. 144—209 5 Claims
Int. Cl. B27c 7/00

ABSTRACT OF THE DISCLOSURE

Back-up rolls for a veneer lathe are rotatably supported in a frame and are movable into and out of a position adjacent a log in the lathe. The frame includes a cam follower. A movable member carries a veneer cutting knife and has a cam track thereon. The cam track is shaped such that contact of the cam follower therewith during movement of the knife carrying member permit the back-up rolls to follow closely the diminishing diameter of the log as it is cut.

This invention relates to apparatus for the bracing and supporting of wood logs in a rotary lathe during the cutting or peeling of veneer therefrom. More particularly, the invention relates to back-up rolls which can support a log during the veneer cutting operation against deformation resulting from pressure on the log by the veener cutting knife and by the pressure or roller bar, and to a system for controlling movement of the back-up rolls.

Veneer is cut from logs in rotary veneer lathes. The log is supported by lathe chucks which engage both ends of the log, and the log is rotated about its longitudinal axis. A cutting knife mounted substantially tangential to the log engages the surface of the log along its length and peels the veneer strip as the log is rotated. A pressure or roller bar usually is provided behind the cutting knife for supporting the sheet of veneer as it is being cut. The sheet passes between the pressure bar and the cutting edge of the knife, and the thickness of the veneer sheet which is being cut can be varied by adjustment of the distance between the knife edge and the pressure bar. During rotation of the log in the veneer lathe the knife and associated pressure bar advance radially toward the centre of the log and peel the veneer from the log in a spiral-like manner.

As the veneer lathe knife and its associated pressure bar advance inwardly during rotation of the log, they exert a pressure against the log which is generally perpendicular to the rotational axis of the log. The log also has a tendency to try to roll up and over the knife as a result of its resistance to being cut. The resultant effect is that the log tends to "bow" away from the knife but in a direction which is an acute angle with the direction of movement of the knife. The tendency for the log to "bow" is particularly pronounced near the midpoint of the log since it is supported at its ends by the lathe chucks. As the log is reduced in diameter during the veneer cutting operation, it becomes less rigid and the tendency for the log to bend or bow away from the knife increases. Without additional support other than the lathe chucks, the log becomes somewhat "cigar-shaped" at smaller diameters because of its decreased rigidity, and the veneer cut near the midpoint of the log becomes thinner than at the ends of the log. Also, the resultant larger circumference of the cigar-shaped log core near its centre makes the veneer sheet longer down the center, and the veneer sheet produced will no longer lie flat without splitting or rippling taking place. An additional difficulty can arise if the log has a variation in its grain such that the wood is harder in some parts than in others. Unless the log is held firmly in position this can produce what is referred to as "hunting" (movement of the log back and forth) which results in eccentricity of the log core and variations in thickness of the veneer sheet being cut.

At one time it was necessary to stop the veneer-cutting operation and discharge a log from the lathe when the log diameter had been reduced to an extent that the log began to bow away from the knife. Apparatus has been developed, however, which braces a log in a veneer lathe against movement resulting from pressure of the knife and roller bar during the cutting operation. When such apparatus is used, veneer can be cut uniformly down to a smaller diameter log core than was previously possible. Apparatus of this type usually includes at least one back-up which is placed adjacent the surface of the log at a point generally antipodal to the veneer cutting knife, and in a position where it can counteract the pressure of the knife and support the log against bowing away from the knife while it is being cut. An example of apparatus incorporating a plurality of back-up rolls is described in Canadian Patent 605,848 of D. M. Zilm, issued Sept. 27, 1960 to Canadian Forest Products, Ltd.

In the prior art devices for bracing and supporting a log in a veneer lathe, the opposing pressure of the back-up rolls on a log in the lathe commonly is provided by an hydraulically or pneumatically actuated piston in a cylinder. The use of such a fluid actuated piston permits variation in and adjustability of the pressure exerted by the rolls in counteracting movement of the log resulting from pressure of the cutting knife.

A difficulty arises with this type of apparatus, however, because the amount of pressure exerted by the back-up rolls which is required to keep a log straight in a lathe varies as the diameter of the log core changes and also fluctuates constantly during the cutting operation due to knots and variations in hardness of the wood. If the pressure of the back-up rolls on the log is not controlled very carefully, it can over-balance the effect of the knife and pressure bar and a log core then can take on an "hourglass" shape, in contrast to the "cigar" shape mentioned previously. Continuous accurate manual control of the back-up roll pressure during operation of a lathe is very difficult and practically impossible, and variations in thickness across the width of the veneer sheet which is produced still can occur when apparatus utilizing unrestrained back-up rolls is used.

An additional problem also may arise since logs often are held in the veneer lathe by chucks at each end which also are conveniently fluid actuated. The forces on the log due to the chucking and cutting operations are sometimes of sufficient magnitude to cause axial splitting of the log, and the log then may "blow apart." The use of unrestrained back-up rolls exerting an opposing pressure to that of the knife aggravates this tendency of a log to split and blow apart. When this occurs, the unrestrained back-up rolls pushing on the log follow in towards the centre of the log, and as a result are subjected to abnormal forces and jolts which may be sufficient to damage or wrench the rolls from the machine.

In an effort to avoid the difficulties inherent in the use of unrestrained back-up rolls, ways for controlling movement of the rolls have been devised. One approach has been mechanically coupling of the back-up rolls with the knife carriage over a limited part of the travel of the latter, so that the back-up rolls travel radially toward the centre of the log at the same rate as the knife advances. This direct mechanical controlled feed tied to the cutting knife overcomes some of the disalvantages of the aforementioned device with unrestrained back-up

rolls, but it fails to provide "give" if a hard knot projects from the core being peeled, and it does not permit any variation in the movement of the back-up rolls relative to the cutting knife as the radius of the log diminishes during the cutting operation. In such a system it also is not possible to disengage the back-up rolls from the log quickly in an emergency such as when a log blows apart, and it is difficult to provide any adjustment or compensation for wear in the mechanical linkage.

It also has been proposed in the prior art to restrain the back-up rolls through the use of hydraulic cylinders having small orifices in the pistons which damp movement of the rolls in the same manner as a shock absorber. Such a restraining mechanism prevents any quick movement of the rolls but in no way relates the position of the rolls to the changing diameter of the log as it is being cut.

Recently, apparatus for bracing and supporting a log in a veneer lathe has been developed which utilizes pilot rolls identical to the back-up rolls that ride on the surface of the log adjacent one of the chucks and thus control the position of the back-up rolls. This method for control of the back-up rolls is superior to previous apparatus in that the pilot rolls follow the changing radius of the log and adjust movement of the back-up rolls accordingly, but it has been found that the pilot rolls follow and tend to accentuate any log eccentricity and also jump or bounce if knots or projections are encountered.

It is an object of this invention to provide apparatus for a veneer lathe which includes a back-up roll and which minimizes some of the disadvantages of the prior art devices.

The apparatus of this invention for backing up a log is used in conjunction with a rotary veneer lathe of a type having a cutting knife which cuts a sheet of veneer from a log rotating in the lathe by advancing progressively into the log during rotation thereof. The apparatus includes at least one back-up roll, and a frame rotatably supporting the roll and guiding movement of the roll toward and away from a position in which it is parallelly adjacent the surface of a log in the lathe and is at a location relative to the cutting knife such that it can counteract bending of the log resulting from interaction of the log with the knife during a veneer cutting operation. The apparatus also includes a movable member and means for moving the movable member at a rate proportional to the speed at which the knife advances. The present invention provides mechanism for restraining the back-up rolls in which either the frame or the movable member has a cam track thereon while the other component includes a cam follower disposed to contact that cam track when the back-up roll is in position adjacent the surface of the log. This mechanism functions as a restraining mechanism in that it establishes an inner limit for the approach of the surface of the back-up roll toward the axis of rotation of the log. The shape of the cam track is correlated with the movement of the member associated with the knife such that contact of the cam follower with the cam track during advancement of the knife effects advancement of the inner limit toward the axis of rotation of the log; the inner limit coinciding substantially with the surface of the log, and the surface of the back-up roll remaining adjacent the surface of the log as the radius of the log diminishes during a veneer cutting operation.

Apparatus according to this invention preferably also includes means for moving the back-up roll into and out of position adjacent the surface of a log in the lathe and for urging the back-up roll into position with the cam follower contacting the cam track so that the roll can counteract bending of the log. It is possible, however, that separate means for moving the back-up rolls might not be necessary (for example in conjunction with small lathes), and in addition, the actual weight of the apparatus would provide a backing-up action. In most embodiments it is convenient to utilize a single mechanism to perform both functions.

In order to provide a clear understanding of the invention, particular embodiments of the invention now will be described with reference to the accompanying drawings, in which:

FIGURE 1 is a perspective view of a portion of a rotary veneer lathe showing a log in the lathe and back-up rolls adjacent to and bracing the log.

FIGURE 2 is a side elevation view of the rotary veneer lathe shown in FIGURE 1 showing the back-up rolls adjacent the log in the lathe and also showing, in phantom, the back-up rolls retracted away from the log in the lathe.

FIGURE 3 is an end view in cross-section of a port of the apparatus of FIGURES 1 and 2 showing the relationship of pressure bar, cutting knife, and back-up rolls.

FIGURE 4 is a diagrammatic end view similar to FIGURE 2 showing the geometry of the arms supporting the back-up rolls and the position of the back-up rolls relative to a log at different diameters during the cutting operation.

FIGURE 5 is a view, partially in cross-section, taken along line **5**—**5** in FIGURE 2.

FIGURE 6 is a view showing an optional feature which may be included in the apparatus illustrated in FIGURES 1 and 2.

FIGURE 7 is a side elevation (partially cut away) similar to FIGURE 2 illustrating an alternative embodiment of the invention.

FIGURE 8 is a partial end view of the embodiment shown in FIGURE 7 as viewed from the right.

FIGURES 1 and 2 show the general arrangement of the back-up rolls and veneer lathe, with a log in the lathe. Since veneer lathes are well known, the complete structural and operating details of the lathe itself have been omitted for simplicity and ease in understanding the present invention.

A log **2** is shown engaged and supported at each end by lathe chucks indicated generally by reference character **3**. During operation of the lathe, a variable speed motor and drive mechanism (not shown) located within head block **8** of the lathe drives the chucks **3**, which in turn rotate the log **2** in the direction shown by the arrow on FIGURES 1 and 3. Back-up rolls **10** are shown positioned adjacent the surface of log **2**. By adjacent is meant that the rolls are very close to or riding lightly on the surface of the log.

Back-up rolls **10** are supported by a frame that includes upper and lower radius arms **11** which control the path described by rolls **10** during any movement thereof. Movements of the back-up rolls **10** are effected by double-acting, fluid actuated pistons (not shown) in cylinders **12**. The radius arms **11** are rotatably mounted with respect to supporting columns **13** by pins **16** at the ends of arms **11** remote from the back-up rolls **10**, and they are connected together at their other ends by connecting members in the form of terminal plates **14** pivotally attached thereto by pins **15**. A support beam **17** extends between and is rigidly secured to connecting members **14**, and the back-up rolls **10** are mounted for rotation on arms **18** which extend from and are rigidly secured to support beam **17**. Stabilizer bars **19** extend between and are rigidly secured to the two upper radius arms **11** and to the two lower radius arms **11**. The stabilizer bars preferably are place near the ends of the radius arms which attach to the supporting columns **13** so as to provide maximum support and rigidity to the frame supporting the back-up rolls.

The lathe includes a veneer cutting knife **4** and a pressure bar **5** (see FIGURE 3) mounted on a carriage (not shown) which extends between and includes slide blocks **6**. The carriage with slide blocks **6** is advanced radially inward toward the centre of the log **2** during the cutting operation by the rotation of feed screws **7**. Feed screws

7 are driven at a rate which is proportional to the speed of rotation of the log in the lathe, which rate can be varied for different logs according to the thickness of veneer to be cut.

The tops of slide blocks **6** provide shaped cam tracks **21** upon which cam followers **22** can ride. In the preferred embodiment illustrated, cam followers **22** are rotatably mounted on arms **25** which are pivotally connected to the lower radius arms **11** by means of pins **23**. The pivotal movement of arms **25** carrying followers **22** is controlled through shock absorbers **24**, also connected to the lower radius arms **11** as shown.

Double-acting fluid-actuated pistons (not shown) in cylinders **12** are used to swing the back-up roll assembly both toward the lathe into operating position and away from the lathe, and also to apply any pressure that may be required on the log by the back-up rolls **10**. Cylinders **12** can be positioned elsewhere on the apparatus if so desired. The fluid operating connections and the mechanical details of the cylinders **12** have not been shown since such cylinders are well known.

When commencing a cutting operation on the veneer lathe, the back-up rolls **10** are retracted to the position shown in phantom on FIGURE 2. A hook **81** can be provided to mechanically support the back-up rolls in this position. A peeler log is placed in the lathe by conventional means (not shown) and engaged by the lathe chucks **3** at both ends. Peeler logs usually have a starting "diameter" in the neighborhood of 24 to 40 inches, although it is sometimes smaller for particular hardwoods. The lathe is started and the log rotated relatively quickly. The knife **4**, but not the pressure bar **5**, is brought into contact with the peeler log and the log is "rounded-up." Once the log has been rounded-up the speed of rotation of the log is slowed, knife **4** is positioned to engage the log and pressure bar **5** is positioned just behind the knife such that it can support the veneer sheet during cutting, and the peeling of veneer begins.

It is desirable to keep the veneer sheet coming off the log at a constant rate, and the common drive mechanism used for the lathe and knife carriage is a variable speed direct current electric motor. It is not anways possible to obtain constant veneer sheet speed throughout the cutting operation since there is not enough speed range and torque in a direct current variable speed drive, but the veneer sheet speed is kept relatively constant over most of the peeling range. As the diameter of the log decreases, the rotational speed of the lathe and the proportional movement of the knife, pressure bar and slide blocks is increased to keep the veneer sheet coming off at a relatively constant rate and thickness. When the log has been peeled to a diameter where bending of the log may occur (usually about 12 inches), the hydraulic cylinders **12** are actuated to bring the back-up rolls **10** down adjacent the log and to hold them there. In some veneer lathes a double chuck is used, such a double chuck consisting of a large diameter outer chuck and a small diameter inner chuck. When the peeler block first is placed in the lathe, both chuchs engage the log. When the diameter of the log has been reduced considerably and the back-up rolls engaged, the large outer chucks are retracted and the peeling of veneer can be continued down to a small log diameter, usually about 4 inches.

The fluid pressure applied against the pistons in the cylinders **12** acts on the upper radius arms **11** of the back-up roll frame to bring the back-up rolls **10** down into position adjacent the surface of the log. In response to actuation of the pistons in cylinders **12**, the rolls move down and in towards the centre of the log until cam followers **22** contact the shaped cam tracks **21**. While arms **25** could be rigidly connected to the lower radius arms **11**, in the preferred embodiment illustrated the arms **25** are pivotally connected to the radius arms and their movement is controlled by shock absorbers **24**. The shock absorbers **24** normally are held in an extended position by means of internal springs when the cam followers **22** are not in contact with cam tracks **21**. When the back-up roll assembly is lowered, the followers **22** contact tracks **21** on slide blocks **6**, and the shock absorbers then are compressed with increasing resistance which damps and slows the movement of the back-up roll assembly until the shock absorber is fully compressed. Upon full compression, the back-up rolls then are prevented from moving further down and in by contact between the cam followers **22** and cam tracks **21**, and a constant pressure applied by the pistons in cylinders **12** holds the cam followers **22** of the back-up roll frame down against the cam tracks **21**. The contact of the cam followers on the cam tracks establishes an inner limit for the approach of the surface of the back-up roll toward the axis rotation of the log. The presence of shock absorbers **24** cushions contact between the cam followers and cam tracks and also prevents sudden jolts to the back-up roll assembly and cam tracks if movement of the back-up rolls takes place.

The seating of the cam followers **22** on tracks **21** of slide blocks **6** prevents further movement of the back-up rolls down and in toward the centre of the log after contact has been made and the shock absorbers **24** are fully compressed. This restraining action holds the back-up rolls at a radial position adjacent the log corresponding to the log diameter at any one instant during the veneer cutting operation, and the rolls therefore are kept adjacent to or ride lightly on the log.

The slide blocks **6** and associated carriage support and move the cutting knife toward the centre of the log at a rate which is proportional to the speed of rotation of the log. The movement of slide blocks **6** is controlled and effected by feed screws **7**. The feed screws are driven by the lathe motor at predetermined speeds directly proportional to the speed of rotation of the lathe chucks. The feed screws **7** are geared to the lathe motor and chucks through a conventional transmission which permits adjustment of their relative speeds so that veneer of varying thicknesses can be cut. To cut thick veneer, the feed screws are rotated more quickly relative to the lathe chucks than in cutting thin veneer; the knife then will advance into the log at a faster rate.

The position of slide blocks **6** on feed screws **7** determines the diameter at which the veneer knife is cutting at any one instant during the cutting operation, and also the distance from the centre of the log at which the back-up rolls are held by contact between the cam followers and tracks. As the slide blocks **6** move toward the log, the log is reduced in diameter by the veneer cutting knife, and cam followers **22** ride on the generally downward slope of tracks **21** under the continuous pressure exerted by the fluid actuated pistons in cylinders **12**. The shape of the cam tracks including the downward slope permits the back-up rolls **10** to move down and in toward the centre of the log and remain adjacent its surface as its radius diminishes.

Referring to FIGURES 1 and 5, each pin **23** which connects a cam arm **25** to a lower radius arm **11** is provided with an eccentric portion **51**. The eccentricity of portion **51** provides means to permit an adjustment of each arm **25** so that the position of the back-up rolls **10** relative to the surface of the log can be varied. It is preferable to include means that permit such an adjustment to be made so as to provide for (1) variations in the amount of pressure being applied to a log by the back-up rolls, which pressure may need to be adjusted for woods of differing hardness, (2) minor changes in the positioning of the back-up rolls for the cutting of different veneer thicknesses, and (3) adjustment of the roll position to compensate for wear in the apparatus. Arm **25** has an opening which receives eccentric portion **51** and can slide within extension **26** on lower radius arm **11**. Rotation of pin **23** and its eccentric portion **51** causes relative movement between extension **26** and arm **25**, as indicated by the arrows on FIGURE 5. The rotation of pin **23** thus can

vary the position of cam 22 relative to the lower radius arm 11, and permits minor adjustments to be made in the position of back-up rolls 10 relative to log 2. Integral with or attached to pin 23 (by a set screw or the like) is a ratchet wheel 53. Wheel 53 is provided with a number of notches 54 around its periphery which are adapted to receive a lock flap 55 that holds the knob in a given position. The wheel 53 can be provided with markings indicating the appropriate settings for the cutting of different veneer thicknesses.

FIGURE 2 illustrates a typical contour of the cam tracks 21. The cam tracks are shaped specifically to keep the back-up rolls from pressing in closer than the radius of the log, and also to ensure that the rolls follow the diminishing log diameter at the geometrically correct progressive rate depending upon the system for restraining the rolls which has been chosen. It has been found that the tracks for the illustrated embodiment, in addition to being sloped as shown, should be slightly concave in shape. The curvature in the contour of the cam tracks is required for several reasons. One factor which must be considered arises from the fact that during the cutting operation cam followers 22 move in an arc determined by the circular movement of the lower radius arms 11 upon which they are mounted. The back-up rolls 10, however, describe an arc which is closer to a straight line, and which is governed by and is due to the geometry of both upper and lower radius arms 11 and plate 14 (see FIGURE 4). The relationship between the two arcs requires a concave shape of the cam tracks to keep the back-up rolls properly adjacent the log surface throughout the arc of movement during which they are in use. Another factor which must be considered is that, as a log in a lathe decreases in size during the veneer cutting operation, a line joining the centres of the back-up rolls 10 must gradually approach closer to the surface of the log if the surfaces of the rolls are to remain adjacent the log surface. This factor becomes much more critical when the log reaches small diameters, as will be apparent from FIGURE 4. The back-up rolls must advance more quickly relative to the knife near the end of the cutting operation, and this requires the cam tracks to have a curved contour which increases in slope; the slope becoming particularly pronounced on the lower portion of the cam tracks which the cams contact at small log diameters (see FIGURE 4).

The contour of the cam tracks 21 must be designed to suit the specific geometry of the system employed. In the present embodiment, in order that the path travelled by the back-up rolls 10 during the veneer cutting operation be reasonably close to a straight line (radial to the log) and that both back-up rolls in each set be adjacent the log as its diameter decreases, two non-parallel radius arms of equal length are utilized on each side of the lathe. If a single arm were used to support the back-up rolls, the rolls would move a circular path, which would not permit both rolls of each set to be adjacent the log throughout the arc during which they are used. This difficulty can be overcome by permitting each set of rolls to pivot on the support arm as in Canadian Patent 605, 848, but it is usually preferable not to utilize a set of rolls which can pivot on the support arm. In certain applications it may be possible to utilize a single back-up roll or a single radius arm and still utilize the restraining mechanism of the present invention. It would be necessary to shape the cam track to suit the specific geometry employed.

The geometry of the radius arms and back-up rolls in various positions during the cutting operation is shown in FIGURE 4. The radius arms are shown in three different positions labelled 1A, 2A, and 3A, for the lower arm and 1B to 3B for the upper arm. The lines marked X1, X2, and X3, are the straight lines joining the pivot pins 15 and represent the position of terminal plates 14 in each of positions 1 to 3. The lines marked Y1 to Y3 join the centres of the two back-up rolls 10 of each set in positions 1 to 3. The perpendicular bisector of each of these lines joining the back-up roll centres passes through the axis of rotation R of a log in the lathe over the range of log diameter through which the back-up rolls are to be utilized (usually about 12 inches down to about 4 inches). The configuration of the radius arms (which permits the perpendicular bisector of a line joining the centres of the back-up rolls to pass through the log centre) keeps both back-up rolls of each set in contact with the log throughout the range of use. This eliminates a further disadvantage of some prior art devices in which the sets of rolls are themselves pivoted on the support beam 17 or arms 18 to achieve the result of both rolls in each set being in contact with the log throughout the peeling operation, as for example on the apparatus disclosed in Canadian Patent 605,848, mentioned previously. The pivoting of each set of rolls in this manner can be a disadvantage in that it can permit the log to oscillate while in the lathe.

The pressure bar 5 is used to support the sheet of veneer as it is being cut from the log and also to control the thickness of the veneer as it passes between the bar and the knife. Several types of pressure bars are known in the art, and that shown in FIGURE 3 is known as a double-roller pressure bar. A driven roller 30 floates in front of a drive roller 31; the housing and barlips 32 surrounding the rollers do not project beyond the driven roller and therefore do not interfere with the cutting of veneer from a peeler core of small diameter.

Referring now to FIGURE 6, there is shown a modification of the back-up roll apparatus which can be useful in some installations. In this particular embodiment, each lower radius arm 11 is divided into two telescoping sections 61 and 62. Inside the telescoping sections is a double-acting fluid-actuated piston and cylinder 63 with its conventional connections (not shown) to a source of fluid under pressure (either liquid or gas). In FIGURE 6, the connecting arm 65 between the piston in cylinder 63 and section 62 is shown in a partially extended position. During normal operation of the back-up rolls, the piston in cylinder 63 is held by fluid pressure in fully extended position with the telescoping portions 61 and 62 pushed apart such that radius arm 11 is at its full length, with the back-up rolls in position as shown in dotted outline on FIGURE 6. When desired, such as at the end of a cutting operation, the fluid pressure supply to cylinder 63 can be reversed to act in the opposite direction on the piston in cylinder 63 to retract connecting arm 65 as indicated by the arrow. The resultant decrease in length of the lower radius arms 11 produces a swivelling action in plates 14 which swings beam 17 with arms 18 and rolls 10 in a clockwise direction. At the same time cylinder 12 can be actuated to begin raising the back-up rolls as they retract. FIGURE 6 shows the back-up rolls as they simultaneously move upward and retract. The lower radius arms can be fully retracted until inner telescopic portion 62 is seated against stop 64.

This additional feature of the apparatus is useful when the cutting of veneer sheet from one log core has been completed and it is desired to place another log in the lathe. At the completion of a cutting operation when raising of the back-up rolls begins lower radius arms 11 are retracted, which pulls the rolls away from the incoming block in the log charger. The lathe charger then can immediately place a new log in the lathe without any delay being incurred while the back-up rolls are being swung out of the way. After a log has been placed in the lathe, the telescoping lower radius arms are extended to their normal position, and fluid pressure is applied continuously to the piston in cylinder 63 to keep the arms in this extended position during the period that the back-up rolls are being utilized to perform their normal function in position adjacent the log.

In FIGURES 7 and 8 there is shown an additional em-

bodiment of the controlled feed back-up rolls of this invention, which embodiment is particularly suited for addition to already existing lathe installations. In this embodiment, a bracket **71** is rigidly secured to the movable slide block **6** of the lathe. A stop **72** having two upstanding portions with a vertical slot therebetween is secured to the head block **8** of the lathe. A member **73** is mounted for sliding movement in the slot of stop **72**, and provides a sloped cam track **121** on its upper surface. A horizontal extension of member **73** extends from the head block **8** towards the lathe and above bracket **71**. Mounted on top of this extension of member **73** is a fluid-actuated cylinder **75** and piston (not shown). The cylinder **75** is connected to a source of fluid pressure, but the operating connections and controls are well known and have been omitted for the sake of simplicity. The piston in cylinder **75** has a connecting rod **76** which extends downward through the horizontal extension of member **73**. Rigidly secured to rod **76** is a plate **77** which has a sloping face on the side which is toward bracket **71**. Fastened to the bottom of the extension of member **73** is a stop **78** and a depending electric limit switch **79**. The position of stop **78** (and associated limit switch **79**) on member **73** is adjustable. Limit switch **79** is connected to the controls (not shown) which operate hydraulic cylinder **75**.

During the veneer cutting operaiton, slide block **6** which carries the knife moves toward the log in the lathe. When it reaches the desired position, bracket **71** will contact the adjustable stop **78** and associated limit switch **79**. Actuation of limit switch **79** activates the controls of cylinder **75** such that previously retracted rod **76** and plate **77** are extended until the sloping face of plate **77** contacts the associated sloping face of bracket **71**. This extension of rod **76** firmly clamps bracket **71** against stop **78** such that any movement of slide block **6** causes identical movement of member **73** and the cam track **121** on its upper surface. Cam follower **122** and shock damper **124** (which are pivotally mounted on terminal plate **14**) enter the somewhat V-shaped opening formed between member **73** and stop **72** as the back-up rolls descend into position adjacent the peeler log in the lathe. The downward movement of the back-up rolls is arrested by cam follower **122** in the V-shaped slot. As slide block **6** moves toward the log during the cutting operation identical movement of member **73** occurs since they are now clamped together, and cam track **121** moves away from stop **72**. This widens the V-shaped slot between them and permits cam **122** to move downward into the slot under the influence of hydraulic cylinder **12**. The movement of member **73** and the shape of cam track **121** thus control the feed of the back-up rolls **10**. The position of the back-up rolls can be adjusted to compensate for wear, for the type of wood being cut, etc., by changing the position of adjustable stop **78**. Movement of stop **78** can change the position at which bracket **71** contacts it, but the use of sloping faces on plate **77** and on bracket **71** permits the clamping action of cylinder **75** to be utilized throughout a range of positions.

In the illustrated embodiments of this invention, two sets of back-up rolls, each including two rolls, have been shown. In some prior art devices, including that shown in Canadian Patent 605,848, only a single set of two relatively long rolls in the centre of the log and extending most of the length of the log are used. In many veneer lathe installations an overhead crane is provided which can be used as one means for placing the log in and removing the log from the lathe. Such a crane is placed at the midpoint of the log, and, for this reason, it can be advantageous, although not essential, to provide separated sets of rolls, as shown. Although a single roll can be used, it also is advisable to have at least two back-up rolls whose axes are offset from each other in a circumferential direction around the log, but which have their axes parallel to and substantially the same distance from the rotational axis of the log. The rolls are offset in such a manner in each of the two sets of rolls shown in the drawings. The pressures generated by the knife and pressure bar throughout the cutting cycle are not always of constant magnitude, and their resultant is not always along the same radial plane but can fluctuate slightly, as mentioned earlier in the specification. Additionally, since the log acts as a driving member by turning the rolls, if only a single roll or even axially aligned plural rolls are used, the log tends to roll itself off the roll or rolls. For these reasons it can be advantageous to utilize at least two rolls which are circumferentially offset. It should be understood, however, that the invention is not limited to the number or placement of the rolls as described. For example, two rolls which are not axially aligned but are offset as described above could be used in positions longitudinally separated along the length of the log.

The back-up rolls of this invention possess a number of advantages. The provision of cam tracks and cam followers restrains the back-up rolls from exerting too much pressure on the log while it remains straight in the lathe. If, however, the advancement of the knife and pressure bar tend to bow the log away from remaining straight in the lathe, the pressure of the back-up rolls can counteract this tendency and will hold the log in its proper position. The cam followers riding on the cam tracks ensure that the back-up rolls do not push the log beyond its proper position. Due to the restraining atcion of the cam followers on the cam tracks, the pressure applied to the back-up rolls by the fluid actuated pistons in cylinders **12** can be kept constant and large enough in magnitude to counteract any pressure on the log by the knife and pressure bar. No accurate control of the pressure is required. When the log is straight in the lathe the pressure of the back-up rolls is restrained by the cam followers and tracks, and is not applied against the log. If the log tends to bow away from the advancing knife and push against the back-up rolls, the cam followers tend to lift from the cam tracks, and the pressure of the back-up rolls then is exerted against the log. The pivotal mounting of the cam followers and the use of shock absorbers cushions contacts between the cam followers and cam tracks and prevents the followers and back-up roll frame upon which they are mounted from banging up and down. The presence of the restraining mechanism permits the application of a constant pressure to the back-up rolls and prevents varying pressures of knife and bar from producing a fluctuation in log position and a "hunting" of the rolls and log up and down. Additionally, since the position of the back-up rolls is determined by the cam tracks **21**, the rolls cannot drop or be pushed into a void in the log and so cause damage to themselves, the log, or the knife. In the case of a log blowing apart, the back-up rolls of the present invention are much safer since they will not swing in toward the rotational axis of the log.

It will be apparent to those skilled in the art that modifications may be made to the apparatus disclosed without departing from the spirit or scope of the invention. It was found convenient in the embodiment disclosed to associate the cam tracks (upon which the cam followers ride) directly with the slide blocks and carriage which carry the cutting knife. A separate movable member tied to the lathe chuck rotation could be used, however. As an example, an eccentric rotating cam member geared to the lathe chucks through reduction gears might be a desirable alternative. It is also possible that the cam followers could be placed on the member which moves proportional to the speed of rotation of the log, and the cam track could be associated with the back-up roll frame. The geometry of the back-up roll frame also could be modified, or the cam followers placed on the frame at a different position. It is only necessary that the contour of the cam tracks be shaped to suit the geometry of the particular system employed. Two tracks and two followers placed at the ends of the lathe were found to be preferable

in the embodiment illustrated, but the invention is not to be construed as limited in this manner since it would be possible to utilize only a single cam track and cam follower to restrain the back-up rolls.

What I claim as my invention is:

1. Apparatus for backing up a log in a rotary veneer lathe having a cutting knife which cuts a sheet of veneer from a log rotating in the lathe by advancing into the log during rotation thereof, said apparatus being characterized by: a plurality of back-up rolls each having substantially the same diameter, the axis of rotation of said back-up rolls being parallel and substantially the same distance from the rotational axis of a log in said lathe, and the axes of at least two of said back-up rolls being offset from each other around the circumference of a log in said lathe; a frame rotatably supporting said back-up roll and guiding movement of said back-up roll toward and away from a position in which it is parallelly adjacent the surface of a log in said lathe and is at a location relative to said cutting knife such that it can counteract bending of said log resulting from interaction of said log with said knife during a veneer cutting operation; a movable member carrying said knife; means for moving said movable member and said knife towards said log at the same rate; said member having a cam track thereon, said frame including a cam follower, said cam follower being disposed to contact said cam track when said back-up roll is in said position adjacent the surface of a log and thereby establish an inner limit for the approach of the surface of said back-up roll toward the axis of rotation of the log; the shape of said cam track being such that contact of said cam follower with said cam track and movement of said member during advancement of said knife effects advancement of said inner limit toward the axis of rotation of said log such that said inner limit coincides substantially with the surface of said log and the surface of the back-up roll remains adjacent the surface of said log as the radius of said log diminishes during a veneer cutting operation; means for moving said back-up roll into and out of said position adjacent a log in said lathe and for urging said back-up roll into said position with said cam follower contacting said cam track so that said back-up roll can counteract bending of a log in said lathe; said frame comprising a connecting member and at least one set of two arms, the two arms in each set being pivotably mounted on supporting structure for pivotable movement perpendicular to the axis of rotation of a log in said lathe and being pivotably connected at their opposite ends by said connecting member, said arms being of equal length, mounted one above the other and diverging in a direction away from said supporting structure and towards said connecting member, said connecting member supporting said back-up rolls, the geometry of said movable frame and the position of said back-up rolls supported on said frame being such that when said cam follower is positively held in contact with said cam track, the perpendicular bisector of a line joining the axes of said offset back-up rolls passes through the axis of rotation of a log in said lathe.

2. Apparatus for backing up a log in a rotary veneer lathe having a cutting knife which cuts a sheet of veneer from a log rotating in the lathe by advancing into the log during rotation thereof, said apparatus being characterized by: a plurality of back-up rolls each having substantially the same diameter, the axes of rotation of said back-up rolls being parallel and substantially the same distance from the rotational axis of a log in said lathe, and the axes of at least two of said back-up rolls being offset from each other around the circumference of a log in said lathe; a frame rotatably supporting said back-up roll and guiding movement of said back-up roll toward and away from a position in which it is parallelly adjacent the surface of a log in said lathe and is at a location relative to said cutting knife such that it can counteract bending of said log resulting from interaction of said log with said knife during a veneer cutting operation; a movable member carrying said knife; means for moving said movable member and said knife towards said log at the same rate; said member having a cam track thereon, said frame including a cam follower, said cam follower being disposed to contact said cam track when said back-up roll is in said position adjacent the surface of a log and thereby establish an inner limit for the approach of the surface of said back-up roll toward the axis of rotation of the log; the shape of said cam track being such that contact of said cam follower with said cam track and movement of said member during advancement of said knife effects advancement of said inner limit toward the axis of rotation of said log such that said inner limit coincides substantially with the surface of said log and the surface of the back-up roll remains adjacent the surface of said log as the radius of said log diminishes during a veneer cutting operation; means for moving said back-up roll into and out of said position adjacent a log in said lathe and for urging said back-up roll into said position with said cam follower contacting said cam track so that said back-up roll can counteract bending of a log in said lathe, said frame comprising connecting members, a beam and two sets of two arms each, the two arms in each set being pivotably mounted on supporting structure for pivotable movement perpendicular to the axis of rotation of a log in said lathe and being pivotably connected at their opposite ends by a different one of said connecting members, said arms of each set being of equal length, mounted one above the other and diverging in a direction away from the supporting structure and towards said connecting member, all of said arms being of equal length, said two sets being positioned adjacent opposite ends of said lathe and being interconnected by said beam, said beam extending between and being rigidly secured to said connecting members, said back-up rolls being supported by said beam, the geometry of said movable frame and the position of said back-up rolls supported on said beam being such that when said cam follower is positively held in contact with said cam track, the perpendicular bisector of a line joining the axes of said offset back-up rolls passes through the axis of rotation of a log in said lathe.

3. Apparatus as defined in claim 1 including means for cushioning contact between said cam follower and said cam track.

4. Apparatus as defined in claim 1 including means permitting adjustment of the position of said cam follower relative to said frame.

5. Apparatus as defined in claim 2 wherein the lower arm in each set comprises two telescopic sections and means connecting said sections for controlling the telescopic action of said sections and for holding said lower arms in extended or retracted positions.

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DONALD R. SCHRAN, *Primary Examiner.*