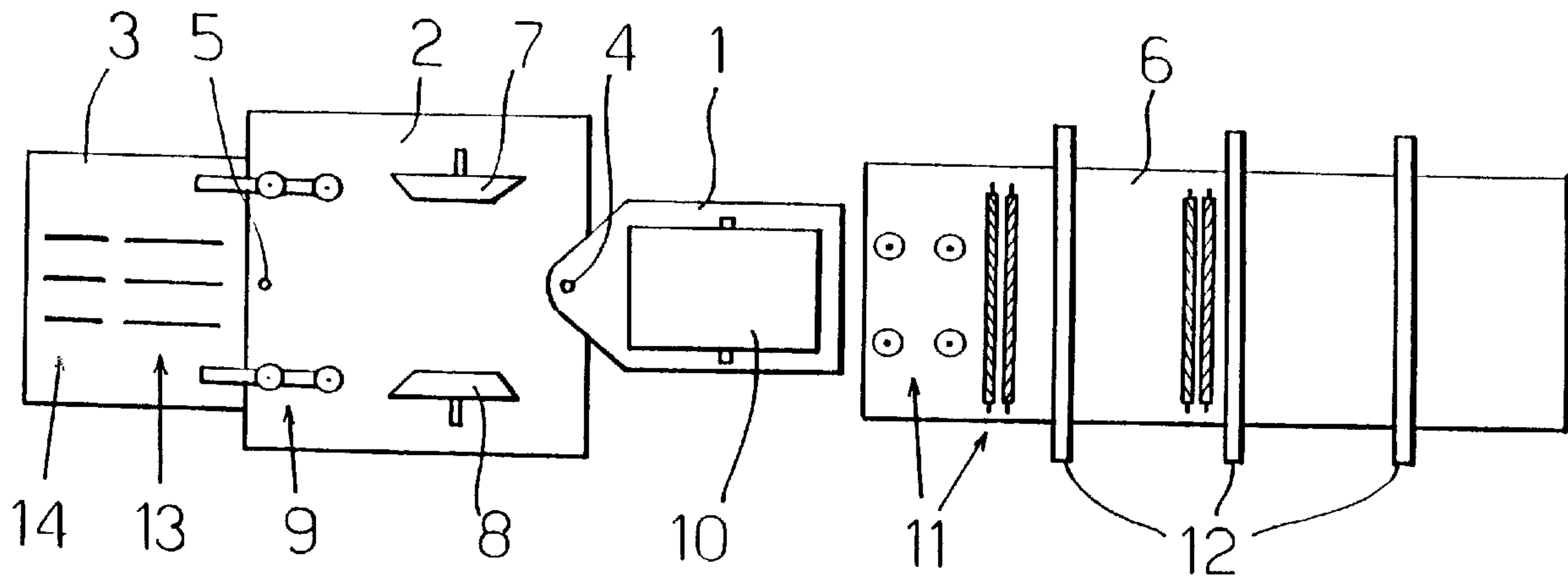




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(54) Titre : APPAREIL DE COUPE DE BOIS D'OEUVRE EQUARRI ET METHODE CONNEXE
 (54) Title: APPARATUS AND PROCEDURE FOR CUTTING SQUARE TIMBER



(57) **Abrégé/Abstract:**

A novel apparatus and method are provided herein for sawing a timber, spar or plank. The apparatus includes a frame, and a feed mechanism, a chipper and a sawing apparatus, all of which are carried on the frame. A feed table is provided for feeding the timber in a controlled manner into the feed mechanism. The feed mechanism is operatively-associated with the chipper to feed the timber into chipper. The feed mechanism is connected with a first pivot with a vertical axis to the chipper. The chipper is arranged to remove any curved surface portions from the timber. The chipper is also connected with a second pivot with a vertical axis to the sawing apparatus. The sawing apparatus is arranged to cut up a spar, arriving from the chipper, into boards, or deals. A control unit is provided for turning the feed mechanism and the chipper on their pivots relative to each other and to the sawing apparatus in a manner consistent with the curvature of the timber.

ABSTRACT

A novel apparatus and method are provided herein for sawing a timber, spar or plank. The apparatus includes a frame, and a feed mechanism, a chipper and a sawing apparatus, all of which are carried on the frame. A feed table is provided for feeding
5 the timber in a controlled manner into the feed mechanism. The feed mechanism is operatively-associated with the chipper to feed the timber into chipper. The feed mechanism is connected with a first pivot with a vertical axis to the chipper. The chipper is arranged to remove any curved surface portions from the timber. The chipper is also connected with a second pivot with a vertical axis to the sawing apparatus. The
10 sawing apparatus is arranged to cut up a spar, arriving from the chipper, into boards, or deals. A control unit is provided for turning the feed mechanism and the chipper on their pivots relative to each other and to the sawing apparatus in a manner consistent with the curvature of the timber.

(a) TITLE OF THE INVENTION

APPARATUS AND PROCEDURE FOR CUTTING SQUARE TIMBER

(b) TECHNICAL FIELD TO WHICH THE INVENTION RELATES

5 The present invention concerns an apparatus for sawing a timber, a spar or a plank into a plurality of boards, and to a method for dividing a timber, spar or plank into a plurality of boards.

(c) BACKGROUND ART

10 In the interest of simplicity, this application mainly uses the term "square timber" when referring to (small) square timbers, spars, planks or equivalent timber goods to be processed.

A person aiming to utilize timber material optimally, encountered problems when cutting up crooked logs. In such instances, the usual procedure was first to turn the log
15 so that the crook or bends pointed up or down, and it was dressed to become a square timber having two opposed planar surfaces. This was accomplished by running it through a saw or, e.g., through a timber hewing machine, or a chipper. The crooked timber then was dressed to become a spar of which all side faces were dressed, by running it, e.g., through a second chipper. The result thus produced was a crooked spar,
20 which was not necessarily uniform in thickness over its entire length. Therefore such timber could not be sawn over its whole length to yield full-sized sawn timber.

Another alternative was to cut the timber with a saw directly in one work step into boards or deals. Both ways of accomplishing the task were troubled by the same problems. It was hard to rip a crooked timber or spar into timbers of uniform thickness
25 over its whole length because its curvature frequently varied and rotated and the thickness changed, whereby it was difficult to guide the timber to meet the saw blades in an optimal manner.

The state of art in the field of the present invention is presented in Finnish Patents Nos. 68014, 68778 and 81985, and in US Patent No. 4,127,044. In all the apparatus
30 described in those references, too, the problem was that cutting of the timber, or spar, into boards or deals was not successfully managed, at least not when the curvature of the

log varied and changed direction while cutting was in progress. In general, satisfactory results were only achievable with existing apparatus when the log that was being ripped was uniformly curved over its entire length.

5 (d) DESCRIPTION OF THE INVENTION

An object of one broad aspect of the invention is to minimize the drawbacks just mentioned.

10 An object of a specific aspect of the invention is to provide a novel apparatus and procedure by the aid of which one gains optimum sawn timber output, independent of curvature variations and changes of direction of the curvature in one log from a crooked log.

15 By one broad aspect of this invention an apparatus for sawing a timber, spar or plank is provided, comprising a frame, as well as a feed mechanism, a chipper and a sawing apparatus, all of which are carried on the frame. A feed table is provided for feeding the timber in a controlled manner into the feed mechanism. The feed mechanism is operatively-associated with the chipper to feed the timber into the chipper. The feed mechanism is connected with a first pivot with a vertical axis to the chipper. The chipper is arranged to remove any curved surface portions from the timber. The chipper is connected with a second pivot with a vertical axis to the sawing apparatus. The
20 sawing apparatus is arranged to cut up a spar arriving from the chipper, into boards, or deals. A control unit is provided for turning the feed mechanism and the chipper on their pivots relative to each other and to the sawing apparatus in a manner consistent with the curvature of saw timber.

25 By a second broad aspect of this invention, an apparatus is provided for sawing a timber into a plurality of boards, the timber having a longitudinal axis and also having a generally-square cross-sectional shape lying in a plane which is generally-normal to the longitudinal axis, the timber is curved along that longitudinal axis. The apparatus includes a frame, a feed table on which the timber to be sawed is placed, and a feed mechanism for receiving the timber from the feed table and for feeding the timber in a
30 direction which is generally-parallel to its longitudinal axis. A chipper is provided which

is coupled to the feed mechanism by a first pivot means by which the feed mechanism and the chipper can move relative to each other. The first pivot means has a rotational axis which is oriented normal to the feeding direction for the timber. The chipper receives the timber from the feed mechanism and removes curved portions from the timber as the timber passes through the chipper. Sawing means are mounted on the frame of the apparatus. The sawing means is coupled to the chipper by a second pivot means by which the chipper can move relative to the sawing means. The second pivot means has a rotational axis which is oriented normal to the feeding direction for the timber. The sawing means receives the timber from the chipper and saws the timber into boards as the timber passes through the sawing means. Control means are provided for moving the feed mechanism and the chipper relative to each other about the first pivot means, and for moving the chipper relative to the sawing means about the second pivot means in accordance with the curvature of the timber as the timber moves through the apparatus.

15 By a first variant of these two broad aspects of this invention, the sawing means is mounted on the frame of the apparatus so as to be stationary with respect to the frame.

By a second variant of these two broad aspects of this invention, and/or the above first variant thereof, the chipper comprises a pair of chipping blades which are spaced in a direction which is normal to the direction the timber passes through the chipper.

20 By a third variant of these two broad aspects of this invention, and/or the above first variant thereof, the chipper comprises a pair of chipping blades which are adapted to be disposed on opposite sides of the timber.

By a fourth variant of these two broad aspects of this invention, and/or the above first variant thereof, the apparatus further includes guide means between the chipper and the sawing means for guiding the timber into the sawing means.

25 By a fifth variant of these two broad aspects of this invention, and/or the above variants thereof, the feed mechanism comprises a pair of spaced rollers between which the timber is fed.

30 By a sixth variant of these two broad aspects of this invention, and/or the above variants thereof, the feed mechanism comprises rollers which are adapted to be disposed

and to rest against the planar faces of the timber, thereby to transport the timber into the chipper.

By a seventh variant of these two broad aspects of this invention, and/or the above variants thereof, the feed table comprises guide members for positioning the timber to be sawed on the feed table. By a first variation thereof, the feed table further includes
5 measuring means for measuring dimensional characteristics of the timber to be sawed, the measuring means being coupled to the control means.

By an eighth variant of these two broad aspects of this invention, and/or the above variants thereof, the sawing means comprises a plurality of blades which are adjustably-
10 positioned with respect to each other in accordance with the dimensional characteristics of the timber being sawed, and the dimensions of the boards which are produced from the timber, the blades having parting knives associated therewith. By a first variation thereof, the parting knives are stationary in relation to the blades. By a second variation thereof, the parting knives are pivotable relative to the blades.

By a third broad aspect of this invention, a method is provided for dividing a timber, spar or plank into parts. The method includes directing the timber between
15 chipping blades by means of a feeding method including feeding rollers, thereby removing its curved sides. The timber is then passed to a dividing apparatus, thereby dividing the timber into parts. The method includes the additional steps of guiding
20 timber to the dividing apparatus in conformity with its curvature by swivelling the entity constituted by chipping blades and feed mechanism rollers, relative to the dividing apparatus, and swivelling rollers of the feed mechanism relative to the chipping blades.

By a fourth broad aspect of this invention, a method is provided for dividing a timber into a plurality of boards, the timber having a longitudinal axis and also having
25 a generally-square cross-sectional shape lying in a plane which is generally-normal to the longitudinal axis, the timber being curved along that longitudinal axis. The method includes the first step of feeding the timber, in a direction which is parallel to its longitudinal axis, from a feed mechanism to a chipper. The timber is passed through the
30 chipper, and curved portions are removed from the timber as it passes through the chipper. The timber from which curved portions have been removed is passed through

a dividing means, and the timber is divided into boards as it passes through the dividing means. The method includes the additional steps of moving the feed mechanism and the chipper relative to each other about a first rotational axis which is oriented normal to the feeding direction for the timber as the timber moves through the feeding mechanism and the chipper, and also moving the chipper relative to the dividing means about a second rotational axis which is oriented normal to the feeding direction for the timber as the timber moves through the chipper and the dividing means.

By one variant of these two broad third and fourth method aspects of this invention, the method further includes the initial step of ascertaining the dimensional characteristics of the timber, and the step of relatively moving the feed mechanism and the chipper is further defined as carrying out the step of relatively moving such feed mechanism and chipper in accordance with the ascertained characteristics.

In other words, the apparatus of one broad aspect of the invention for cutting timber includes a feed mechanism, a chipper and a sawing apparatus which are interrelated in such manner that the feed mechanism is arranged to feed the timber into the chipper. The chipper is arranged to remove any curved superficial portions from the timber. The sawing apparatus is arranged to cut the spar emerging from the chipper into boards, deals or equivalent. The feed mechanism is connected to the chipper by means of a first pivot with a vertical axis. The chipper is connected to the sawing apparatus by means of another pivot with a vertical axis. The sawing apparatus is carried on the frame of the overall apparatus. The apparatus further includes a feed table from which the square timber is fed, in controlled manner, into the feed mechanism. The apparatus likewise includes a control unit, by the aid of which the feed mechanism and the chipper are swivelled about their pivots, both relative to each other and relative to the sawing apparatus, in accordance with the curvature of the timber that is being processed.

In this way, in the apparatus of a broad aspect of the invention, the chipper and the feed mechanism both follow the shape of the timber or the spar which is being cut, i.e., they follow its curvature, and turn the timber or the spar along with themselves so that the timber or the spar will be fed into the saw blades paralleling these blades at all times. This has the effect of precluding any torsion effects on the timber or on the spar

and, likewise, any forces from the spar tending to twist the saw blades. Thus, ruptures which occurred in the techniques of the prior art at the sites of knots in the timber or the spar are successfully eliminated, as are also later detachments of knots.

Advantageously, the sawing apparatus which is employed in the apparatus of an aspect of this invention is an entity which is stationary in relation to the frame of the apparatus, other parts of the apparatus being swivelled in relation to the sawing apparatus as implied by the curvature of the log that is being cut. Of course, the possibility is not excluded either that the sawing apparatus could also be swivelled when required. It is equally possible to contemplate swivelling of the parting knives following after the saw blades of the sawing unit. The fact is that, usually, at least when thinner sawn timber is being produced, the sawn timber will readily bend enough as it passes the parting knives to obviate the need of swivelling these knives.

No limitations whatsoever are imposed on the sawing apparatus to be used in the apparatus of aspects of the invention: one may use a circular saw, a band saw, or possibly another sawing apparatus. The number of blades in the sawing apparatus and their spacing may also vary and may be freely selectable and adjustable consistent with each timber to be cut up and with the products required in each instance.

Advantageously, guides are provided in the apparatus of aspects of the invention between the chipper and the sawing apparatus. These guides may be, e.g., suitable rollers with a vertical axis, with the aid of which the timber or the spar which is to be cut is guided into the sawing apparatus. Such guides are so-fixed or carried on the sawing apparatus that they can turn slightly along with the chipper as the chipper is swivelled relative to the sawing apparatus. Alternatively, they are carried on the sawing apparatus by elastic arms, whereby they will yield slightly to the spar presenting the curved shape.

Advantageously, the feed mechanism comprises rollers, or equivalent, which are disposed to rest against the planar faces of the timber and to impact the timber between themselves, thereby transporting the timber into the chipper.

In the apparatus of aspects of the invention, the parting knives following after the blades may also be pivoted to swivel as one entity out from the direction which is defined

by the blades, whereby they, too, will swivel and yield in a way consistent with the curvature of the goods that is being cut. In such a case, the parting knives are advantageously comprised, in combination, in a separate frame which is pivotally mounted on the blade frame.

5 Advantageously, various guiding members may be used on the feed table, by the aid of which the timber is transported in proper position to the feed mechanism. It is equally possible to swivel the feed mechanism relative to the timber on the feed table so that the timber will be properly positioned as it moves in between the rollers of the feed mechanism.

10 Advantageously, in the apparatus of aspects of the invention, the feed table comprises appropriate measuring elements, measuring frames or equivalent by the aid of which the dimensions, e.g., its length, thickness and crookedness of the timber, are measured. The results of measurement serves as a basis for turning the feed mechanism and the chipper in relation to each other and to the sawing apparatus. The timber is
15 transported from one treatment step to another step in accordance with commands from the control unit forming an essential part of the apparatus of aspects of the invention.

 In the method of other aspects of the invention for dividing a timber into parts, the timber is guided to pass through the apparatus between chipping blades, thereby removing its curved sides and then to a dividing apparatus for dividing the timber into
20 parts. As taught by aspects of the method of the invention, the timber is guided to the dividing apparatus in accordance with its inherent crookedness, turning the entity constituted by the chipping blades and the feed mechanism rollers, relative to the dividing apparatus, and by swivelling the rollers of the feed mechanism relative to the chipping blades. Thus, the timber will be guided to the dividing apparatus, e.g., to a set of saw
25 blades, at all times paralleling the blades. The other units participating in handling the timber swivel, in accordance with the curvature of the timber, and turn it so as to keep the part of the timber at the dividing apparatus parallel with the blades thereof at all times.

 Thus, advantageously, in the method of aspects of the invention the length,
30 thickness and curvature of the timber are measured prior to taking the timber up on the

feed mechanism, either the feed mechanism or the timber being turned so as to make the timber enter the gap between the rolls of the feed mechanism in a fully determined position. Then, in accordance with the progress of the timber through the apparatus, and in accordance with the curvature of the timber, the various units processing the timber are swivelled relative to each other so that the timber will be successfully divided on its entire length into boards, or deals or equivalent which parallel its curvature.

The apparatus and methods of various aspects of the invention afford the advantage, compared with the prior art, that they enable optimum yields to be obtained from every log which is processed, regardless of the curvature of the log, the changes of the curvature, and/or the changes in direction of the curvature.

(e) DESCRIPTION OF THE FIGURE

In the accompanying drawing, the single figure depicts, schematically, an apparatus according to an embodiment of one aspect of the invention for sawing timber.

(f) AT LEAST ONE MODE FOR CARRYING OUT THE INVENTION

The apparatus of an embodiment of an aspect of the invention depicted in the Figure comprises a sawing apparatus 3, comprising blades 13 and coordinated parting knives 14. The number and location of these blades and knives are freely selectable and adjustable as required. A chipper 2 presenting opposed chipping blades 7 and 8, of which the mutual distance can be adjusted in accordance with the dimensions of the square timber to be chipped is carried on the sawing apparatus with a pivot 5 having a vertical axis. Further, guides in the form of rollers, guide rollers 9, are supported on the sawing apparatus 3, in the region of the pivot 5. The guide rollers 9 guide the square timber to the blades 13 along lines which are substantially-determined by the chipping blades.

A feed mechanism 1, consisting of two rollers, or rollers 10, is carried on the chipper 2 and is swivellable around a pivot 4 with a vertical axis. The rollers 10 press against each other. The square timber is carried between these rollers 10 through to the chipper 2.

Furthermore, the apparatus of this embodiment of this aspect of the invention comprises a feed table 6 carrying measuring elements 12, three measuring frames, and guide members 11 for transporting the square timber in a controlled manner to the feed mechanism 1.

5 The apparatus according to this embodiment of this aspect of the invention depicted in the drawing is operated as follows: when a log, or square timber, dressed to be planar on two opposed sides, either sawn or chipped, is conveyed onto the feed table 6, the measuring elements 12, representing a technology known in itself in the art, measure and record the dimensions of the square timber, i.e., its length, thickness and
10 curvature. Next, guide members 11, either helix rollers or rollers with a vertical axis, or both, are employed to guide the end of the square timber in between the rollers 10 of the feed mechanism 1. It is equally possible to turn the feed mechanism 1 on its pivot 4, to receive the square timber in a direction which is perpendicular to the axes of the rollers 10.

15 Thereafter, the feed mechanism 1, having taken the square timber in between its rollers, the influence of the guide members 11 on the square timber is discontinued, e.g., by lowering the guide members down below the level of the feed table 6. The square timber being impacted between the rollers 10 of the feed mechanism 1, can turn freely on the feed table 6, along with the swivelling of the feed mechanism 1. The feed
20 mechanism 1 is now operated to feed the square timber in between the opposed chipping blades 7 and 8 of the chipper 2. The curved surfaces which are unfit to be cut into sawn timber are thus dressed off. The spar thus obtained is guided into the blades 13 of the sawing apparatus 3, under guidance by the guide rollers 9.

25 It is essential in the apparatus of aspects of this invention that, since the dimensions and configurations of the timber to be processed have been accurately-measured and are known to the control unit, the transporting of the timber through the entire apparatus takes place under scrupulous control by the control unit. This control is such that the various parts of the apparatus are continuously turned and adjusted in accordance with the curvature of the timber passing therethrough.

Thus, the feed mechanism 1 and the chipper 2 turn together, on the pivot 5, relative to the sawing apparatus 3. The feed mechanism 1 turns on the pivot 4 relative to the chipper 2. The feed mechanism 1 and the chipper 2, thus turn freely and independent of each other. If the curvature changes direction, i.e., if the timber has an "s"-shape, the different component parts of the apparatus follow the timber accurately and move it so that it will arrive at the blades 13 of the sawing apparatus 3 with its direction the same as that of the blades 13, at all times.

CLAIMS

1. An apparatus for sawing a timber, spar or plank, into a plurality of boards, comprising:
 - a frame;
 - a feed mechanism, which is carried on said feed frame;
 - a feed table for feeding said timber in a controlled manner into said feed mechanism;
 - a chipper which is carried on said frame downstream of said feed mechanism, said feed mechanism being operatively associated with said chipper to feed said timber into said chipper, said feed mechanism being connected with a first pivot with a vertical axis to said chipper, said chipper being arranged to remove any curved surface portions from said timber;
 - a sawing apparatus, which is carried on said frame downstream of said chipper, said chipper being connected with a second pivot with a vertical axis to said sawing apparatus, said sawing apparatus being arranged to cut up a spar arriving from said chipper, into boards, or deals; and
 - a control unit for turning said feed mechanism and said chipper on their pivots relative to each other and to the sawing apparatus in a manner consistent with the curvature of said timber.

2. An apparatus for sawing a timber into a plurality of boards, said timber having a longitudinal axis and having a generally-square cross-sectional shape lying in a plane which is generally-normal to the longitudinal axis, said timber being curved along said longitudinal axis, said apparatus comprising:
 - a frame;
 - a feed table on which said timber to be sawed is placed;
 - a feed mechanism for receiving said timber from said feed table and for feeding said timber in a direction which is generally-parallel to its longitudinal axis;
 - a chipper which is coupled to said feed mechanism by a first pivot means by which said feed mechanism and said chipper can move relative to each other, said first pivot means having a rotational axis which is oriented normal to the feeding direction for said timber, said chipper receiving said timber from said feed mechanism and removing curved portions from said timber as said timber passes through said chipper;

sawing apparatus which are mounted on said frame of said apparatus, said sawing means being said coupled to said chipper by a second pivot means by which said chipper can move relative to said sawing means, said second pivot means having a rotational axis which is oriented normal to the feeding direction for said timber, said sawing means receiving said timber from said chipper and sawing said timber into boards as said timber passes through said sawing means; and

a control unit for moving said feed mechanism and said chipper relative to each other about said first pivot means, and for moving said chipper relative to said sawing means about said second pivot means in accordance with the curvature of said timber as said timber moves through said apparatus.

3. An apparatus according to claim 1 or claim 2, wherein said sawing apparatus is mounted on said frame of said apparatus so as to be stationary with respect to said frame.
4. An apparatus according to claim 1, claim 2 or claim 3, wherein said chipper comprises a pair of chipping blades which are spaced in a direction which is normal to the direction said timber passes through said chipper.
5. An apparatus according to claim 1, claim 2 or claim 3, wherein said chipper comprises a pair of chipping blades which are adapted to be disposed on opposite sides of said timber.
6. An apparatus according to claim 1, claim 2, claim 3, claim 4 or claim 5, further including guide means between said chipper and said sawing apparatus for guiding said timber into said sawing apparatus.
7. An apparatus according to claim 1, claim 2, claim 3, claim 4, claim 5 or claim 6, wherein said feed mechanism comprises a pair of spaced rollers between which said timber is fed.

8. An apparatus according to claim 1, claim 2, claim 3, claim 4, claim 5 or claim 6, wherein said feed mechanism comprises rollers which are adapted to be disposed and resting against the planar faces of said timber, thereby to transport said timber into said chipper.

9. An apparatus according to claim 1, claim 2, claim 3, claim 4, claim 5, claim 6, claim 7 or claim 8, wherein said feed table comprises guide members for positioning said timber to be sawed on said feed table.

10. An apparatus according to claim 9, wherein said feed table further includes measuring means for measuring dimensional characteristics of said timber to be sawed, said measuring means being coupled to said control means.

11. An apparatus according to claim 1, claim 2, claim 3, claim 4, claim 5, claim 6, claim 7, claim 8, claim 9 or claim 10, wherein said sawing apparatus comprises a plurality of blades which are adjustably-positioned with respect to each other in accordance with the dimensional characteristics of said timber being sawed, and the dimensions of the boards which are produced from said timber, said blades having parting knives associated therewith.

12. An apparatus according to claim 11, wherein said parting knives are stationary in relation to said blades.

13. An apparatus according to claim 11, wherein said parting knives are pivotable relative to said blades.

14. A method for dividing a timber, spar or plank having curved sides into parts, which method comprises:

directing said timber by a feeding mechanism including feeding rollers between chipping blades, thereby removing its curved sides; and

passing and guiding said timber to a dividing apparatus in conformity with its curvature thereby dividing said timber into parts by

(1) swivelling the monolithic combination constituted by said chipping blades and said feed mechanism rollers, relative to said dividing apparatus; and

(2) swivelling rollers of said feed mechanism relative to said chipping blades.

15. A method for dividing a timber into a plurality of boards, said timber having a longitudinal axis and also having a generally-square cross-sectional shape lying in a plane which is generally-normal to the longitudinal axis, said timber being curved along said longitudinal axis, said method comprising the steps of:

feeding said timber, in a direction which is parallel to its longitudinal axis, from a feed mechanism to a chipper;

passing said timber through said chipper, and removing curved portions from said timber as it passes through said chipper; and

passing said timber from which curved portions have been removed through a dividing means, and dividing said timber into boards as it passes through said dividing means;

said method including the additional steps of:

moving said feed mechanism and said chipper relative to each other about a first rotational axis which is oriented normal to the feeding direction for said timber as said timber moves through said feeding mechanism and said chipper; and

moving said chipper relative to said dividing means about a second rotational axis which is oriented normal to the feeding direction for said timber as said timber moves through said chipper and said dividing means.

16. A method according to claim 14 or claim 15, further including the initial step of ascertaining the dimensional characteristics of said timber; and carrying out said step of relatively moving said feed mechanism and said chipper in accordance with said ascertained characteristics.

