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(54) End dogging device

(57) An end dogging device for use in a sawmill having a saw cluster allows a plurality of flitches to be cut from a workpiece, such as a log or a cant, in a single pass through the saw cluster. The workpiece is clamped between a fixed end dog (26) and a movable end dog (28) both upstream and downstream of the saw cluster (16). Each end dog has two or more fingers (32) which

are held in spaced-apart relation on a pin joint (34). During the sawing operation, the saw passes between adjacent fingers. Accordingly, each individual flitch is supported by opposing pairs of fingers, one on each end dog, thereby preventing the flitches from twisting or otherwise falling relative to each other flitch and relative to the unsawn portion of the workpiece.

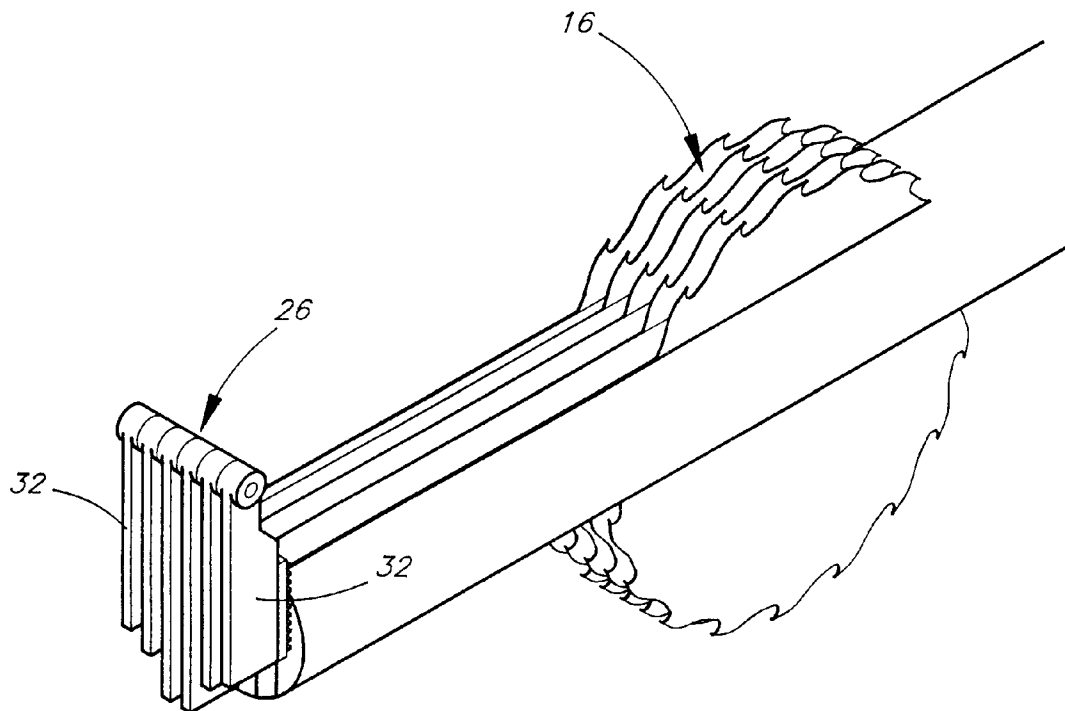


FIG.5

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Description

FIELD OF THE INVENTION

The present invention relates to the field of sawmill equipment and, in particular, to an end dogging device for feeding a workpiece, such as a log or a cant, to a saw cluster for cutting a plurality of flitches from the workpiece.

BACKGROUND OF THE INVENTION

There are many known devices for feeding a workpiece, such as a log or a cant, to a saw for cutting the workpiece longitudinally. For example, a log or cant can be held in place on an infeed with teeth which extend upwardly from the infeed to grip the workpiece. In other devices, a workpiece may be fed to the saw by applying pressure on a flat top surface or at the sides of the workpiece. In many devices, the cutting of a plurality of flitches requires repeated passes of a log or cant past a saw blade, often involving rotation of the log for a subsequent pass through the saws. There are however, some known devices designed for use with multiple saw blades.

For example, Canadian Patent Number 1,051,324 (Kenyon, March 27, 1979) and corresponding United States Patent Number 4,127,044 (Kenyon, November 28, 1978) relate to a feeding mechanism for a gang saw. A cant is fed on a set of spiral rollers rotatably mounted on a carrier and then passes between a pressure roller which exerts an inward lateral orienting pressure on the cant and a control pressure roller which bears on a convex side surface of the cant. A feed roller exerts pressure on the top and bottom of the cant proximate the gang of band saws.

This type of feed mechanism focusses primarily on holding a log in position only upstream of the saw with no means for guiding the sawn lumber downstream from the gang saw. This raises safety and quality control concerns, especially as the end of the cant approaches the gang saw. It will be appreciated by those skilled in the art that unsupported flitches will tend to fall sideways and downwardly and/or twist with respect to each other and the unsawn portion of the cant. The flitches may then not be straight or of uniform thickness. Moreover, the falling flitches could cause injury to a person standing nearby. This problem is addressed in the following two patents.

United States Patent Number 4,363,252 (Volk, December 14, 1982) discloses a multiple blade circular sawing machine wherein each blade extends through a slot of a depressor member equipped with four rollers which project slightly beyond the lower edge of the depressor member. In operation, the rollers of the depressor member press on a flat upper surface of the upstream and downstream sides of a workpiece as it is conveyed on a conveyor chain through the multiple saw

blades. It does not appear that this device is adaptable to the sawing of round logs.

United States Patent Number 5,287,782 (Scott, February 22, 1994) teaches a clamp or hold-down assembly for a rip saw with multiple saws. The clamp or hold-down assemblies are adapted to be secured to the frame of a saw apparatus. A first assembly is positioned upstream from the circular saw blades to bear down on a workpiece with an elongated pressure shoe. A second assembly has a roller which holds down the sawn lumber on a slat bed dip chain conveyer supporting the underside of the lumber. This device also appears to be applicable only to workpieces with a flat upper surface and does not appear to have application to round logs.

While the devices described in United States Patent Numbers 4,363,252 and 5,287,782 restrict, at least to some degree, undesirable movement of the sawn lumber, the sawn lumber may be pushed in such a way that undue pressure is exerted on the saw blades of the gang saw, again representing safety and quality control problems. It would therefore be advantageous to provide a mechanism whereby the sawn lumber is held in spaced-apart relation to each other.

For example, Canadian Patent Number 110,023 (Douglas, January 8, 1908) describes a feed mechanism for a circular gang sawing machine wherein the workpiece is fed to the saw blades by a plurality of grooved feeding rolls. Pressure rolls, located one on each side of the saw blades and one upstream of the saw blades, bear on a flat upper surface of the workpiece against the feeding rolls to bind and hold the workpiece more securely in place. A plurality of guide blades are provided immediately above the point at which the saws enter the workpiece to contact adjacent saw blades with a minimum amount of friction. At the rear of the saw, a set of spreading blades enter in the kerfs to prevent binding of the sawn lumber against the sides of the saw blades.

Many of the above-mentioned devices are suitable only for workpieces which have at least upper and lower flat surfaces and these are therefore not suitable for round workpieces, such as logs. Known devices adaptable to feeding both round workpieces and workpieces having flat surfaces into a sawmill are end dogs which bear on the ends of the log. However, such devices are not adaptable to cutting a plurality of flitches simultaneously.

For example, Canadian Patent Application Number 2,062,521 (Wijesinghe, published September 13, 1992) discloses a log carriage for supporting a log during a sawing operation. The carriage has a carriage frame supported by a plurality of rollers on a pair of spaced-apart guide tracks. The carriage frame has a lower platform and an upper perimeter portion connected to the lower platform by four uprights. A pair of dog assemblies are mounted on the carriage frame. Each dog assembly supports a dog member which is in the form of a disk with a plurality of pointed projections thereon. The dog

members are hydraulically movable in relation to each other. A log is supported initially by a pair of rolls in each dog assembly and once the dog members are caused to grip the log therebetween, the rolls are returned to their original position so that the log is solely supported by the dog member. The log may then be scanned with a laser or X-ray scanner and/or fed to a saw blade.

In the sawmill described in Canadian Patent Number 949,432 (Hartzell et al, June 18, 1974), a log is supported by a carriage having an elongated rigid top member and a support bracket at each end thereof, hydraulically movable in relation to each other. One of the support brackets has a pointed dog element extending toward the opposite end of the elongated top member. The other support bracket has a bar-like dogging member rotatably mounted thereon. The bar-like dogging member has three pointed elements, the centre point of which is coaxial with the point of the pointed dog element. The lateral pointed elements permit the log to be rotated while it is gripped between the dogging members. Once a log is gripped between the dogging members, the log is passed by two circular saw blades which cut two parallel boards from the sides of the log. The log is then rotated between the dogging members to saw two boards from the remaining two sides of the log. A plurality of boards are cut from the log by repeatedly passing the resultant cant past the saw blades.

Thus it can be seen that end dogging devices of the prior art are adapted only to the sawing of one or two slabs from a log in a single pass. United States Patent Number 4,264,064 (Allen et al, April 28, 1981) describes an end dogging log carriage which permits more than two boards to be cut from a log by positioning a second pair of band saws downstream from the first pair of band saws. A pair of spaced end dogs which grip the end faces of a log and are mounted at upper ends of a fixed jaw and a movable jaw. An intermediate dog is mounted on the carriage between the end dogs and is adapted to engage the log extending between the end dogs to reduce lateral movement of the log relative to the carriage. In use, a log is positioned and gripped by the end dogs and the intermediate dog is raised upwards to engage the log and partially penetrate the log in an amount slightly greater than that necessary to overcome downward bowing of the log due to the weight of the log. The log is then fed to the quad band mill having two pairs of band saws, the first pair cutting two outside slabs and the second pair cutting two subsequent slabs from the log. The individual flitches cut from the log are not supported.

The prior art primarily focusses on holding a log in position only upstream of the saw however, some of the prior art devices also bear on the sawn lumber downstream of the saw. Few of these devices also endeavour to hold, even temporarily, the sawn lumber in spaced-apart relation to each other. None of the prior art devices are adapted for feeding a workpiece to a gang sawmill for the simultaneous cutting of a plurality of boards

therefrom and for holding the boards in spaced-apart relation during the sawing operation.

It is an object of the present invention to provide a device for feeding a workpiece to a gang sawmill for the simultaneous cutting of a plurality of flitches or boards therefrom and for holding the flitches or boards in spaced-apart relation during the sawing operation.

It is a further object of the present invention to provide a device which allows the thickness of the boards being cut in a gang sawmill to be adjustable.

It is another object of the present invention to provide a device which allows boards of different thicknesses to be cut simultaneously in a gang sawmill.

15 SUMMARY OF THE INVENTION

In accordance with one aspect of the present invention, there is provided an end dog for a sawmill having a cluster of saws, comprising at least two fingers held in spaced-apart relation on a pin joint, the distance between adjacent fingers sufficient to allow passage of a saw of the saw cluster therebetween, and gripping means on at least a portion of a face of each finger for gripping an end face of a workpiece.

In accordance with another aspect of the present invention, there is provided a carriage for a sawmill having a cluster of saws, comprising a pair of end dogs, wherein at least one of the end dogs is movable in relation to the other end dog; the end dogs having at least two opposed pairs of fingers, adjacent fingers of each end dog held in spaced-apart relation on a pin joint, the distance between adjacent fingers sufficient to allow passage of a saw of the saw cluster therebetween; and gripping means provided on at least a portion of opposing faces of each finger for gripping the end faces of a workpiece.

In accordance with a further aspect of the present invention, there is provided in a sawmill having a saw cluster for cutting a plurality of flitches from a workpiece, the improvement comprising a carriage supporting a pair of end dogs; the end dogs having at least two opposed pairs of fingers, adjacent fingers of each end dog held in spaced-apart relation on a pin joint, the distance between adjacent fingers sufficient to allow passage of a saw of the saw cluster therebetween; and gripping means provided on at least a portion of opposing faces of each finger for gripping the end faces of the workpiece; carriage moving means for moving the carriage from a downstream side of the saw cluster to an upstream side of the saw cluster and for moving the carriage from the upstream side of the saw cluster to the downstream side of the saw cluster; and end dog moving means for moving at least one of the end dogs relative to the other end dog.

55 BRIEF DESCRIPTION OF THE DRAWINGS

In drawings which illustrate embodiments of the

present invention:

Figure 1 is a front elevational view of a sawmill according to the present invention;

Figure 2 is a side elevational view of the sawmill of Figure 1;

Figure 3 is a side elevational view of another embodiment of an end dog according to the present invention;

Figure 4 is a front elevational view of an end dog in an extended position; and

Figure 5 is a perspective view of a partially cut log passing through a saw cluster and supported by an end dog of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Figure 1, a sawmill 10 has a frame 12, an infeed 14, a saw cluster 16 and a discharge device 18. A beam 22 is supported by the frame 12 and extends along the length of the sawmill 10, over the infeed 14, the saw cluster 16 and the discharge device 18. A carriage 24 is mounted on the beam 22 such that the carriage 24 can move from the upstream side of the saw cluster 16 to the downstream side of the saw cluster 16 and then return to the upstream side.

The carriage 24 has two opposing end dogs for clamping the end faces of a workpiece, such as a log or a cant. One of the end dogs is a fixed end dog 26 and the other is a movable end dog 28. Each end dog 26, 28 has two or more fingers 32 which are held in spaced-apart relation to each other on an end dog pin joint 34. The opposing pairs of fingers 32 on each end dog 26, 28 are substantially in alignment with each other, such that the spaces formed therebetween are substantially in alignment with the saws of the saw cluster 16, as shown more clearly in Figure 2.

The finger 32 may be formed as shown in Figure 2 to have a shoulder portion 36 which spaces two adjacent fingers 32 along the pin joint 34 so that there is at least a minimum clearance for a saw of the saw cluster 16. This allows a plurality of relatively thin flitches to be cut simultaneously with good quality control. If a thicker flitch is desired, a spacer (not shown) can be used between adjacent fingers 32.

The spacing of adjacent fingers 32 on the end dog pin joint 34 may also be effected as shown in Figure 3. In the embodiment shown in Figure 3, the finger 32 is of substantially uniform thickness along the length of the finger 32. A space is provided between adjacent fingers 32 by placing a spacer 38 between adjacent fingers 32. The spacing can be adjusted by providing additional spacers 38, as shown in Figure 3, and/or by providing spacers of different thicknesses between adjacent fingers 32.

In accordance with the present invention, it is also possible to cut flitches of different thicknesses at the

same time by adjusting the spaces between adjacent fingers 32. In this case, the fingers 32 of the end dogs 26, 28 may be arranged as shown in Figure 3 so that the centre flitch is thicker than the outer flitches. The saws of the saw cluster 16 would then be arranged on the saw arbour. Each flitch is supported between two opposing fingers 32, one on each end dog 26, 28. In the case of relatively thick flitches, if desired, additional support may be provided by arranging the fingers 32 and the spacers 38 so that the end face of each flitch is clamped by two or more opposing fingers 32.

At least a portion of the inside face of the finger 32 is provided with gripping means 42, for example teeth, a pointed element or a serrated surface. In the embodiment shown in Figure 4, the gripping means 42 is a series of horizontal ridges 44 which act as teeth to grip the end face of a workpiece. The gripping means 42 minimizes the chance of a flitch becoming unclamped between the fingers 32, thereby reducing safety hazards and increasing quality control.

In the embodiment shown in Figure 2, the length of the fingers 32 of each end dog 26, 28 is staggered so that the longest fingers 32 are in the centre of the end dog 26, 28. The end dogs 26, 28 are formed in this manner for two reasons. Firstly, only a portion of the inside faces of the fingers 32 are provided with gripping means 42 and due to the cross-section of the log, the gripping means 42 are higher on the outer fingers 32. Secondly, for some infeed devices, such as log rollers, it is preferable to have fingers 32 of varying lengths to accommodate movement of the log rollers in relation to each other. However, it is possible to form the fingers of substantially equal lengths as shown in the embodiment depicted in Figure 3, for example if another type of infeed is used and/or a greater portion of the inside faces of the fingers 32 are provided with gripping means 42.

In the embodiment shown in the drawings, the fingers 32 of the movable end dog 28 are movable about the pin joint 34, for example, by a hydraulic or pneumatic cylinder. Preferably, each finger 32 of the movable end dog 28 is controlled by an independent double-acting cylinder 46 which causes partial rotation of the finger 32 about the pin joint 34 when the rod 48 of the cylinder 46 is extended and retracted. However, movement of the fingers 32 of may also be controlled by a single cylinder, for example by acting on a plate (not shown) connecting the fingers 32.

The use of a fluid cylinder to partially rotate the fingers 32, either individually or together, about the pin joint 34 is advantageous in that the subsequent workpiece may be placed in the infeed 14 while the current workpiece is being sawn. When the flitches are released to the discharge device 18, the movable end dog 28 is extended as shown in Figure 4. The carriage 24 is then moved back through the saw cluster 16. The movable end dog 28 thus clears the subsequent log already in position in the infeed 14. Accordingly, the use of the movable end dog 28 which is partially rotatable about

the pin joint 34 reduces the down-time between sawing operations and a higher throughput is possible.

The movable end dog 28 may also be movable with respect to the fixed end dog 26 by sliding either on the carriage 24 or on the beam 22 in a longitudinal direction. The sliding movement may also be effected by a fluid cylinder (not shown).

Furthermore, if desired, both end dogs may be movable, either by partially rotating about the pin joint or by sliding in a longitudinal direction.

The longitudinal spacing of the fixed end dog 26 and the movable end dog 28 may be adjusted, for example, by bolt hole spacings (not shown) on the carriage 24, by a fluid cylinder (not shown) or by other suitable means.

A workpiece is clamped between the fixed end dog 26 and the movable end dog 28 by extending the rod 48 of the hydraulic cylinder 46, positioning the workpiece longitudinally between the fixed end dog 26 and the movable end dog 28, and retracting the rod 48 of the hydraulic cylinder 46. The workpiece is held between the end dogs 26, 28 during the entire sawing operation. Moreover, each individual flitch cut from the workpiece is clamped between two opposing fingers 32, one from each end dog 26, 28, until the sawing operation is complete and the flitches are discharged, by retracting the rod 48 of the hydraulic cylinder 46, into the discharge area 18 of the sawmill 10. Figure 5 illustrates how a partially cut log is supported by the end dogs 26, 28 of the present invention during the sawing operation.

The carriage 24 is movable on the beam 22, from the infeed 14 to the discharge area 18 of the sawmill 10. In the embodiment depicted in the drawings, the carriage 24 is provided with a sprocket (not shown) which engages a chain 54 extending along the length of the sawmill 10 above the beam 22. The carriage 24 is provided with wheels (not shown) for movement along the beam 22. It will be appreciated by those skilled in the art that other arrangements are possible for movement of the carriage 24 relative to the beam 22, for example by electric, hydraulic, pneumatic or mechanical friction means.

In the embodiments shown in the drawings, both end dogs 26, 28 are mounted on opposite ends of the carriage 24 which is formed substantially as a rectangular tube. It will be appreciated by those skilled in the art that the carriage 24 may also be formed of two support brackets (not shown), one for each end dog 26, 28, adapted for movement on the beam 22.

The infeed 14 may be, for example, a pair of parallel log rollers 56 mounted on the frame 12. Such log rollers are known in the prior art. A suitable log roller is manufactured by Anderson Ventures Ltd. of Fredericton, New Brunswick, Canada. Typically, such log rollers are movable with respect to each other to allow an operator to orient a log as desired. The infeed 14 may alternatively be a cradle as shown in Canadian Patent Number 949,432. Regardless of the configuration, the infeed 14 is purposed to hold the workpiece in position for clamp-

ing by the end dogs 26, 28.

Preferably, the logs are trimmed to a predetermined length and to provide "clean" end faces prior to being fed to the infeed 14. A clean end face allows for better gripping by the gripping means 42 of the fingers 32.

The saw cluster 16 is comprised of the desired number of saw blades arranged on an arbour. The saws are spaced on the arbour to achieve the desired thickness of flitch. The saws are arranged such that the blades pass through the spaces between the fingers 32 of the end dogs 26, 28. The discharge device 18 of the sawmill 10 may be a belt or chain conveyor, for example.

The sawmill of the present invention may be operated manually, automatically or semi-automatically.

In the discussion of operation of the device of the present invention below, it will be understood that while reference is made to a log, operation of the end dogging device of the present invention is also applicable to a cant or other such workpiece.

In operation, the fingers 32 are spaced, with spacers 38 if necessary, on the pin joint 34 of the fixed and movable end dogs 26, 28 such that flitches of the desired thickness can be cut. The saws of the saw cluster 16 are arranged on the saw arbour to correspond to the spaces formed between adjacent fingers 32 of the end dogs 26, 28. The carriage 24 is positioned over the infeed 14. A log is fed to the log rollers 56, for example, via a ladder (not shown) which trims the log to a predetermined length and provides "clean" end faces of the log. An operator rotates the log by moving the log rollers 56 to orient the log as desired. The carriage 24 is moved over the log so that the fixed end dog 26 abuts one end face of the log. The operator causes the movable end dog 28 to move against the second end face of the log by controlling the hydraulic cylinders 46 attached to the fingers 32 of the movable end dog 28. The log is thus urged against the gripping means 42 of the fingers 32 of the fixed end dog 26 and the log is clamped between the fixed end dog 26 and the movable end dog 28.

The carriage 24 is then moved along the beam 22, for example by a chain-driven sprocket, towards the saw cluster 16. The log is passed through the saw cluster 16 while still being gripped between the fixed end dog 26 and the movable end dog 28. Accordingly, the partially sawn flitches are held in spaced-apart relation with each adjacent flitch and in alignment with the unsawn portion of the log. The outer slabs of the log may fall away from the flitches. Once the log has passed completely through the saw cluster 16, the sawn flitches continue to be held in spaced-apart relation by the fingers 32 of the end dogs 26, 28. The carriage 24 continues to move along the beam 22 to the discharge device 18. The rods 48 of the hydraulic cylinders 46 of the movable end dog 28 are then extended to release the flitches to the discharge device 18. The flitches fall onto the discharge device 18 for subsequent sorting and/or processing.

The carriage 24 is then moved back past the saw cluster 16 to the log rollers 56 for clamping another log.

The log may already be in position on the log rollers 56, in which case the movable end dog 28 which is in the extended position, as shown in Figure 4, passes over the log. The fixed end dog 26 however, does not clear the log and abuts the end of the log proximate the saw cluster 16. The rods 48 of the hydraulic cylinders 46 are then retracted so that the movable end dog 28 abuts the second end of the log, urging the first end of the log against the fixed end dog 26, and the process is repeated.

In accordance with the present invention, a workpiece is clamped between two end dogs during the entire sawing operation. Moreover, each individual flitch cut from the workpiece is clamped between two opposing fingers, one from each end dog, until the sawing operation is complete. Since the sawn portion of the workpiece is held in alignment with the unsawn portion of the workpiece during the sawing operation, the partially cut flitches do not "kick" in the saw cluster or tend to twist or otherwise fall out of alignment with the unsawn workpiece. Accordingly, the flitches are of good quality, of uniform thickness and straight. Since the quality control is improved substantially, the flitches can therefore be cut to a finished size. This eliminates the requirement for a planing operation after sawing to correct defects that are found in flitches cut by prior art sawmills. This not only represents a saving of time since a plurality of flitches are sawn simultaneously instead of by repeated passes past a saw and a planing step is not required, but there is also a substantial reduction in material waste. A planing step can typically consume 20 to 30% of material.

Claims

1. An end dog for a sawmill having a cluster of saws, comprising at least two fingers held in spaced-apart relation on a pin joint, the distance between adjacent fingers sufficient to allow passage of a saw of the saw cluster therebetween, and gripping means on at least a portion of a face of each finger for gripping an end face of a workpiece.
2. An end dog according to claim 1, wherein the gripping means is one or more teeth.
3. An end dog according to claim 1, wherein the gripping means is one or more pointed elements.
4. An end dog according to claim 1, wherein the gripping means is a serrated surface.
5. An end dog according to claim 1, wherein the fingers are at least partially rotatable about the pin joint.
6. An end dog according to claim 5, further comprising a fluid cylinder for partially rotating the fingers.
7. An end dog according to claim 6, wherein each finger is provided with a hydraulic cylinder.
8. An end dog according to claim 1, wherein adjacent fingers are held in spaced-apart relation by a spacer member.
9. An end dog according to claim 1, wherein adjacent fingers are held in spaced-apart relation by a thickened shoulder portion on the fingers.
10. A carriage for a sawmill having a cluster of saws, comprising a pair of end dogs, wherein at least one of the end dogs is movable in relation to the other end dog; the end dogs having at least two opposed pairs of fingers, adjacent fingers of each end dog held in spaced-apart relation on a pin joint, the distance between adjacent fingers sufficient to allow passage of a saw of the saw cluster therebetween; and gripping means provided on at least a portion of opposing faces of each finger for gripping the end faces of a workpiece.
11. A carriage according to claim 10, wherein at least one of the end dogs is movable by at least partial rotation of the fingers of the end dog about the pin joint.
12. A carriage according to claim 11, further comprising a hydraulic cylinder for partially rotating the fingers.
13. A carriage according to claim 12, wherein each finger is provided with a hydraulic cylinder.
14. A carriage according to claim 10, wherein at least one of the end dogs is slidably movable with respect to the other end dog.
15. A carriage according to claim 10, wherein the gripping means is one or more teeth.
16. A carriage according to claim 10, wherein the gripping means is one or more pointed elements.
17. A carriage according to claim 10, wherein the gripping means is a serrated surface.
18. A carriage according to claim 10, wherein adjacent fingers are held in spaced-apart relation by a spacer member.
19. A carriage according to claim 10, wherein adjacent fingers are held in spaced-apart relation by a thickened shoulder portion on the fingers.
20. In a sawmill having a saw cluster for cutting a plu-

ality of flitches from a workpiece, the improvement comprising:

a carriage supporting a pair of end dogs; the end dogs having at least two opposed pairs of fingers, adjacent fingers of each end dog held in spaced-apart relation on a pin joint, the distance between adjacent fingers sufficient to allow passage of a saw of the saw cluster therebetween; and gripping means provided on at least a portion of opposing faces of each finger for gripping the end faces of the workpiece; carriage moving means for moving the carriage from a downstream side of the saw cluster to an upstream side of the saw cluster and for moving the carriage from the upstream side of the saw cluster to the downstream side of the saw cluster; and end dog moving means for moving at least one of the end dogs relative to the other end dog.

21. In a sawmill according to claim 20, wherein the end dog moving means is a hydraulic cylinder for partially rotating the fingers of the at least one end dog about the pin joint.
22. In a sawmill according to claim 21, wherein each finger is provided with a hydraulic cylinder.
23. In a sawmill according to claim 20, wherein the end dog moving means is a hydraulic cylinder adapted to slidably move at least one of the end dogs with respect to the other end dog.
24. In a sawmill according to claim 20, wherein the gripping means is one or more teeth.
25. In a sawmill according to claim 20, wherein the gripping means is one or more pointed elements.
26. In a sawmill according to claim 20, wherein the gripping means is a serrated surface.
27. In a sawmill according to claim 20, wherein adjacent fingers of each end dog are held in spaced-apart relation by a spacer member.
28. In a sawmill according to claim 20, wherein adjacent fingers are held in spaced-apart relation by a shoulder portion on the fingers.

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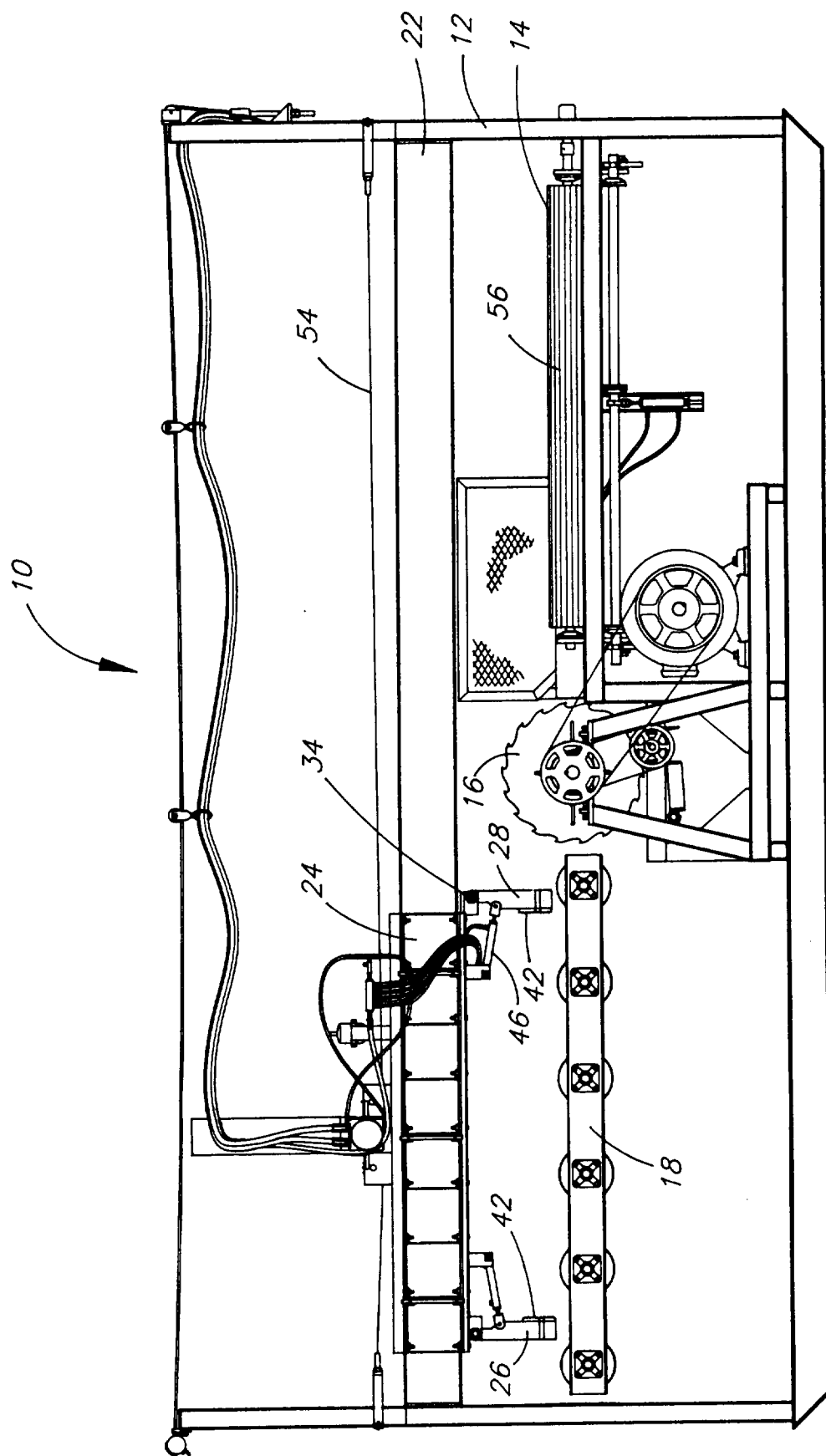


FIG. 1

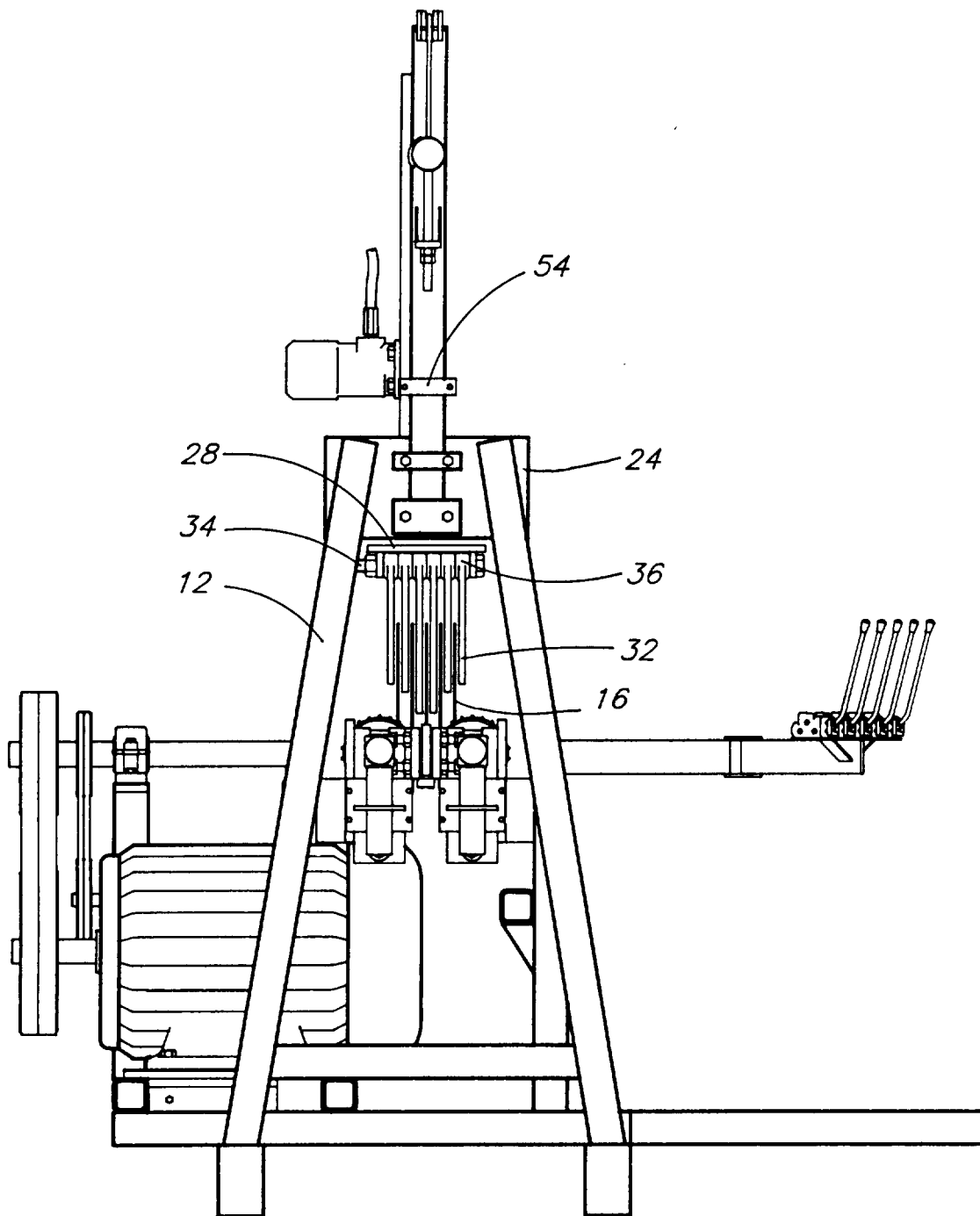


FIG.2

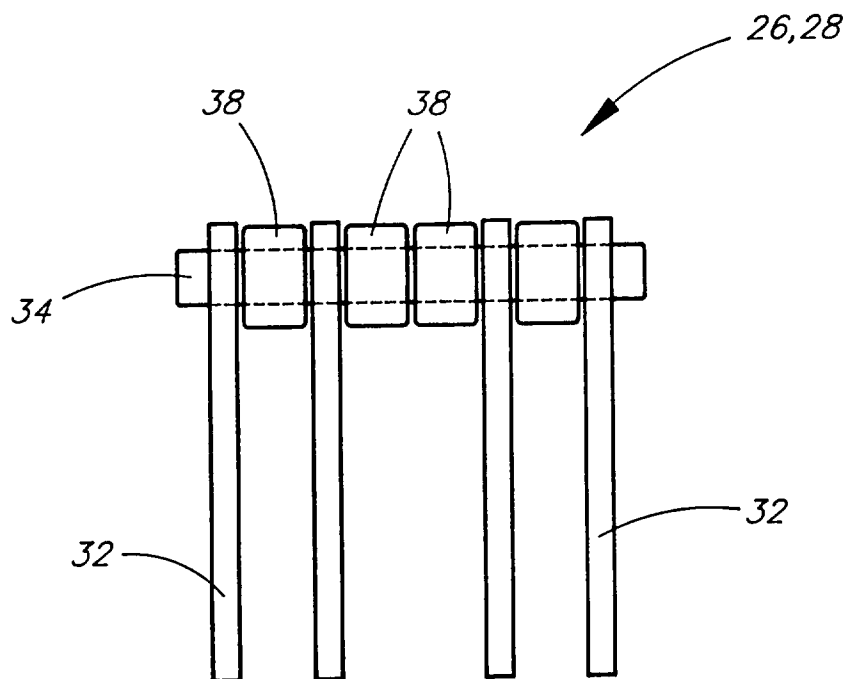


FIG. 3

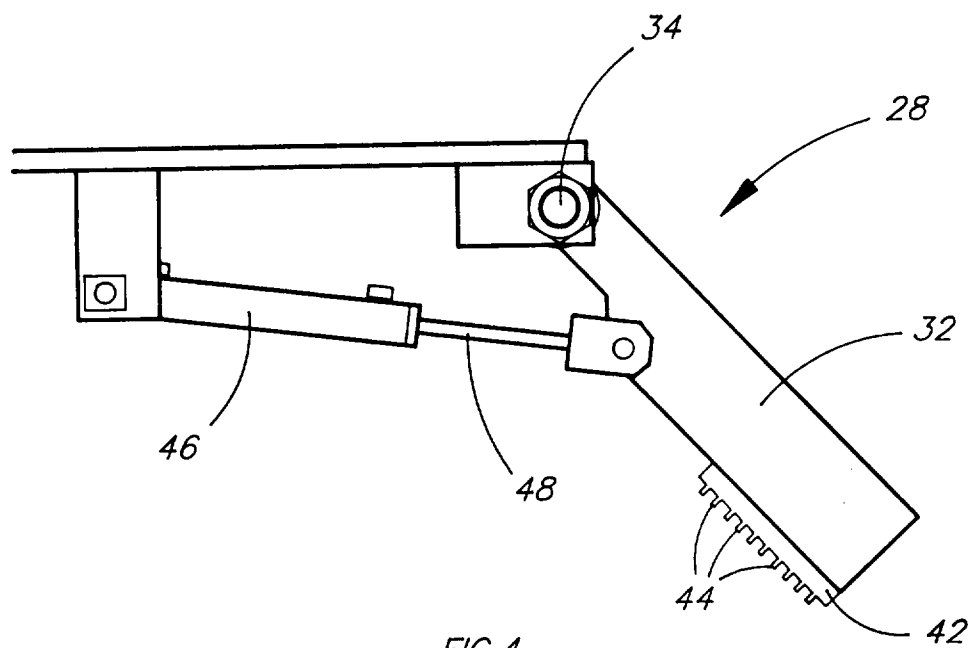


FIG. 4

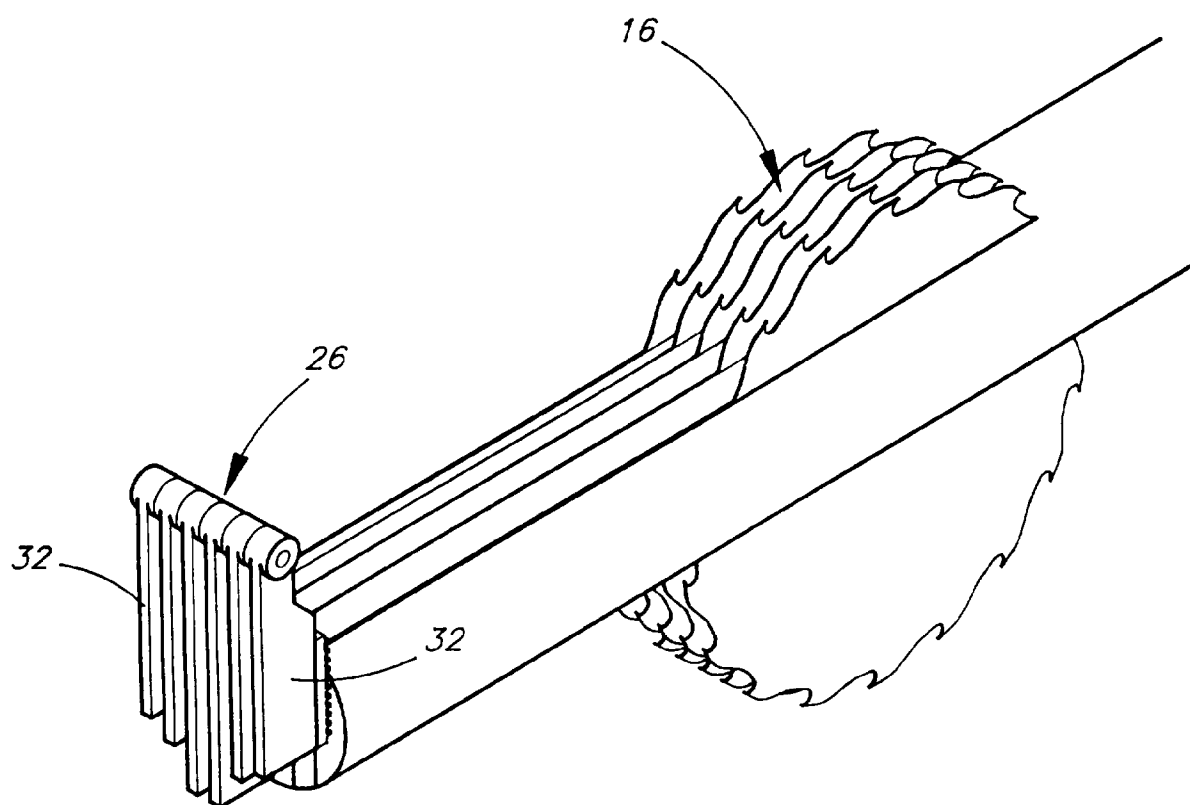


FIG.5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 30 7519

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US-A-3 224 475 (A. FEHR)	1-6, 10-13, 15-17, 20,21, 24-26	B27B29/08
Y	* column 2, line 18 - line 22 * * column 2, line 37 - line 64 * * figures 1,2,4,5 * ---	7,14,22, 23	
Y	DE-A-27 54 502 (WEYERHAEUSER CO) * page 18, line 21 - line 23 * * page 19, line 20 - line 28 * * figure 9 * ---	7,14,22, 23	
A	US-A-5 052 885 (T.C. FOSTER) -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B27B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 February 1996	Examiner Moet, H
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