

PATENT SPECIFICATION

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DRAWINGS ATTACHED



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(54) IMPROVEMENTS IN BAND SAWS

(71) We, KABUSHIKI KAISHA FUJI SEISAKUSHO, a corporation organised and existing under the laws of Japan, of No. 401, Hinode-cho, Sanmaibashi, Numazu-shi, Shizuoka-ken, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a band saw of the type in which wood, for example in the form of logs, is automatically moved and sawn, and in which those portions of the logs which are to be resawn are automatically returned to the operator.

Some band saws are adapted to saw logs of large diameters and other band saws are for sawing relatively small-sized logs or lumber. The former type of band saw utilises a truck on which a log is securely mounted for conveyance, while in the latter type of band saws logs or lumber are transferred completely manually or with the help of feed rollers. The present invention relates to a band saw of the latter type.

Known band saws usually include a table or a group of rollers disposed within a horizontal plane, on which lumber to be sawn is placed. On the horizontal plane defined by this table or the group of rollers, there is mounted a gauging guide on one side of the plane and a feed roller on the other side of the plane. A band saw is located between the guide and the feed roller at a short distance behind them. This feed roller is biased towards the guide with its axis of rotation perpendicular to the plane. Thus, when one end of a piece of wood is placed on the said table, the feed roller urges one side of the wood into contact with the guide and at the same time feeds the wood held between the guide and the feed roller into the travelling path of the band saw.

A "bend" or "twist" will sometimes take place in wood being sawn at the rear of the band saw. If a considerable "bend" or

"twist" is thus caused, this will result in a distorted kerf and the band saw will produce off-grade products.

Moreover, since known band saws are designed to feed wood into the saw by means of a feed roller which comes into a frictional engagement with the wood, the sawway or kerf made by the saw tends to be distorted. Thus, in sawing wood with a band saw, an operator is required to hold the wood being sawn at the bottom end thereof, to steer the wood and push the wood into the travelling path of the band saw. In a sawing operation using a band saw, another operator is usually required positioned at the rear of the saw in the direction of lumber feed to catch and pull the wood being sawn by holding it at the top end thereof, and the remaining material to be sawn again must be pushed back to the first mentioned operator leaving the sawn lumber behind.

An object of the present invention is to provide a band saw which is so designed that without any assistance of an operator, lumber is automatically fed into the travelling path of a band saw, the lumber is sawn, and that part which is to be resawn is automatically sorted and returned to the operator.

According to the present invention there is provided a band saw with a roller conveyor for automatically returning a portion of a sawn lumber which is to be resawn to the operator, the lumber being fed to a band saw blade on a horizontal roller conveyor by means of two driven feed rollers each mounted on a respective horizontal shaft above the horizontal roller conveyor, one feed roller being disposed in the front and the other roller at the rear of the band saw blade in the direction of lumber feed, and means for raising or lowering said two horizontal feed rollers in unison.

The two horizontal feed rollers act to press wood on the conveyor at the front and

at the rear of the band saw, while forcing the wood to move along a gauging guide.

In one embodiment of the invention, the band saw is provided with a guard roller disposed on the opposite side of the feed conveyor to the gauging guide and adapted to freely rotate about a vertical axis, the roller being biased towards the guide. The guard roller is further adapted so that it goes down below the feed conveyor when it is not required to function.

In a further embodiment of the present invention, the band saw is provided with a guide plate and divider means which are disposed at the rear of the saw. This guide plate is adapted so that as the top end of wood being sawn and conveyed approaches, the plate enters into the kerf or cut made by the saw to a certain depth and then guides the wood by means of the kerf so as to ensure a straight cut. The divider means is mounted below the feed conveyor so that as the wood comes out of engagement with the guide plate, the divider means fits into kerf made in the wood from beneath the conveyor and divides the sawn lumber and lumber to be resawn.

In the accompanying drawings:

Figure 1 is a plan view of an automatic band saw according to the present invention;

Figure 2 is a plan view showing in detail the band saw blade and the adjacent part of the automatic band saw shown in Figure 1;

Figure 3 is a side view of those parts of the automatic band saw shown in Figure 2;

Figure 4 is a side view showing a guard roller adapted to urge wood against a gauging guide;

Figure 5 is an end view showing a guide plate fitted into the kerf of the sawn wood;

Figures 6 and 7 are views showing divider means and a wire drum used with the divider means, respectively; and

Figure 8 is a view showing another embodiment of the divider means.

In the plan view of Figure 1, designated at numeral 1 is the principal part which corresponds to the conventional band saw; a feed roller conveyor is shown at 2; and a roller conveyor 3 for returning the lumber to be resawn.

This principal part 1 is illustrated in Figure 2 on a larger scale and the section cut through line III—III is shown in Figure 3. A plurality of idle rollers 12 are mounted on a frame 11 and wood 13 to be sawn is conveyed over the rollers 12. Pressed against the surface of the wood 13 are a first feed roller 17 having a horizontal shaft 16 journaled in the free end of an arm 15 pivotally secured to a base 14, and a second feed roller 21 having a horizontal shaft 20 supported by the arm 15 and link members 18, 19. These two feed rollers are respectively

disposed at the front and at the rear of a band saw 22, and press the wood, before and after the sawing operation, against the rollers 12 to guide the wood in a straight line. The driven feed rollers 17 and 21 are preferably formed on their respective peripheries with protrusions 17a and 21a extending in parallel with the shafts 16 and 20, respectively, and these protrusions ensure that the wood 13 makes headway straight. Under some circumstances, the rollers 12 on the frame 11 may be disposed with a slight gradient with respect to a guide 23 to ensure that the wood 13 is positively guided along the guide 23. The first and second feed rollers 17 and 21 are moved up and down by means of an air cylinder 24 mounted between the base 14 and arm 15, and the second feed roller 21 may be biased, for example, by means of a spring (not shown) mounted on a link arm 18 so that it is located slightly below the first feed roller 17.

Although no extensions of the feed conveyor and the return conveyor for the lumber to be resawn are shown in the front of the principal part 1 in Figure 1, conveyor means may be provided to form such extensions for the respective conveyor paths. Now assuming that the wood 13 is fed into the principal part 1 by means of driven rollers (not shown) disposed in the front of the principal part 1, a limit switch 23a of the gauging guide 23 actuates a cylinder 26 so that a guard roller 25 causes the wood 13 to be guided along the guide 23. As shown in Figure 2 and in Figure 4, this guard roller 25 is moved by means of the cylinder 26 so that the roller 25 is kept in operation until the wood 13 completely sawn to thereby ensure that the wood is sawn in a straight line. However, if wide and flat lumber is to be sawn, for example, a support arm 28 of the roller 25 may be pulled down by means of an auxiliary cylinder 27 to cause the roller 25 to go down below the conveyance surface provided by the group of rollers 12.

The wood 13 is sawn by the band saw 22 as it is guided along the guide 23 by the guard roller 25 and drawn in by the feed roller 21, and the wood is then pushed further past the first roller 17 under the added feeding force of the roller 17.

Disposed at the rear of the first feed roller 17 is a guide plate 30 suspended from the upper frame 11 by means of dependent arms 29. As shown in Figure 2 and Figure 3, this guide plate is located over the sawway at the rear of the band saw 22. Thus, a tip 31 of the guide plate enters into a kerf 32 of the wood 13 just at the back of the first feed roller 17 and the guide plate 30 is then swung backwards until fins 33 of the plate 30 ride on the surface of the wood 13 (see Figure 5). This swinging guide plate 30

suspended from the dependent arms 29 ensures, despite its very simple construction, that the plate is led positively into the kerf 32.

- 5 With the guide plate 30 placed in the kerf as described above, the wood 13 is driven on to driven rollers 34 which are in alignment with the rollers 12. At a position where the wood eventually disengages from the guide plate 30, divider means disposed below the rollers 34 are actuated and, as shown in Figure 1 for example, the divider means may be disposed at three points on the sawway line and may each have a structure as shown in Figure 6 or in Figure 8.

- 10 In the embodiment shown in Figure 6, the divider means is actuated as a motor 35 winds a wire 37 on its drum 36. As the wire 37 is wound on the drum 36, a lever 38 is pivoted in the direction of the arrow shown. This pivots a coaxially secured crank lever 39 and projects a nail 41 on a link bar 40 into the kerf 32. The crank lever 39 then engages a pin 43 on a pivotable arm 42 to move the arm 42 to a position shown in Figure 6 by a dotted line. In this way, lumber to be resawn 13a on the driven rollers 34 is transferred on to returning driven rollers 44. On the other hand, sawn lumber 13b is pushed away from the conveyor 2 by means of levers 39¹, 42¹, a link arm 40¹ and a nail 41¹ which are actuated by a slotted second crank lever (not shown) connected to the lever 38 and acting on the crank lever 39¹ by means of a slot and pin arrangement in a similar manner to the actuation of the levers 39, 42 and nail 41. As lever 38 pivots, the slotted second crank lever also pivots and, by means of a pin mounted at the joint of link arm 40¹ and crank lever 39¹ and projecting into the slot of the second lever, causes lever 39¹ to pivot. The divider means shown in Figure 8 is the same as the embodiment of Figure 6, except that the motor and the wire in the latter are replaced by a cylinder 45.

- 50 Upon completion of the dividing operation which separates the material to be resawn from the sawn lumber 13b, the lever 38 actuates a limit switch 46 which in turn causes a weight 47 to unwind the wire 37 from the drum 36. Whereupon, the crank lever 39 tends in the first place to return to its original position leaving the pivotable lever 42 in its position shown by the chain line. Thus the nail 41 is withdrawn by the link lever 40 and a collar 48 which is slidably mounted on the lever 42 engages pins 49 to thereby return the pivotable lever 42 to its initial position.

- 65 The lumber to be resawn 13a which has been transferred on to the returning conveyor from the feed conveyor 2 by the

divider means is returned by means of the driven rollers 44 back to the operator in front of the principal part 1 where the operator supplies it to the feed conveyor for the resawing process.

WHAT WE CLAIM IS:—

1. A band saw with a roller conveyor for automatically returning a portion of a sawn lumber which is to be resawn to the operator, the lumber being fed to a band saw blade on a horizontal roller conveyor by means of two driven feed rollers each mounted on a respective horizontal shaft above the horizontal roller conveyor, one feed roller being disposed in the front and the other roller at the rear of the band saw blade in the direction of lumber feed, and means for raising or lowering said two horizontal feed rollers in unison.

2. A band saw according to claim 1, comprising a guide apparatus guiding wood in said band saw, the guide apparatus comprising a guide plate having a tip portion adapted to enter into the kerf of a piece of lumber sawn by the band saw blade, and an arm adapted to swingably suspend the guide plate from a frame above the kerf at the rear of the band saw blade, the guide plate being provided with a horizontal fin above the tip portion to limit the penetration of the tip portion into the kerf.

3. A band saw according to claim 1, comprising guard roller apparatus comprising an idle roller on a vertical shaft disposed on the opposite side of the feed conveyor from a gauging guide, the idle roller being mounted on the end of a roller support arm which is pivotally and slidably mounted on a pivot on the conveyor frame, the support arm being adapted to swing the roller towards the guide when a limit switch mounted on the gauging guide is actuated by a piece of lumber, thereby causing the lumber to be guided along said gauging guide by said roller, said roller being adapted to be lowered together with the support arm below the lumber feed conveyor when the said roller is not required to function.

4. A band saw according to claim 1, comprising dividing apparatus for separating the portion of a lumber which has been sawn by the said band saw that is to be resawn from the remainder and transferring it onto the returning conveyor, said dividing apparatus comprising arms disposed below the feed conveyor and pivotally secured to a frame, nail means slidably fitted on the respective tips of the arms, crank levers pivoted coaxially with the arms, link rods interconnecting the ends of the crank levers remote from their pivots and the nail means, means for causing said crank levers to pivot thereby projecting the nail means



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kerf as described above, the wood 13 is
driven on to driven rollers 34 which are in
alignment with the rollers 12. At a position
where the wood eventually disengages from
the guide plate 30, divider means disposed
10 below the rollers 34 are actuated and, as
shown in Figure 1 for example, the divider
means may be disposed at three points on
the sawway line and may each have a
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15 8.

In the embodiment shown in Figure 6, the
divider means is actuated as a motor 35
winds a wire 37 on its drum 36. As the
20 wire 37 is wound on the drum 36, a lever 38
is pivoted in the direction of the arrow
shown. This pivots a coaxially secured
crank lever 39 and projects a nail 41 on a
link bar 40 into the kerf 32. The crank
25 lever 39 then engages a pin 43 on a pivot-
able arm 42 to move the arm 42 to a posi-
tion shown in Figure 6 by a dotted line.
In this way, lumber to be resawn 13a on the
driven rollers 34 is transferred on to re-
turning driven rollers 44. On the other hand,
30 sawn lumber 13b is pushed away from the
conveyor 2 by means of levers 39¹, 42¹ a
link arm 40¹ and a nail 41¹ which are actu-
ated by a slotted second crank lever (not
35 shown) connected to the lever 38 and act-
ing on the crank lever 39¹ by means of a
slot and pin arrangement in a similar
manner to the actuation of the levers 39, 42
and nail 41. As lever 38 pivots, the slotted
40 second crank lever also pivots and, by
means of a pin mounted at the joint of link
arm 40¹ and crank lever 39¹ and projecting
into the slot of the second lever, causes lever
39¹ to pivot. The divider means shown in
45 Figure 8 is the same as the embodiment of
Figure 6, except that the motor and the
wire in the latter are replaced by a cylinder
45.

Upon completion of the dividing opera-
50 tion which separates the material to be re-
sawn from the sawn lumber 13b, the lever
38 actuates a limit switch 46 which in turn
causes a weight 47 to unwind the wire 37
from the drum 36. Whereupon, the crank
55 lever 39 tends in the first place to return to
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60 ably mounted on the lever 42 engages pins
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The lumber to be resawn 13a which has
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ator supplies it to the feed conveyor for the
resawing process.

WHAT WE CLAIM IS:—

1. A band saw with a roller conveyor
for automatically returning a portion of a
sawn lumber which is to be resawn to the
operator, the lumber being fed to a band
75 saw blade on a horizontal roller conveyor
by means of two driven feed rollers each
mounted on a respective horizontal shaft
above the horizontal roller conveyor, one
feed roller being disposed in the front and
the other roller at the rear of the band saw
blade in the direction of lumber feed, and
means for raising or lowering said two hori-
zontal feed rollers in unison.

2. A band saw according to claim 1, 85
comprising a guide apparatus guiding wood
in said band saw, the guide apparatus com-
prising a guide plate having a tip portion
adapted to enter into the kerf of a piece of
lumber sawn by the band saw blade, and
90 an arm adapted to swingably suspend the
guide plate from a frame above the kerf at
the rear of the band saw blade, the guide
plate being provided with a horizontal fin
above the tip portion to limit the penetration
95 of the tip portion into the kerf.

3. A band saw according to claim 1,
comprising guard roller apparatus com-
prising an idle roller on a vertical shaft dis-
posed on the opposite side of the feed con-
veyor from a gauging guide, the idle roller
being mounted on the end of a roller sup-
port arm which is pivotally and slidably
mounted on a pivot on the conveyor frame,
the support arm being adapted to swing the
roller towards the guide when a limit switch
mounted on the gauging guide is actuated by
a piece of lumber, thereby causing the lum-
ber to be guided along said gauging guide by
said roller, said roller being adapted to be
lowered together with the support arm below
the lumber feed conveyor when the said
roller is not required to function.

4. A band saw according to claim 1,
comprising dividing apparatus for separat-
ing the portion of a lumber which has
been sawn by the said band saw that is to
be resawn from the remainder and trans-
ferring it onto the returning conveyor, said
dividing apparatus comprising arms disposed
below the feed conveyor and pivotally se-
cured to a frame, nail means slidably fitted
on the respective tips of the arms, crank
levers pivoted coaxially with the arms, link
rods interconnecting the ends of the crank
levers remote from their pivots and the nail
means, means for causing said crank levers
to pivot thereby projecting the nail means



into the kerf of the sawn lumber, engaging
means mounted on the crank levers to cause
the arms to pivot when the nail means have
projected into the kerf, and engaging means
5 mounted on the arms to return the arms to
their original positions after the crank levers
have pivoted back to their original posi-

tions and the nail means have been with-
drawn from the kerf.

ELKINGTON AND FIFE,
Chartered Patent Agents,
High Holborn House,
52/54 High Holborn, London, W.C.2.
Agents for the Applicants.

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