(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 052 073 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
15.11.2000 Bulletin 2000/46

(51) Int Cl.[7]: **B27B 27/10**, B27B 27/02

(21) Application number: **00830333.1**

(22) Date of filing: **05.05.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **07.05.1999 IT RN990014 U**

(71) Applicant: **SCM GROUP S.p.A.**
47900 Rimini (IT)

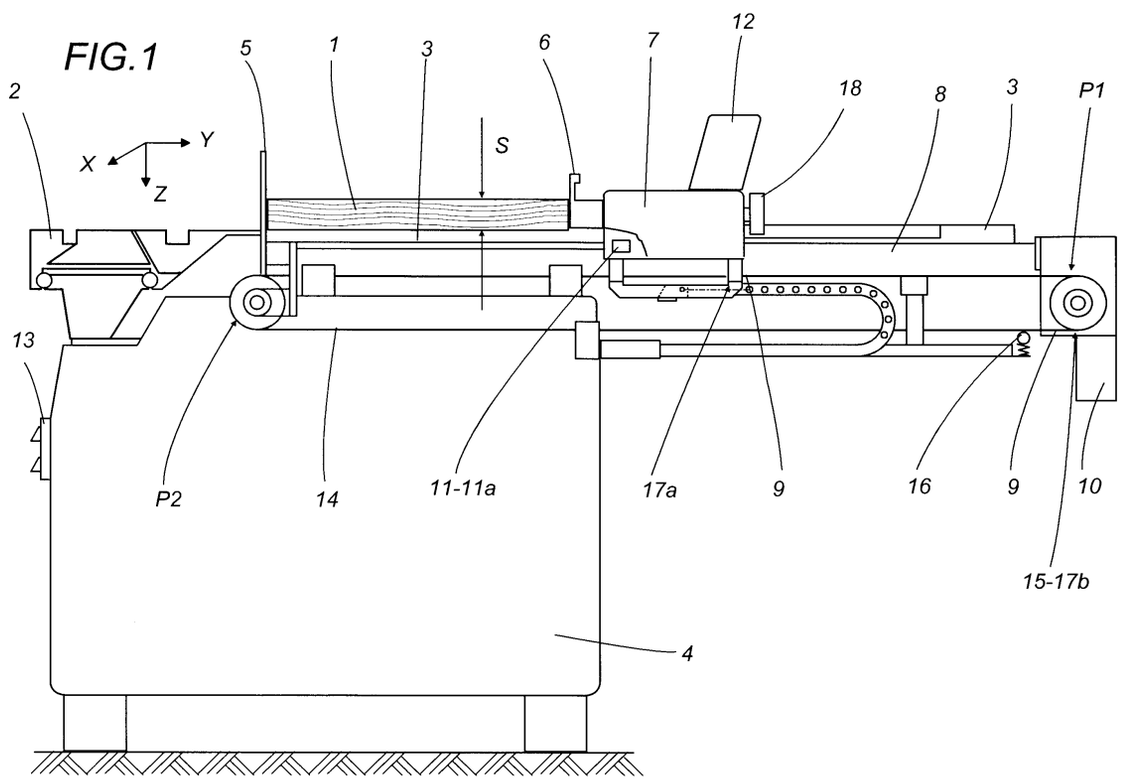
(72) Inventor: **Pucci, Aureliano**
47900 Rimini (IT)

(74) Representative: **Lanzoni, Luciano**
c/o BUGNION S.p.A.
Via Goito, 18
40126 Bologna (IT)

(54) A disc type panel saw machine with a drive system for the side reference elements

(57) In a disc type panel saw machine comprising a bed (4), a mobile carriage (2), a fixed table (3), a disc saw blade (5) and a side referencing stop (6) for the panel (1) where the stop is attached to a support (7) driven by a kinematic chain (9) with a motor (10), the kinematic chain (9) consists of a system for transmitting motion between at least two co-planar pulleys (P1, P2), and a flexible element (14) such as a cable, belt or chain placed around the pulleys (P1, P2), where the support (7) is coupled with the element (14) and the motor (10) is coupled with the drive pulley (P1) and where the kinematic chain (9) comprises mechanical means for limiting the transmitted force.

FIG.1



EP 1 052 073 A2

Description

[0001] The present invention relates to a disc saw machine of known type in the field of woodworking machinery, especially machines for working small lots of panels made of wood or similar materials, and relates in particular to a machine of this type equipped with a new system for driving the side reference stop of the panel to be cut, where the new system basically consists of a pulley and cable, belt or chain transmission unit which transmits drive from a motor to a side stop mounting unit, with a mechanical element between the two designed to limit the force transmitted. Disc saw machines of this kind normally comprise a mobile work table (carriage) and/or a fixed work table for the panel to be cut, a disc saw blade normally lying in a vertical plane and located between the fixed and mobile work tables, a side reference stop for the panel that runs in suitable slideways so as to adjust to different panel widths, and accessories for detecting the position of the side stop, driving the side stop and clamping it in place.

[0002] At the present time, known disc saw machines, including machines made by the Applicant, may be basic, low-end machines where the side reference stop is moved manually by the operator. The operator pushes the stop or the stop supports and, with the aid of calibrated rules, reads off the current distance of the guide from the tool either directly or through an analog or digital display unit.

[0003] Other disc saw machines of known type, also made by the Applicant, may be more sophisticated, high-end machines where, instead of being manual, the stop is motor-driven by a system consisting of a gear and motor unit connected to a ball screw, the motor usually being fixed relative to the machine bed and the screw is attached to the means for supporting the mobile stop, so that the stop moves as the screw turns. An encoder mounted on the motor detects the position of the stop on the basis of the turns of the motor. These machines normally have a numeric control where a large number of stop positions, corresponding to different cutting widths, can be set.

[0004] The solution where the stop is moved manually presents considerable problems because it obliges the operator to move from one side of the mobile work table to the other so as to be able to push the stop. This means going round the panel and the work table itself, which may be a very awkward operation, especially if the panel being cut is very large.

[0005] Moreover, in solutions of this kind, the position of the stop often has to be read out directly and errors are quite frequent. The magnitude of the errors is proportional to the divisions of the scale.

[0006] In the high-end saw machines mentioned above the problem is not that of the operator having to move around the carriage and the workpiece. All of these machines operate with a closed circuit servosystem for adjusting the position of the side stop and consisting of a gear and motor unit, a position encoder mounted on the motor, and a transmission system comprising a ball screw that drives the side stop. In a set-up of this kind, problems inevitably arise on account of the slack created by loosened parts in the drive system. This slack causes the encoder mounted on the geared motor unit to give incorrect readings and creates overall stop position errors. Further, if the workpiece is not exactly the right size, the position controller follows the machine program's target dimension and forces the workpiece against the blade, causing it to jam, and, at the best of times, to stop the machine through an overload or other non-mechanical safety device built into the controller's electronic system.

[0007] The aim of the machine made according to the present invention is to overcome the above mentioned problems. The invention, as characterised in the claims, solves the problem of providing a machine with motor-driven stops, and therefore of higher class and utility than a manually-controlled machine, but using components that are more simple and economical than those used for machines with programmable stop control systems, and implementing the concept of open loop operation for the machine driver.

[0008] The invention disclosed herein accordingly provides a machine of the above mentioned type where operation of the stop occurs thanks to a kinematic chain connecting the geared motor to the stop supports and consisting of a system for transmitting motion between at least two co-planar pulleys - whose shafts are attached to the machine bed - and a flexible but inextensible element such as a cable, belt or chain closed in a loop around the pulleys, where the peripheries of the pulleys are coupled with the flexible element by friction or shape and where the transmission of motion between the stop support and the kinematic chain made in this way occurs thanks to the coupling of the stop support with the flexible element, and the transmission of motion between the geared motor and the kinematic chain occurs thanks to the coupling of the geared motor with one of the pulleys, called the drive pulley, where the kinematic chain for transmitting motion or the geared motor itself comprises mechanical means for limiting the transmissible force or torque. The system may also comprise a linear position transducer, which directly measures the position of the stop relative to the tool or to the machine bed, and a digital display unit, for easy and accurate reading of the distance measured, these two components being connected in such a manner that operation occurs in open loop.

[0009] As a result, all the operator has to do is operate an appropriate control, for example, a spring-return pushbutton, to drive only the kinematic chain of the stop, while the display unit displays the current position of the stop. When the stop reaches the end of its stroke against the workpiece, which comes into contact with the tool, the transmissible force is limited by purely mechanical means.

[0010] The main advantage of the present invention is that the kinematic chain is not only simple and economical but also practical and reliable, enabling the operator to accurately and easily position the stop with the aid of a motor. Moreover, the operator may remain on the same side of the machine, where the control panel is located, although the machine need not be equipped with a costly numerical control system or with one of the sophisticated ball screw drive systems normally found on the market. Yet another advantage is the direct stop position measuring system. Unlike other machines currently available on the market, the position of the stop is not detected through a device mounted on the geared motor which does not take into account the slack and elasticity of the kinematic chain leading to the stop but by a device that measures the actual position of the stop itself: this eliminates the drawbacks of the solutions known to prior art.

[0011] The invention will now be described with reference to the accompanying drawing which illustrates a preferred embodiment of the invention and in which:

- the figure, called Figure 1, shows a view of the machine in the longitudinal direction, that is, in the cutting feed direction of the panel.

[0012] Other views do not provide any additional information for the purposes of the present disclosure.

[0013] With reference to the accompanying drawing, the disc saw machine is used to cut panels made of wood or similar materials.

[0014] The machine, whose architecture and basic functions are substantially of known type, basically comprises: a stationary machine bed 4 that rests on the floor; a mobile table or carriage 2 that runs in a horizontal cutting feed direction X and that is designed to support and feed the panel 1 of thickness s; a fixed table 3 lying in the same plane as the carriage 2 and designed to support the panel 1; a disc saw blade 5 positioned vertically along the line separating the carriage 2 from the fixed table 3; and a stop 6 designed to reference the edge of the panel 1 and which is mounted on a support 7 that runs on the table 3 in a horizontal direction Y normal to X.

[0015] Looking more closely at the constructional details, especially of the reference stop drive unit as disclosed herein, the preferred embodiment illustrated in Figure 1 shows a kinematic chain 9 designed to drive the stop 6 and the related support 7 and consisting of a geared motor 10 that drives a drive pulley P1, whose shaft is at the far end, relative to the bed 4, of a slideway 8 for the support 7, positioned along Y and attached to the bed 4. Another transmission pulley P2, lying in the same plane as pulley P1, is mounted with its shaft at the near end, relative to the bed 4, of the same slideway 8. A steel cable 14 is stretched in a loop around the two pulleys in such a way as to transmit motion thanks to the friction created between the cable and the peripheries of the pulleys. The stop 6 is attached to its support 7 that runs in the slideway 8 in the Y direction. As illustrated, the support 7 is connected to the cable 14 by two end heads applied to the ends of the cable and used to secure the cable in appropriate slots made in the support 7. Cable tension is controlled by conventional spring tensioners 16.

[0016] The position of the stop 6, which is referenced to the home position of the tool 5, is measured by a position transducer 11 comprising a transduction element lla of magnetic linear type and operating at the interface between the support 7 and a magnetic rule built into the table 3 and positioned in the Y direction. The output signal is applied to a display unit 12 in a form which can be read by the operator. On the front of the machine, there is a control 13, for example a spring-return pushbutton, used to drive the motor so as to move the stop 6 until the reading on the display unit 12 corresponds to the position required by the operator. Means 18 are also envisaged for stopping the support 7 in the slideway 8. These means may be manual, of the cam type, or pneumatic, acting on the control 13 that operates the geared motor 10.

[0017] To position the stop 6 at a required distance from the tool 5, all the operator has to do is hold down the control 13 and read the display unit 12 until the desired value appears. The stop is thus driven in open loop mode.

[0018] If the operator holds down the control 13 for too long after the stop 6 has come into contact with the panel 1, which is in turn in contact with the tool 5, in such a way that the drive force exerted on the stop exceeds a safe limit, then the purely mechanical means 15 for limiting the transmissible force come into operation, this being one of the characteristic features of the invention. In the embodiment illustrated in Figure 1, the limiting means are constituted by the assembly formed by the pulley P1, cable 14 and tensioner 16, where the limitation is achieved by causing the cable to slip on the pulley P1. Moreover, the geared motor 10 may be equipped with a mechanical clutch 17b or the cable (now uninterrupted) may be passed through an adjustable clamp 17a designed to allow slipping when the force transmitted exceeds a preset limit.

[0019] A machine made in this way achieves the above mentioned aims, thanks to a simple stop drive unit, without having to alter the existing machine structure completely.

[0020] The invention described can be subject to modifications and variations without thereby departing from the scope of the inventive concept. Moreover, all the details of the invention may be substituted by technically equivalent elements.

Claims

1. A disc saw machine for panels (1) made of wood or similar material and having a defined thickness (s),

the machine comprising: a first table (2) designed to support the panel (1), lying in a horizontal XY plane relative to an XYZ triple of directions at right angles to each other, the table being in the form of a carriage that slides relative to a machine bed (4) in a cutting feed direction X; a second, fixed table (3) located next to and in the same plane as the first table (2) and designed to support the panel (1); a disc saw blade (5) lying substantially in an XZ plane between the edge of the first table (2) and the edge of the second table (3) and designed to cut the panel (1); a straight-edged stop (6) extending in the X direction just above the second table (3) and designed to reference the edge of the panel (1); means (7) for supporting the stop (6) and running in the Y direction in slideways (8) fixed to the bed (4), the stop (6) being adjustably mounted on the means (7); a kinematic drive chain (9) where the means (7) and the stop (6) mounted on them, constitute the follower and where a geared motor (10) constitutes the driver; means (11) for measuring the position of the stop (6) relative to the saw blade (5), and related means (12) for displaying the distance measured; and means (18) for stopping the means (7) in the slideways (8); the machine being characterised in that

the kinematic chain (9) connecting the geared motor (10) to the stop support means (7) consists of a system for the transmission of motion between at least two co-planar pulleys (P1, P2), whose shafts are attached to the machine bed (4), and a flexible, inextensible element (14) such as a cable, belt or chain closed in a loop around the pulleys (P1, P2), where the peripheries of the pulleys are coupled with the flexible element (14) by friction or shape and where the transmission of motion between the means (7) that support the stop (6) and the kinematic chain (9) made in this way occurs thanks to the coupling of the means (7) with the flexible element (14), and the transmission of motion between the geared motor (10) and the kinematic chain (9) occurs thanks to the coupling of the geared motor (10) with the drive pulley (P1) of the two pulleys (P1, P2), and where the kinematic chain (9) for transmitting motion or the geared motor (10) itself comprises mechanical means (15) for limiting the transmissible force or torque.

2. The machine according to claim 1, characterised in that the flexible, inextensible element (14) is a cable made of steel or synthetic material, or a friction belt, so that motion is transmitted between the element (14) and the two pulleys (P1, P2) thanks to the peripheral friction depending on the tension of the element (14).

3. The machine according to claim 1, characterised in that the kinematic chain (9) comprises means (16) for controlling the tension of the flexible, inextensible element (14).

4. The machine according to claim 2, characterised in that the kinematic chain (9) comprises means (16) for controlling the tension of the flexible, inextensible element (14).

5. The machine according to claim 4, characterised in that the mechanical means (15) for limiting the transmitted force or torque consist of the assembly formed by both the drive pulley (P1) and the flexible, inextensible element (14), the tension of which is controlled by the means (16), where the limitation of the transmitted force or torque is achieved by causing the flexible, inextensible element (14) to slip on the pulley (P1), said limitation depending on the preset tension controlled through the means (16).

6. The machine according to claim 1 or 3, characterised in that the mechanical means (15) for limiting the transmitted force or torque consist of a clutch unit (17a) located at the interface between the flexible, inextensible drive transmission element (14) and the stop supporting means (7) constituting the follower element.

7. The machine according to claim 1 or 3 or 6, characterised in that the flexible, inextensible element (14) is a toothed belt or chain, so that motion is transmitted between the element (14) and at least the drive pulley (P1) of the two pulleys (P1, P2) thanks to the shape coupling between the element (14) and the periphery of the two pulleys.

8. The machine according to claim 1 or 3 or 7, characterised in that the mechanical means (15) for limiting the transmitted force or torque consist of a clutch unit (17b) located at the interface between the drive pulley (P1) and the geared motor (10) constituting the driving element, or located in the geared motor (10) itself.

9. The machine according to any of the foregoing claims from 1 to 8, characterised in that the slideways (8) comprise at least one bar positioned lengthways along the Y direction, and each of the two pulleys (P1, P2) is located at one end of the bar.

10. The machine according to any of the foregoing claims from 1 to 9, characterised in that the means (11) for measuring the position of the stop (6) relative to the saw blade (5) comprise a direct measurement linear position transducer (11a) attached to the means (7) for supporting the stop (6), located at the interface between the means (7) and a reference element attached to the bed (4).

11. The machine according to claim 10, characterised in that the linear transducer (11a) is of the direct reading type used in conjunction with a magnetic rule fixed to an element attached to the bed (4).

12. The machine according to claim 10 or 11, characterised in that the driving of the stop (6) through the kinematic chain (9) is done in open loop mode, there being envisaged not only display means (12) connected to the linear position transducer (lla), but also a control (13) which can be used by the operator to drive the geared motor (10), so that the adjustment of the position of the stop (6) is the direct result of the operator's action on the control (13) and the reading of the display means (12).

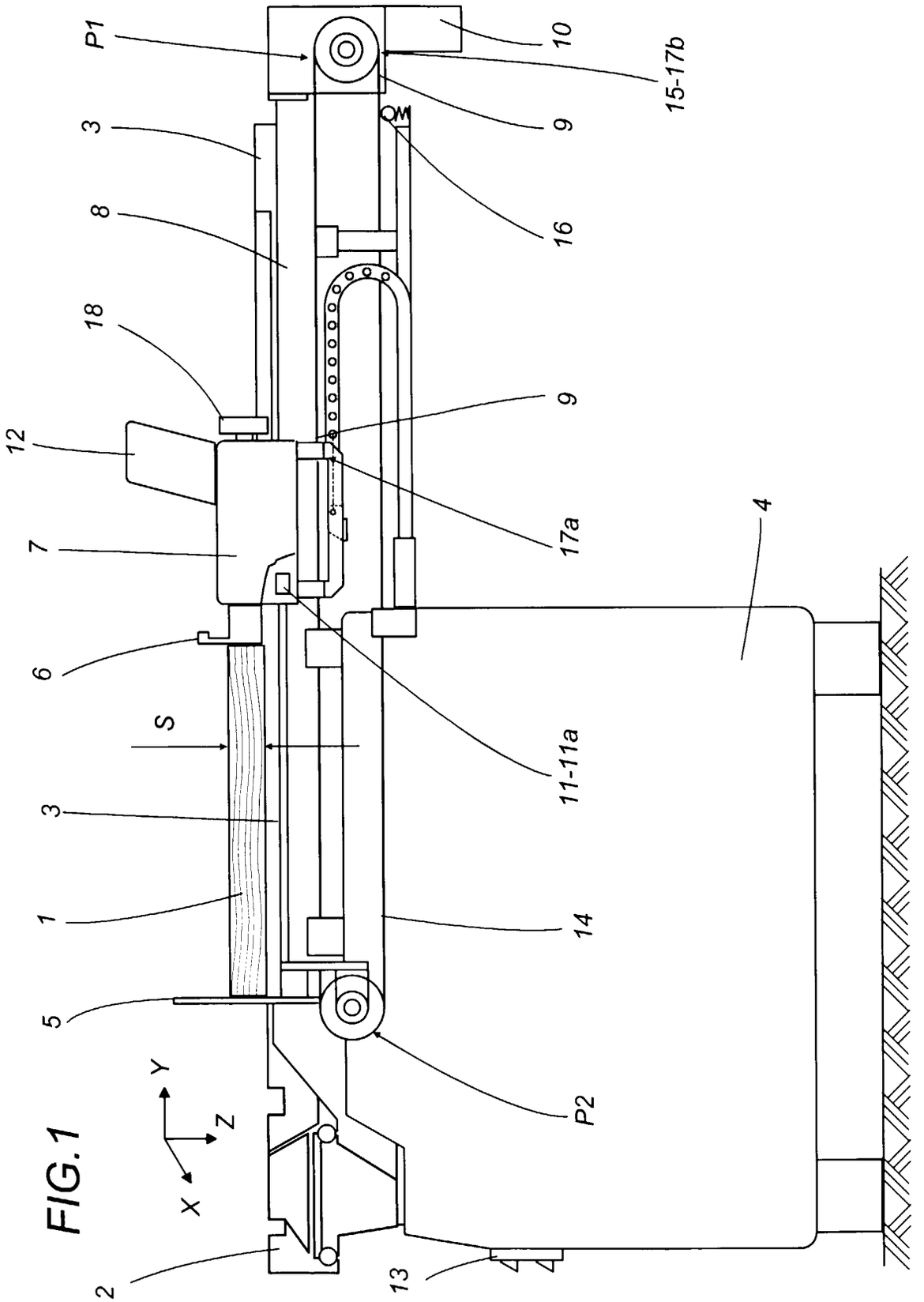


FIG.1