United States Patent [19]

Prentice

[11] **3,745,868**

[45] **July 17, 1973**

[54] **CLIPPER WITH DOUBLE-ACTION TOGGLE MECHANISM**

[76] Inventor: **Thomas H. Prentice,** 9015 S. W. 19th Avenue, Portland, Oreg. 97219

[22] Filed: **Sept. 30, 1971**

[21] Appl. No.: **185,089**

[52] **U.S. Cl.** **83/630,** 74/110, 74/520

[51] **Int. Cl.** **B26d 5/18**

[58] **Field of Search** 83/630, 632, 627; 74/520, 110

[56] **References Cited**

UNITED STATES PATENTS

2,928,305	3/1960	Heth et al.	83/630 X
2,691,995	10/1954	Carlson	83/630 X

FOREIGN PATENTS OR APPLICATIONS

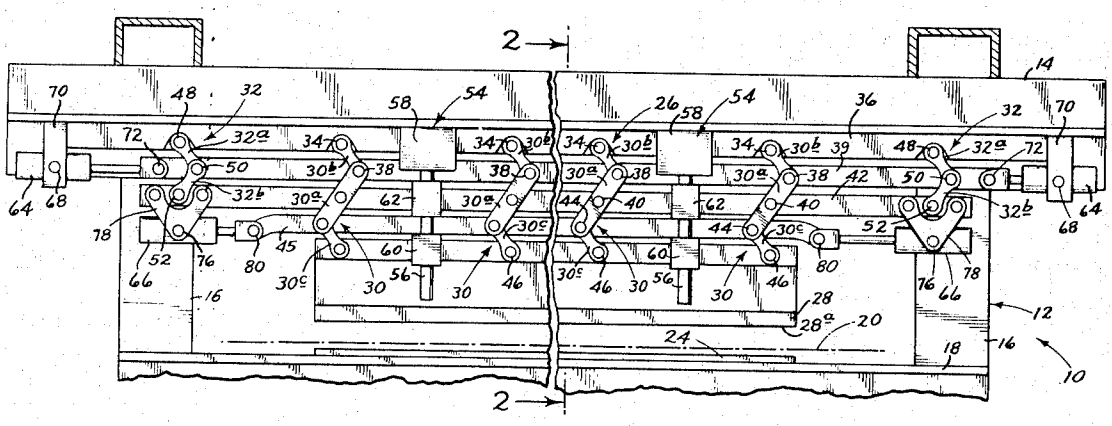
1,182,055	6/1959	France	74/520

Primary Examiner—Andrew R. Juhasz
Assistant Examiner—James F. Coan
Attorney—Kolisch, Hartwell & Dickinson

[57] **ABSTRACT**

A veneer clipper in which the movable knife is driven through a double-action toggle mechanism that is powered by a pair of reciprocable pneumatic motors. The toggle mechanism include two sets of corresponding pivoted joints, with each motor drivingly connected to a different one of such sets. One of the motors is mounted in a nontraveling position on the clipper's frame, while the other motor is mounted for travel relative to the frame, generally in the same direction as the knife.

9 Claims, 5 Drawing Figures



PATENTED JUL 17 1973

3,745,868

SHEET 1 OF 2

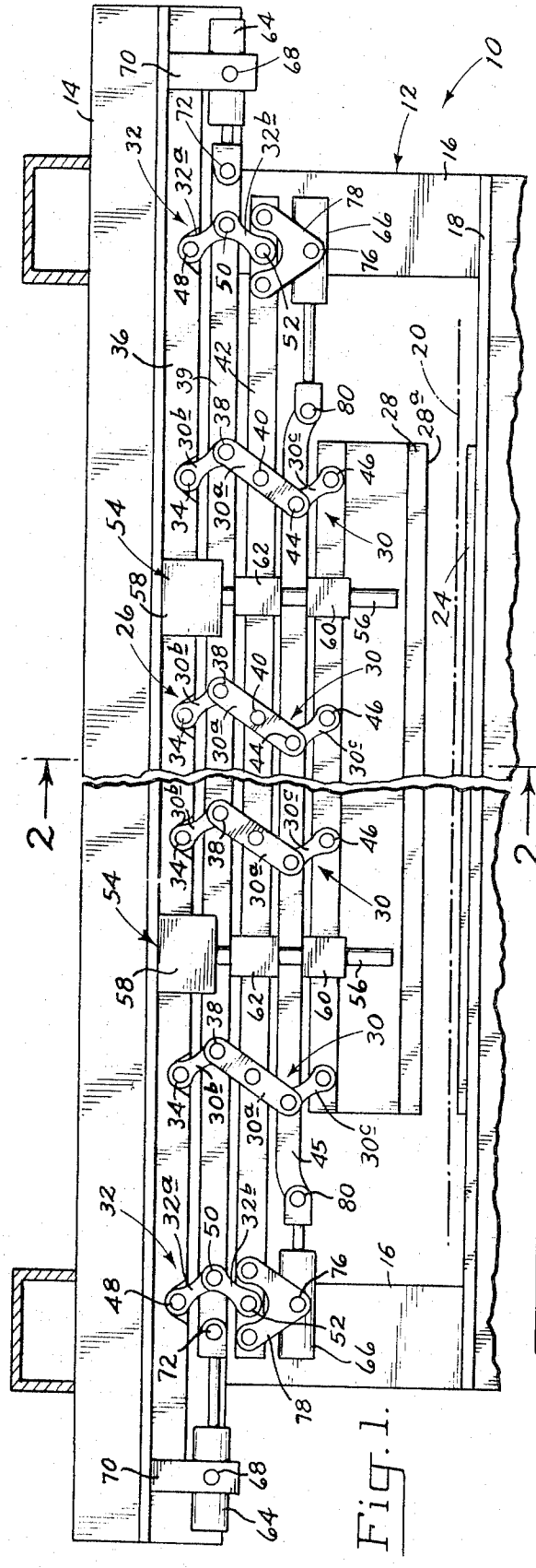


Fig. 1.

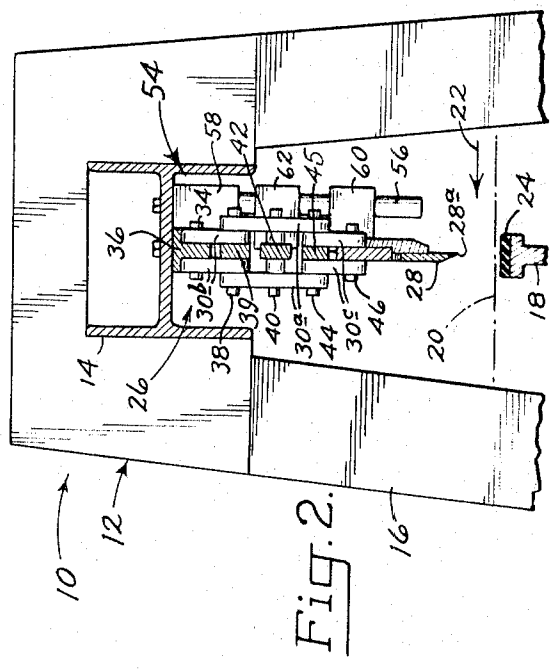


Fig. 2.

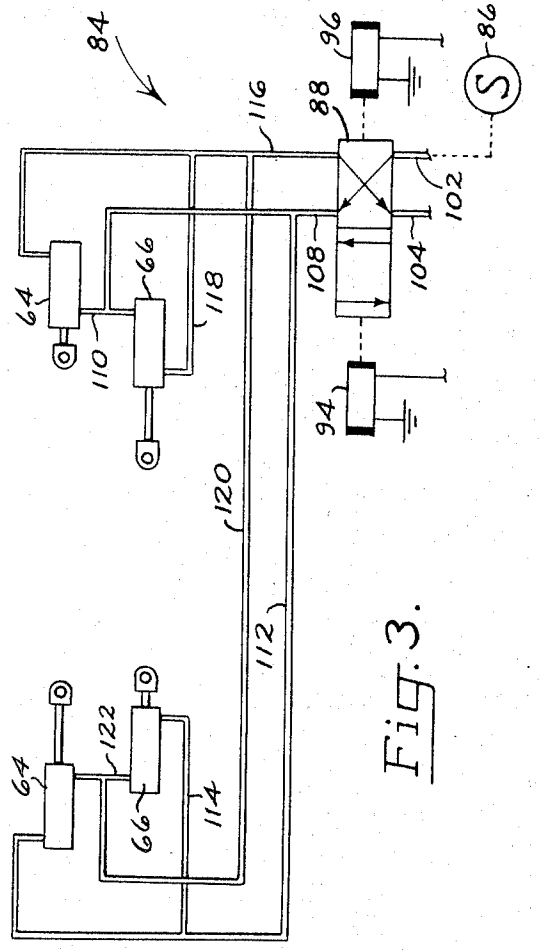
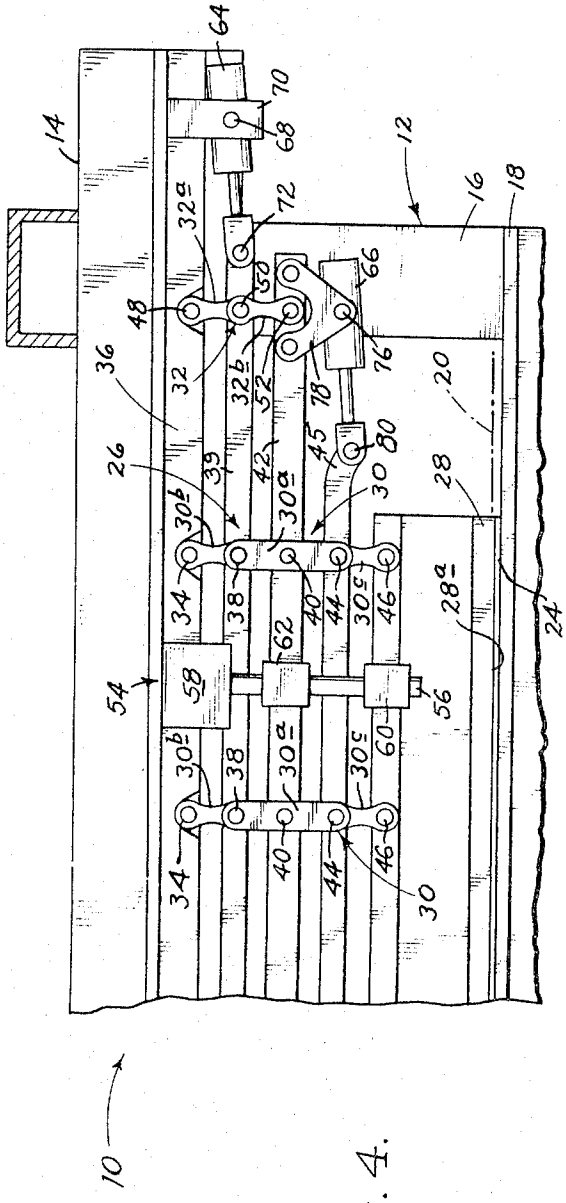
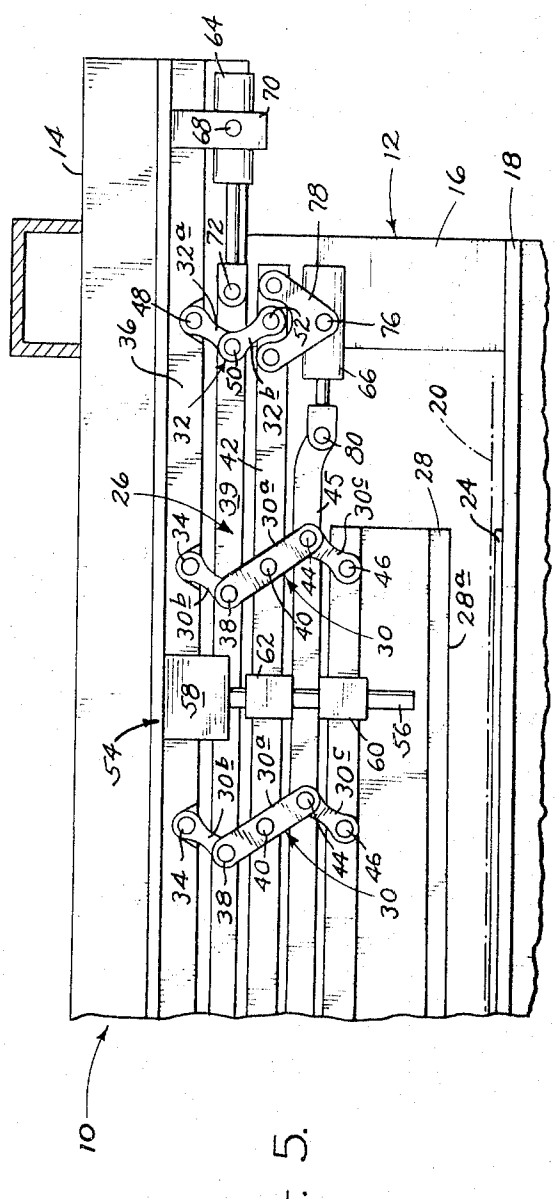


Fig. 3.



10

Fig. 4.



10

Fig. 5.

CLIPPER WITH DOUBLE-ACTION TOGGLE MECHANISM

BACKGROUND AND SUMMARY OF THE INVENTION

This invention pertains to a clipper including a recriprocable knife which is driven through a double-action toggle mechanism. For the purpose of illustration herein, a preferred embodiment of the invention is described in conjunction with a clipper for cutting sheets of wood veneer and the like, wherein the invention has been found to have particular utility.

Over the years, numerous improvements have been made in the different kinds of equipment used in the manufacture of plywood. Many of these improvements have greatly increased the speed with which various ones of the steps leading up to the final preparation of a plywood panel can be accomplished. However, a situation presently existing is that veneer clippers used in the preassembly cutting of veneer sheets are not capable of keeping up with the greatly increased rate at which sheets (to be clipped) can now be supplied a clipper. In other words, the time required for the usual clipper to produce a cutting stroke in its knife, and to return the knife to a condition ready to undergo another cutting stroke, is so long that sheets must be fed to a clipper at a rate considerably below that attainable in other machines used in plywood manufacturing.

A general object of the present invention, therefore, is to provide a novel clipper which practically and satisfactorily takes care of the drawback just mentioned.

More specifically, an object of the invention is to provide such a clipper which is capable of handling present-day sheet feed rates attainable in other machinery used in plywood manufacturing.

To attain these objects, a clipper constructed according to the present invention features a novel double-action toggle mechanism for driving a movable knife. The toggle mechanism includes two sets of corresponding pivoted toggle joints, to each of which are drivingly connected a pair of synchronously actuated pneumatic motors. The proposed toggle mechanism includes a plurality of sets of toggle links, with each set including a central link pivotally connected adjacent its opposite ends to a pair of end links. Two of the motors mentioned act between the clipper's frame and one of the sets of the toggle joints. These two motors, are pivoted for rocking on the frame, but otherwise do not travel relative to the frame, and are referred to herein as being mounted in nontraveling positions on the frame. The other two motors act between a carrier bar (which is mounted on the central links) and the other set of toggle joints. These two motors move with the carrier member, and are referred to herein as being mounted for travel relative to the clipper's frame.

With such mechanism, a complete cutting stroke in a knife in the clipper (which knife is carried by the toggle mechanism) is producible in a very short period of time in comparison with cutting stroke times attainable in presently available clippers. The use of synchronized motors, mpunted as just generally indicated, promotes speed and reliability in the clipper.

DESCRIPTION OF THE DRAWINGS

These and other objects and advantages attained by the invention will become more fully apparent as the description which follows is read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a fragmentary rear elevation illustrating a veneer clipper embodying the present invention;

FIG. 2 is a cross-sectional view taken generally along the line 2—2 in FIG. 1;

FIG. 3 is a simplified schematic diagram illustrating portions of pneumatic and electrical circuits that are employed to actuate pneumatic motors in the clipper of FIGS. 1 and 2; and

FIGS. 4 and 5 are fragmentary views, similar to the right side of FIG. 1, showing various parts in the clipper in different respective positions which they occupy at different points in a cutting stroke.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to the drawings, and referring first to FIGS. 1 and 2, indicated generally at **10** is a wood veneer clipper embodying the present invention. The clipper includes the usual frame **12** which may be entirely conventional in construction. Frame **12** herein includes an elongated overhead substantially horizontal beam **14**, opposite ends of which are supported on a pair of spaced apart upright leg structures **16**. Extending between and suitably joined to the leg structures in the frame, at a point considerably below beam **14**, is an elongated beam **18**. Beam **18** is disposed with its longitudinal axis substantially paralleling the axis of beam **14**.

The generally upright rectangular space (see FIG. 1) bounded by beams **14, 18** and leg structures **16** accommodates the passage of successive pieces of wood veneer which are to be clipped. Veneer pieces may be fed to and carried away from clipper **10** by means of conventional power-driven conveyor mechanisms, with such pieces traveling horizontally through the clipper along what might be thought of as a workpath shown generally in dash-dot lines at **20**. With respect to clipper **10**, veneer pieces travel in the direction of arrow **22** in FIG. 2.

Suitably mounted on top of beam **18** is a conventional clipper anvil **24**. Supported directly above the anvil, through a double-action toggle mechanism **26** as contemplated herein, is a conventional clipper knife, or cutting device, **28** having a cutting edge **28*a***. Edge **28*a*** substantially parallels the top surface of the anvil. In FIGS. 1 and 2, knife **28** is shown in a fully raised position with respect to anvel **24**. The distance between edge **28*a*** and the top surface of the anvil under these circumstances is about 2 inches.

Considering the construction of toggle mechanism **26**, it includes a plurality of double-action toggle assemblies **30** disposed directly above and distributed along knife **28**. Each toggle assembly **30** comprises three laterally spaced pairs of toggle links, including a pair of central links **30*a***, and pairs of upper and lower links **30*b***, **30*c***, respectively. The upper ends of links **30*b*** are mounted through spaced pivot connections **34** on an elongated bar **36** which is anchored to and extends along the underside of the central web in beam **14**. The lower ends of links **30*b***, and the upper ends of links **30*a***, are mounted through spaced pivot connections **38** on an elongated substantially horizontal bar

39. The opposite ends of bar 39 extend longitudinally beyond the opposite ends of knife 28. The centers of links 30*a* are pivoted at 40 at points spaced along an elongated member 42—referred to herein as a carrier member. The lower ends of links 30*a* and the upper ends of links 30*c* are mounted through spaced pivot connections 44 on an elongated substantially horizontal bar 45. Bar 45 is somewhat shorter than member 42, and longer than knife 28. The lower ends of links 30*c* are pivoted through spaced pivot connections 46 to the top of knife 28.

Explaining certain terminology which is used herein, links 30*b*, 30*c* are also referred to as link portions. In addition, the parts of links 30*a* between pivot connections 38, 40, and between pivot connections 40, 44, also constitute link portions. Pivot connections 38, 44 are referred to as toggle joints. Links 30*a*, 30*b*, 30*c*, and pivot connections 38, 44, are also referred to herein as portions of a drive train for driving knife 28.

Also included in clipper 10 are two toggle assemblies 32. These two assemblies are similar, and are located adjacent opposite ends of bar 39. Each assembly 32 includes upper and lower laterally spaced toggle links 32*a*, 32*b*, respectively. The upper ends of links 32*a* are mounted through pivot connections 48 on bar 36, and the lower ends of these links, together with the upper ends of links 32*b*, are mounted through pivot connections 50 on bar 39. The lower ends of links 32*b* are mounted through pivot connections 52 on carrier member 42. Pivot connections 50 are referred to herein as toggle joints.

As will be more fully explained later, with operation of the clipper, both knife 28 and carrier member 42 reciprocate vertically relative to the frame, with knife edge 28*a* moving in a cutting stroke first toward and than away from anvil 24. In order to assure proper vertical movement of these two parts, two guide assemblies 54 are provided. These guide assemblies are similar in construction, each including a substantially vertical cylindrical bar 56 whose upper end is anchored on beam 14 through a mounting 58. As can be seen clearly in FIG. 2, the guide assemblies are disposed toward the sides of blade 28 and member 42 which face oncoming sheets of veneer. Suitably mounted on blade 28 and on member 42 are slider blocks 60, 62, respectively, which contain vertical bores sized freely and slidably to receive bars 56. With operation of the clipper, and with vertical reciprocation of the knife and carrier member, blocks 60, 62 ride vertically on bars 56 to guide the movements of the knife and carrier member.

According to the preferred embodiment of the invention as disclosed herein, two pairs of double-acting reciprocating pneumatic motors are provided for driving knife 28 in a cutting stroke. One of these pairs of motors, which might be thought of as the upper motor pair, includes motors 64. The other pair, which might be thought of as the lower motor pair comprises motors 66. Motors 64, 66 are substantially identical in construction, and are conventional.

As can be seen clearly in FIG. 1, motors 64 are mounted through pivot connections 68 on brackets 70 which are joined to the opposite ends of beam 14. Pivot connections 68 accommodate rocking of motors 64 in a substantially common vertical plane. The outer ends of the rods of motors 64 are joined through pivot connections 72 to the opposite ends of bar 39.

Motors 66 are joined through pivot connections 76 to brackets 78 which are anchored adjacent the opposite ends of carrier member 42. Pivot connections 76 accommodate rocking of motors 66 in substantially the same vertical plane mentioned above with respect to motors 64. The outer ends of the rods of motors 66 are joined through pivot connections 80 to the opposite ends of bar 45.

All of the pivot connections heretofore mentioned are disposed with their pivot axes substantially parallel to one another, and normal to the plane of FIG. 1.

In FIG. 1, the right motor 64 and the left motor 66 are shown in substantially fully contracted conditions, with the left motor 64 and the right motor 66 shown in substantially fully extended conditions. With such the case, the links making up the various toggle assemblies are disposed at the angles shown relative to one another, and knife 28 is fully raised above anvil 24. Under these circumstances it will be noted that in each toggle assembly 30, pivot connections 34, 40, 46 lie along a substantially vertical line, with pivot connection 38 located to the right of this line in FIG. 1, and pivot connection 44 located to the left of the line in the figure. In each toggle assembly 32, pivot connections 48, 52 lie along a substantially vertical line, with pivot connection 50 to the right of this line in FIG. 1.

According to the present invention, a cutting stroke in knife 28, wherein it moves downwardly toward and against, and then away from, anvil 24, results from the simultaneous coordinated operation of motors 64, 66. Considering generally what takes place in such a stroke, with the various movable parts in the clipper beginning in the positions shown in FIG. 1, and with operation of the motors, the two motors which are contracted extend, and the two that are extended contract. As a consequence, toggle joints 38, 50 move toward the left in FIG. 1, and toggle joints 44 move toward the right in the figure.

Such movement of these joints causes downward vertical travel of bar 39, member 42, bar 45 and knife 28 relative to frame 12. More specifically, knife 28 moves downwardly relative to bar 45, bar 45 moves downwardly relative to member 42, member 42 moves downwardly relative to bar 39, and bar 39 moves downwardly relative to the clipper frame. The motors rock to accommodate such vertical movement.

Midway through the stroke, the various toggle joints occupy their over-center positions, and knife edge 281 contacts anvil 24. Motors 64, 66 are then in approximately the same conditions of extension or contraction. This situation is illustrated in FIG. 4.

With continued operation of the motors, the toggle joints pass through their over-center positions, and bar 39, member 42, bar 45, and knife 28 travel upwardly toward the same relative vertical positions which they had at the beginning of the stroke. At the conclusion of the stroke, the two motors which were fully extended at the beginning of the stroke are now fully contracted, and the two that were fully contracted are now fully extended. Knife 28 is fully raised above the anvil. This situation is shown in FIG. 5. Toggle joints 38 are now located to the left in FIG. 5 of the vertical lines containing pivot connections 34, 40, 46, and toggle joints 44 are located to the right of these lines in the figure. Toggle joints 50 are located to the left of the vertical lines containing pivot connections 48, 52.

The clipper is now in a condition ready for another cutting stroke, wherein the reverse actions from those just described take place.

Operation of motors **64, 66,** and performance of toggle assemblies **30,** thus results in a double-action drive for knife **28** which produces relatively rapid movement of the knife in a cutting stroke. It is important to note in this regard that motors **66,** being carried on carrier member **42** which itself reciprocates vertically, remain throughout in proper positions relative to bar **45** to act through this bar upon toggle joints **44.** The pivot mountings provided for the various motors, of course, permit suitable vertical rocking in the motors to take care of the vertical movements which occur in the movable bars and carrier member.

Considering now the means which is provided herein for producing coordinated simultaneous operation of the motors, such means is illustrated in FIG. **3.** The specific means employed in clipper **10** for this purpose comprises a pneumatic system **84** which interconnects the motors, and electrical circuits for operating a valve in the pneumatic system. Included in the pneumatic system is a source **86** of air under pressure, and a main control valve **88.** Valve **88** includes a valve spool which can occupy two different positions. The valve is represented in FIG. **3** by means of a block diagram of its spool. More specifically, the spool is shown as a rectangular block divided into two squares, with arrows included in the squares to indicate the manner in which air flow takes place through the valve with the spool adjusted to its different positions. The spool in valve **88** is suitably ganged to a pair of solenoids **94, 96,** and is shown in a condition with flow through the valve permitted as indicated on the right side of the spool in FIG. **3.**

Source **86** is connected to valve **88** through a conduit **102.** An exhaust line **104** to the atmosphere is provided for the valve. Valve **88** is connected to the rod end of the right motor **64** and to the butt end of the right motor **66** through conduits **108, 110.** In addition, this valve is connected through conduit **108** and conduits **112, 114** to the butt end of the left motor **64** and to the rod end of the left motor **66.** Conduits **116, 118** connect valve **88** to the butt end of the right motor **64** and to the rod end of the right motor **66.** Conduit **116,** along with conduits **120, 122,** connect valve **88** to the rod end of the left motor **64** and to the butt end of the left motor **66.**

The coils in solenoids **94, 96** are connected to conventional circuitry (not shown) through which they are alternately and momentarily energized in response to a signal indicating that a sheet of veneer is moving through the clipper and into a proper position to be clipped.

The spool of valve **88** is shown in a position supplying pressurized air from source **86** to conduit **108,** and exhausting conduit **116** through line **104.** This position of the valve spool has resulted from prior momentary energizing of solenoid **94.** Solenoids **94, 96,** as shown in FIG. **3,** are nonenergized.

Describing now how the means shown in FIG. **3** produces a cutting stroke in knife **28,** the next time that a signal (of the type generally mentioned above) occurs indicating the presence of a sheet to be clipped, it results in solenoid **96** momentarily energizing to shift the spool of valve **88** to the right in FIG. **3.** On such shifting, flow takes place as indicated at the left side of the spool in the figure. More specifically, pressurized air from source **86** is then supplied conduit **116,** and conduits **108** is exhausted. Under these circumstances, the right motor **64** and the left motor **66** extend, and the right motor **66** and the left motor **64** contract—all simultaneously. The toggle joints, bars, carrier member, and knife then move in a cutting stroke as previously described in conjunction with FIGS. **4** and **5.** At the conclusion of the stroke, the various movable parts occupy the positions shown in FIG. **5.**

The next successive signal indicating the presence of a sheet to be clipped results in momentary energizing of solenoid **94** which returns the spool in valve **88** to the position in which it is shown in FIG. **3.** Another cutting stroke then results in the knife, with the motors returning to the conditions illustrated in FIG. **1.**

This type operation then repeats with successive signals.

It will thus be appreciated that a novel drive mechanism is provided for a clipper knife, which mechanism offers a number of advantages. One of the more important of these advantages is that a complete cutting stroke can be produced which is considerably faster than that attainable in present-day clippers. More specifically, with the mechanism proposed herein, cutting strokes (full 2-inches including return) have been made within about 55 milliseconds—such speed permitting veneer sheet feed rates between about 800 and 900 feet per minute.

This kind of fast performance is made possible by the novel double-action toggle assemblies, and the novel motor mountings and arrangement. It will be noted, for example, that only relatively short (distancewise) motor strokes are required to produce a relatively long (distancewise) cutting stroke.

Another advantage is that the proposed mechanism can easily be incorporated in existing clippers.

It should be understood that while a particular form of pneumatic system is shown for operating the motors, the invention is not limited to any specific type of such a system.

While a preferred embodiment of the invention has been described herein, it is appreciated that variations and modifications may be made without departing from the spirit of the invention.

It is claimed and desired to secure by letters patent:

1. In a clipper for cutting sheets of veneer and like workpieces including a frame and a cutting device mounted thereon for reciprocation relative thereto,

a carrier member adjacent said cutting device mounted on said frame for reciprocation relative both to said frame and to said cutting device,

first toggle means interconnecting said frame and said carrier member actuatable to produce reciprocation of the latter relative to the former,

first motor means operatively interposed between said frame and said first toggle means operable to actuate the latter,

second toggle means interconnecting said carrier member and said cutting device actuatable to produce reciprocation of the latter relative to the former,

second motor means operatively interposed between said carrier member and said second toggle means operable to actuate the latter, and

means interconnecting said first and second motor means for producing simultaneous operation thereof.

2. The clipper of claim **1,** wherein said first and second toggle means each includes at least a pair of pivotally interconnected toggle link portions, with one of the toggle link portions of said first toggle means being integral with one of the toggle link portions of said second toggle means.

3. The clipper of claim the wherein said first motor means is drivingly connected to he pivot connection between the toggle link portions of said first toggle means, and said second motor means is drivingly connected to the pivot connection between the toggle link portion of said second toggle means.

4. The clipper of claim **1,** wherein said first motor means is pivotally mounted on said frame, and said second motor means is pivotally mounted on said carrier member.

5. The clipper of claim **3,** wherein said first motor means is pivotally mounted on said frame, and said second motor means is pivotally mounted on said carrier member.

6. In a clipper for cutting sheets of veneer and like workpieces including a frame having a workpath extending therethrough and a cutting device mounted on said frame for movement toward and away from said workpath,

a double-action toggle mechanism interconnecting said frame and said cutting device, and actuatable to produce movement of the latter, said toggle mechanism including a pair of pivoted toggle joints which form part of a drive train between the frame and cutting device, with one of said joints operatively interposed between said frame and the other joint, and said other joint operatively interposed between said one joint and said cutting device, and

a pair of motors for actuating said mechanism each drivingly connected to a different one of said joints.

7. The clipper of claim **6,** wherein said toggle mechanism includes a central toggle link interposed between its said toggle joints, which link moves toward and away from said workpath with actuation of the mechanism, and one of said motors is mounted for movement with said central link.

8. In a clipper for cutting sheets of veneer and like workpieces including a frame having a workpath extending therethrough and a cutting device mounted on said frame for movement toward and away from said workpath,

a double-action toggle mechanism interconnecting said frame and said cutting device, said toggle mechanism including a pair of pivoted toggle joints and being actuatable to produce movement of the cutting device,

a pair of motors for actuating said mechanism each drivingly connected to a different one of said joints,

first mounting means mounting one of said motors in a nontraveling position on said frame, and

second mounting means mounting the other motor for travel relative to the frame.

9. The clipper of claim **8,** wherein said first and second mounting means each comprises a pivot connection.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,745,868 Dated July 17, 1973

Inventor(s) Thomas H. Prentice

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 3 should read as shown below:

3. The clipper of claim 2, wherein said first motor means is drivingly connected to the pivot connection between the toggle link portions of said first toggle means, and said second motor means is drivingly connected to the pivot connection between the toggle link portions of said second toggle means.

This certificate supersedes Certificate of Correction issued January 24, 1974.

Signed and sealed this 24th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,745,868 Dated July 17, 1973

Inventor(s) Thomas H. Prentice

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 3, lines 1 and 2 should read

-- 3. The clipper of claim 1, wherein said first motor means is drivingly connected to the pivot connection --.

Signed and sealed this 29th day of January 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.

54