Feb. 1, 1966 J. G. BARANCZYK 3,232,327

DOVETAILING MACHINE

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FIG. 1.

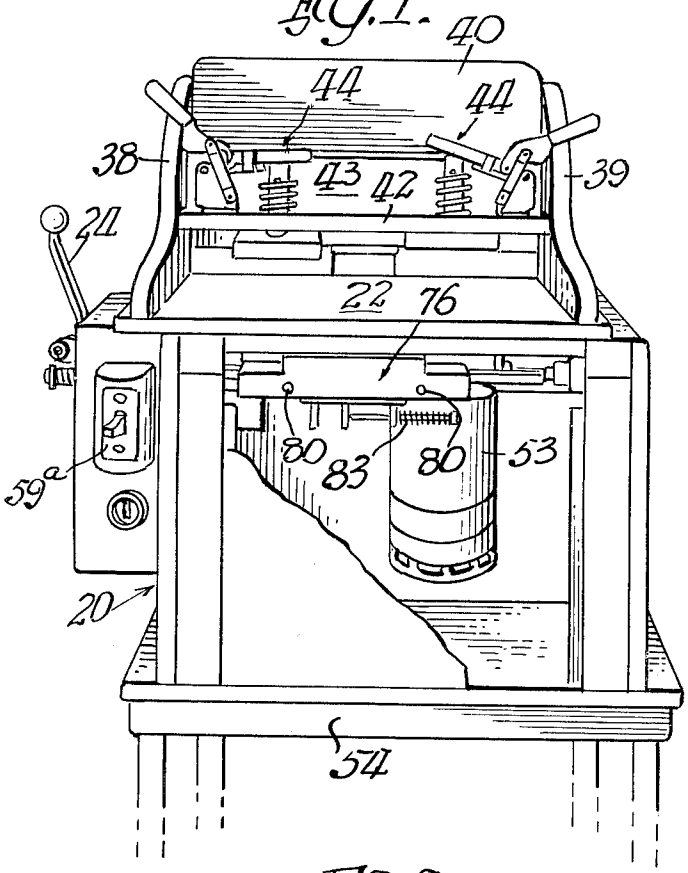


FIG. 9.

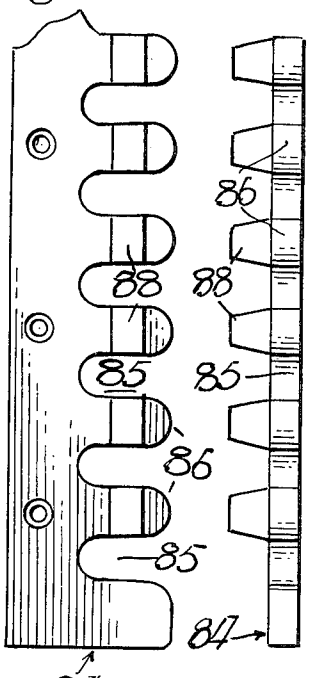


FIG. 8.

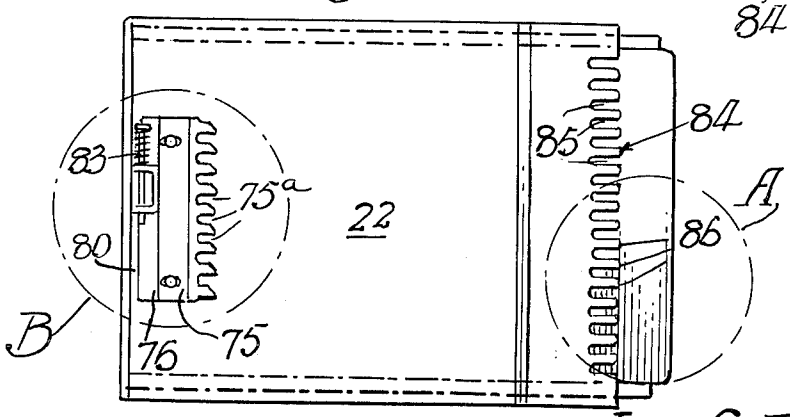


FIG. 10.

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FIG. 2.

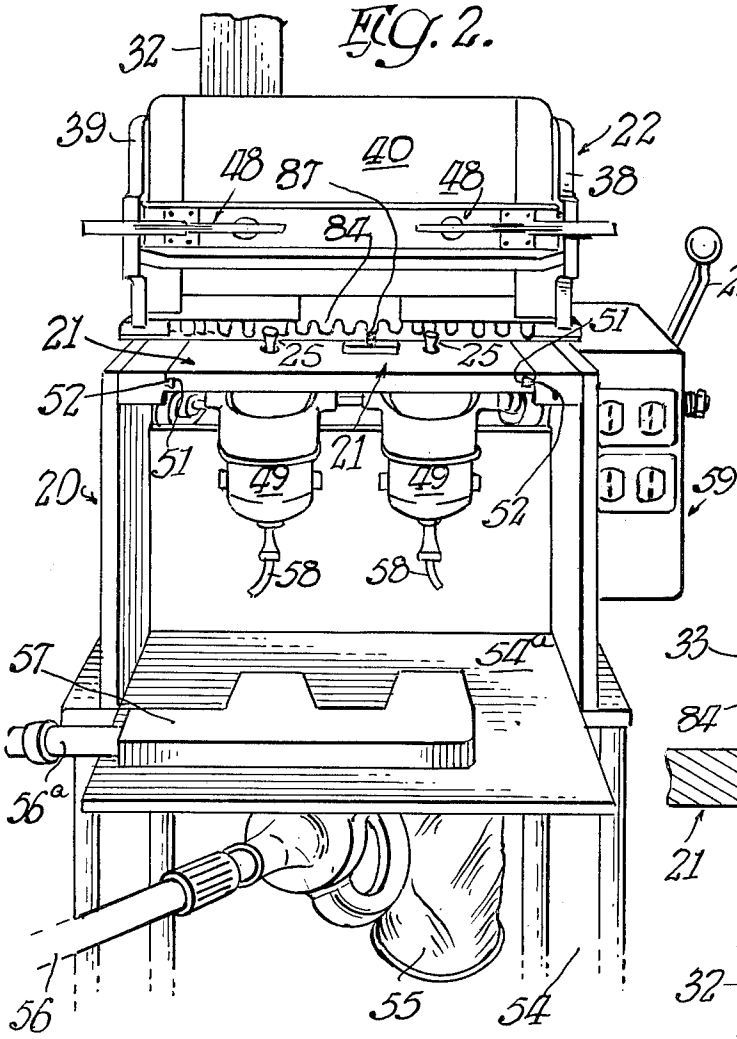


FIG. 12.

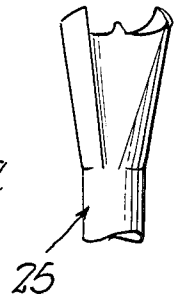


FIG. 13.

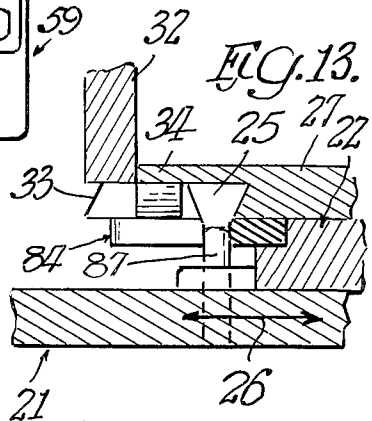


FIG. 14.

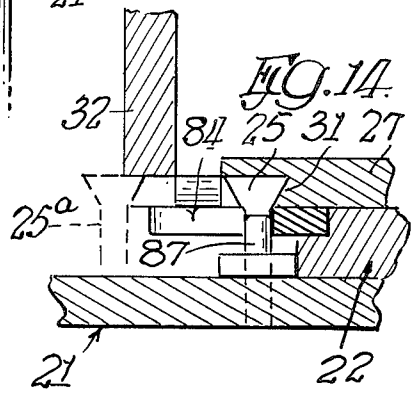
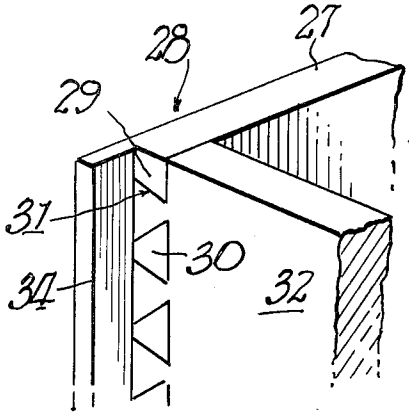


FIG. 15.



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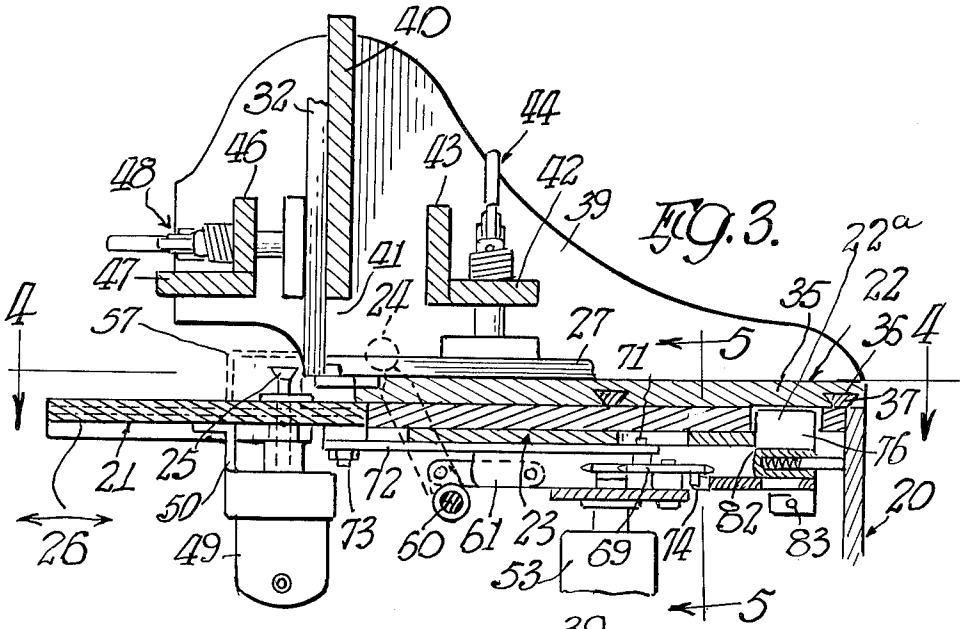


FIG. 3.

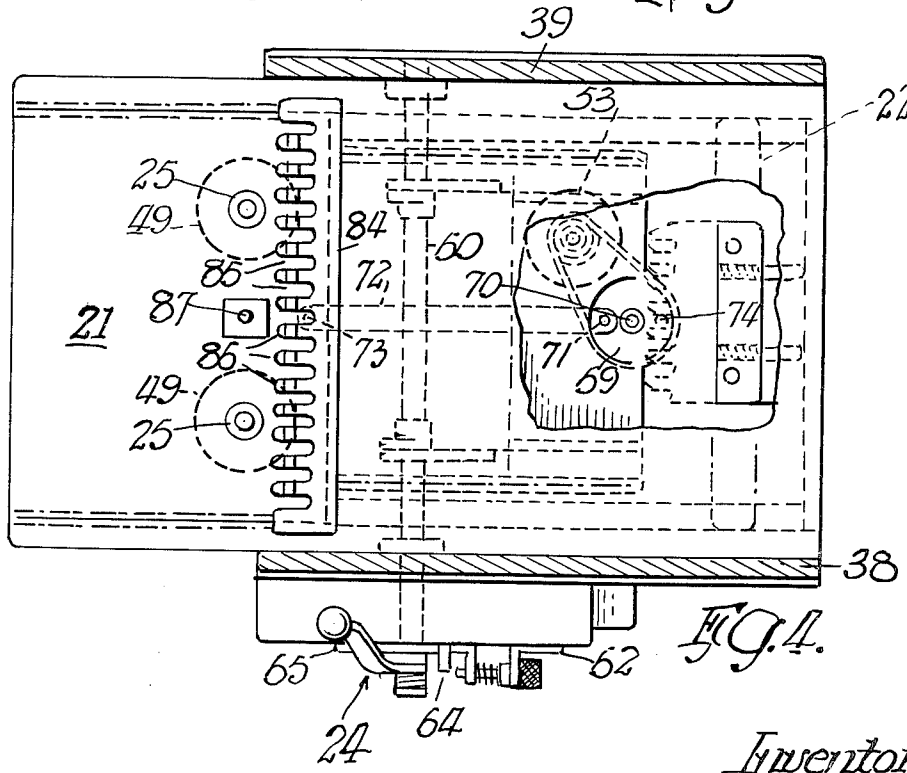


FIG. 4.

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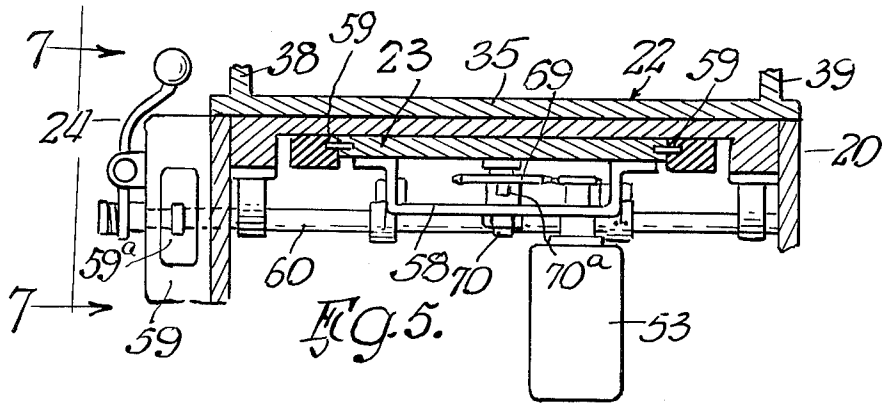


Fig. 5.

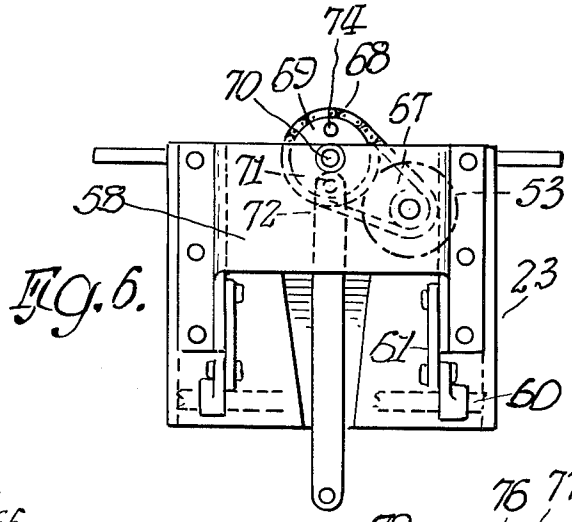


Fig. 6.

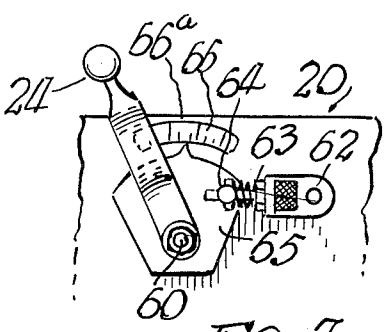


Fig. 7.

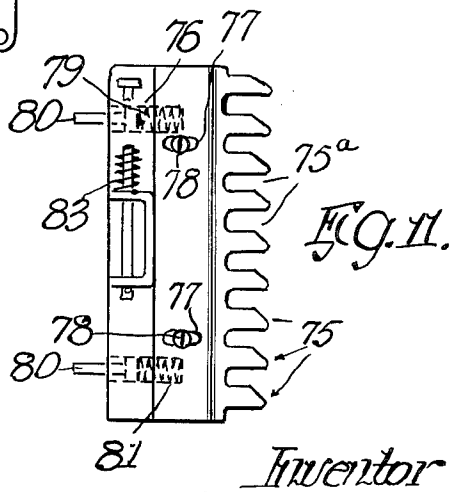


Fig. 11.

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3,232,327

DOVETAILING MACHINE

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Filed Feb. 11, 1963, Ser. No. 257,691
1 Claim. (Cl. 144—85)

This invention relates to a dovetailing machine, and, more particularly, to a machine adapted to cut the dovetail fittings, i.e., mortises and tenons, in two or more boards substantially simultaneously.

An important use of a dovetail fitting is in the construction of drawers, but heretofore this has been restricted to furniture of the higher quality grades because of the expense involved. Many dovetailing machines have been known to the art for this purpose, but they have all been characterized by complexity in make-up and limited adaptability to different sized boards and drawers. This has meant special set-ups for each particular type drawer, necessitating restriction of the use of the prior art machine to high volume, relatively expensive furniture. It is not an uncommon phenomenon for a drawer of the slotted and glued type to "come apart at the seams." Through the instant invention, this drawback is avoided, and, more importantly, dovetailing is now made available to the makers of relatively inexpensive furniture.

The provision of a machine achieving this advantageous usage constitutes an important object of the invention—this being developed through the provision of a machine which is compact and simple in execution, yet rugged in construction, and which is adapted for a wide variety of drawer sizes, board thicknesses, etc.

Another object of the invention is to provide a novel guide in a dovetailing machine whereby lip and flush drawers are equally conveniently made via dovetailing.

Still another object of the invention is to provide a machine having a unique adjustment feature which adapts the machine for varying thickness boards, particularly over the range of ⅜–½″, so as to avoid the drawbacks of prior art machines where the board's thickness had to be at a predetermined value in order to achieve a proper dovetail joint.

These and other objects and advantages of the invention may be seen in the details of construction and operation set down in this specification.

The invention is described in conjunction with an illustrative embodiment in the accompanying drawing, in which:

FIG. 1 is a perspective view, partially broken away, of the inventive machine as seen from the operating end thereof;

FIG. 2 (on the second drawing sheet) is a perspective view of the machine of FIG. 1 but seen from the rear or work side thereof;

FIG. 3 (on the third drawing sheet) is a vertical sectional view, in fragmentary form, of the machine of FIGS. 1 and 2 as viewed from the right and left sides, respectively;

FIG. 4 is a top plan sectional view, taken along the line 4—4 as applied to FIG. 3;

FIG. 5 (on the fourth drawing sheet) is a fragmentary vertical sectional view taken along the line 5—5 as applied to FIG. 3;

FIG. 6 is a fragmentary bottom view of the showing in FIG. 5;

FIG. 7 is a fragmentary elevational view such as would be seen along the sight line 7—7 as applied to FIG. 5;

FIG. 8 (on the first drawing sheet) is a bottom plan view of the board carriage of the machine;

FIG. 9 is a fragmentary enlarged top view of the rack encircled as at A in FIG. 8;

FIG. 10 is a fragmentary side elevational view of the FIG. 9 rack;

FIG. 11 (on the fourth drawing sheet) is a bottom plan view of the rack encircled as at B in FIG. 8;

FIG. 12 (on the second drawing sheet) is an enlarged fragmentary view of a router bit employed in conjunction with the invention machine;

FIG. 13 is a fragmentary elevational view, partially in section, of boards assembled within the dovetailing machine for forming a lip-type drawer;

FIG. 14 is a fragmentary elevational view, partially in section, of boards assembled for the purpose of making a flush-type drawer; and

FIG. 15 is a fragmentary perspective view of a lip-type drawer corner.

In the illustration given, and with particular reference to FIG. 1, the numeral **20** designates generally a box-type frame for supporting the moving elements of the dovetailing machine. As seen in FIG. 2, the frame **20** supports a router carriage generally designated **21** and a board carriage **22**. Still further, as seen in FIG. 5, the frame **20** supports a motor carriage generally designated **23**.

Operation in general

The board carriage **22**, during a dovetailing operation, moves interruptedly in one horizontal direction, i.e., the direction away from the handle **24**. The handle **24** is employed for immobilizing the motor carriage **23**. During the time the board carriage **22** is at rest, the router carriage **21** reciprocates with the router bits **25** rotating. This operation can be most readily appreciated from a consideration of FIG. 3, where the direction of reciprocating movement of the router carriage is designated by **26** and the interrupted movement of the board carriage **22** is into the paper. At the end of a given dovetailing cycle, the board carriage is returned in a direction out of the paper (insofar as FIG. 3 is concerned), which corresponds to movement of the carriage **22** to the left in FIG. 1, i.e., toward the handle **24**.

The operation performed during these two carriage movements is illustrated in FIG. 13, wherein the direction of movement **26** is again indicated relative to the router carriage **21**. The upper or board carriage **22** is seen to support a board **27**, ultimately becoming the end board of a drawer generally designated **28** in FIG. 15. This board, at the conclusion of the dovetailing operation, is equipped with projections **29** and **30**, developing a cavity as at **31** and constituting the mortise portion of the dovetail point. The side board **32** is also supported on the board carriage **22** and during reciprocation of the router bit **25** shaped to develop the tenon portion of the dovetail joint which fits into the mortise **31**. It will be appreciated that to engage the tenon portion **33** of the side board **32** with the mortise portion **31** of the end board **27**, the side board **32** must be rotated 180° from its position in FIG. 13 and shifted one joint sideways in order to achieve the arrangement of FIG. 15. At this juncture, it can be briefly pointed out that the only difference in the FIG. 13 and FIG. 14 showings lies relative to the provision of a lip **34** on the end board prior to the dovetailing operation. This results in the type of drawer seen in FIG. 15, where again the lip on the front end of the drawer is designated by **34**.

Board carriage

The board carriage **22** is seen in rather detailed form in all of FIGS. 1–5, and constitutes the superstructure of the dovetailing machine. The board carriage **22** is made up of a bottom plate **35** (see FIG. 3 on the third drawing sheet), which is dovetail slotted as at **36** on its underside to receive dovetail tracks or rails **37** provided as part of the frame **20**. Thus, the board frame **22** moves laterally horizontally along a guided path. Upstanding

from the bottom plate **35** are side walls **38** and **39** (see FIGS. 1, 2 and 5), the showing in FIG. 3 being only of the side plate **39**. Interconnecting the side plates **38** and **39** is a partition plate **40** which provides an opening as at **41** (designated only in FIG. 3), communicating the operating and work ends of the machine.

The side plates **38** and **39** are further tied together and rigidified by virtue of stringer plates **42** and **43** (still referring to FIG. 3) which support a clamping mechanism generally designated **44** for securing the end board **27** against the plate **35**, i.e., horizontally.

On the other side of the partition **40**, the side plates **38** and **39** are connected by stringer plates **46** and **47** which provide a mounting for a second clamp generally designated **48** and which is employed to urge the side board **32** against the partition **40**. Thus the side and end boards are orthogonally related, with the lower end of the side boards **32** resting against the board carriage **22**, as is readily seen in FIGS. 13 and 14.

In the illustration given, the stringer plates **46** and **47** support a pair of clamps **48**, as can be appreciated from FIG. 2, while the stringers **42** and **43** support a pair of clamps **44**, as seen in FIG. 1. Thus, with a board carriage **22** measuring slightly in excess of 12" between the insides of the side plates **38** and **39**, it is possible to make all four sides of a 6" high drawer at one time, i.e., one interrupted horizontal movement of the board carriage **22**. To this end, the machine is equipped with a pair of router bits **25**, each mounted on the shafts of router motors **49** (see FIG. 2), the router motors **49** being secured to the router carriage **21** by means of brackets **50**, as seen in FIG. 3 on the third drawing sheet.

Router carriage

Before going into the description of the means for moving and positioning the board carriage **22**, the router carriage **21** will be described. The router carriage **21** (see FIG. 2 on the second drawing sheet) is equipped with a dovetail mortise portion along the sides as at **51**. Received within the mortise **51** is a tenon **52** extending laterally from the frame **20**. Thus, the router carriage **21** is adapted for horizontal movement perpendicular to the movement of the board carriage **22**. As seen in FIG. 3 on the third drawing sheet, the router carriage **21** extends only a short distance beyond the partition **40** toward the operating end of the machine. This makes it possible to bring the main driving motor **53** up close to the underside of the board carriage **22**, resulting in a compact machine, as can be appreciated from a consideration of FIG. 1, where the frame **20** is supported on a table **54**. The table **54** may be employed for supporting a dust-collection bag **55** (see FIG. 2), communicating by means of pipe **56** with a source of suction (not shown). The dust bag **55**, by means of a conduit **56***a*, communicates with a suction hood **57** arranged over the router bits **25**, as seen in dotted line in FIG. 3. In FIG. 2, the hood **57** has been removed from its position over the bits **25** and placed on the surface **54***a* so as to permit viewing of the bits.

As mentioned previously, the brackets **50** secure the router motors **49** to the underside of the router carriage **21**, with suitable electrical connections at **58** (see FIG. 2) being provided for interconnection with a junction box generally designated **59** and which carries the main switch as at **59***a* (see FIG. 1).

Router carriage reciprocating means

The means for reciprocating the router carriage can be best seen in FIGS. 5 and 6. As mentioned previously, the motor **53** is employed for this purpose, and is secured by means of a bracket **58** to the underside of the motor carriage **23**, The motor carriage is mounted for horizontal movement into and out of the paper, as seen in FIG. 5, by means of guide rails **59** provided as part

of the main frame **20**. Only limited movement of the motor carriage **23** is required—to position the routers out of the way of the board carriage **22** during the return movement after a dovetailing operation is completed. This positioning of the motor carriage **23** is achieved through the handle **24**, which is rigidly fixed to a cross shaft **60** (see also FIG. 7). A linkage as at **61** (see FIG. 3 on the third drawing sheet) is provided that interconnects the cross shaft **60** with the motor carriage **23**. Thus, as the handle **24** is rotated, the motor carriage **23** is positioned accordingly. To define the limits of position of the motor carriage **23**, the frame **20** is equipped with a bracket **62** (see FIG. 7 on the fourth drawing sheet), which slidably carries a threaded shaft as at **63** secured at one end as at **64** to a plate **65** fixed to the handle **24**. Thus, movement of the handle **24** in the clockwise direction seen in FIG. 7 is opposed by the spring **63**, and the handle **24** is maintained in its extreme clockwise position by means of a holder **66** also mounted on the frame **20**. The holder **66** is positionably mounted on the frame **20** so as to permit more or less clockwise movement of the handle **24** to its extreme position, thereby refining a series of positions of the motor carriage **23**. This in turn determines the extent of penetration of the router bits **25** so as to develop a perfect fit, since the router carriage **21** is directly coupled to the motor through a power train which will now be described.

Router carriage power train

The power train for moving the router carriage **21** can be most readily appreciated from a consideration of FIG. 6 on the fourth drawing sheet. There, the motor **53** is seen to be equipped with a sprocket **67**. The sprocket **67** is coupled by means of a chain **68** to a second sprocket **69** which is mounted on a shaft **70**. The shaft **70** is journaled in a bearing **70***a* secured to the underside of the motor carriage **23**. The sprocket **69** is equipped with an eccentrically located pin **71** to which is connected a long link **72**. The other end of the long link **72** is rotatably connected to the underside of the router carriage **21** as at **73** (see FIG. 3 on the third drawing sheet). Thus, as the motor **23** rotates, the rotational motion is transmitted through the sprocket and chain drive (elements **67–69**) to reciprocate the linkage **72** and thus the router carriage **21**.

The motor **53** also provides power for interruptedly moving the board carriage **22** by means of a cam-type connection which will now be described.

Board carriage cam drive

Reference is now made to FIG. 4, where again the motor is designated **53** and, in a cut-away portion, the cam sprocket is designated again by the numeral **69**. Opposite the pin **71** providing a journal for the long link **72**, the cam sprocket **69** is equipped with a pin **74**. The pin **74** is adapted to engage a ratchet-type rack generally designated **75** and which is provided on a block **76** secured to the underneath portion of the board carriage **22**. This can be appreciated from the showing in FIG. 8, wherein the rack **75** is encircled and seen with its associated mounting block **76** as at B—this portion being seen in larger scale in FIG. 11.

Referring now to FIG. 11, the rack **75** is seen to be equipped with slots **77** through which bolts **78** project from the block **76**. Urging the rack rearwardly, i.e., toward the router bits **25**, are springs **79** suitably mounted on guide rods **80** carried by the block **76**. The springs **79** project into slots **81** provided as part of the rack **75**, and the springs **79** insure that the rack **75** is urged against the motor table **23** as at **82** in FIG. 3 (on the third drawing sheet). This insures that the cam post **74** necessarily engages the ratchet rack **75**.

The block **76** (see FIG. 1) may also be equipped with a depending switch actuator **83** which is adapted to en-

gage a switch (not shown) on the right-hand inside of the frame **20** (as seen in FIG. 1) to shut off the motor **23** at the end of a given traverse of the board carriage **22**.

Although the board carriage **22** and the router carriage **21** have predetermined movements developed from the cam sprocket **69** and through the long link **72** relative to the router carriage **21**, and the ratchet racket **75** relative to the board carriage **22**, I find it advantageous to provide a means for correlating these two movements at the dovetailing site, and for this purpose make use of a guide rack generally designated **84**.

Guide rack

The guide rack **84**, as seen in the encircled portion A of FIG. 8, is secured to the board carriage **22** as seen in FIGS. 13 and 14. The rack itself is seen in enlarged scale in FIGS. 9 and 10 and is characterized by a series of entrance grooves **85** spaced by projecting, curved-ended fingers **86**. Cooperating with the rack **84** is a pilot pin **87** (see FIG. 4) carried by the router carriage **21**. Thus, as the router carriage **21** is reciprocated, the pilot pin **87** enters successive grooves **85** to properly position the router bits **25** for the next cutting operation.

Additionally, the rack **84** is provided with integral upstanding portions as at **88** (compare FIGS. 9 and 10), which serve to space the end board **27** relative to the side board **32** as seen in FIG. 14 when a flush or non-lip joint is required. On the other hand, the spacers **88** serve to support the lip **34** in the fashion seen in FIG. 13 when a lip drawer is being developed.

Example

As a specific example of the inventive machine, the illustrated embodiment has a board carriage measuring about 18" x 18", with the frame measuring about 28" from front to rear. This sized machine is adapted to simultaneously dovetail four boards, thereby providing the sides and ends of a complete drawer. The guide rack **84** is 12¾" long by 2¼" wide, having slots 1⅜" on ⅞" centers. Thus, the stroke of the router bits is 1⅜". The machine thus described is equipped with high speed router motors capable of developing 21,000 r.p.m. so as to develop dovetail joints even in plywood. The operation is speedy, with the motor **53** developing 12 r.p.m. on the cam sprocket **69**. The total weight of the machine is about 150 pounds, making the same readily portable and, as pointed out before, is capable of dovetailing boards of varying thicknesses, over the conventional range of ⅜"–½". The operation of the inventive machine will now be described.

Operation

The first step is, of course, to clamp the side boards **32** and end boards **27** in the orthogonally-related positions seen in FIGS. 13 and 14. This is done through operation of the clamps **48** and **44**, respectively. Thereafter the handle **24** is moved clockwise as seen in FIG. 7 to engage a recess or detent **66***a* in the positionable holder **66**. The setting of the holder **66** is dependent upon the thickness of the boards employed, the position of the holder **66** determining the extent to which the router bits **25** move toward the operating end facing the viewer in FIG. 1. Here, it will be appreciated that not only must there be a setting for different thickness boards, but even in a given thickness—say, ½"—there will be a variation from batch to batch.

In the operation, it is preferred to have the handle **24** actuate both the main motor **53** and the router motors **49**, this assuming the main switch **59***a* is suitably positioned. This actuation of the motors **53** and **49** is sequential, with the router motors **49** first being started so as to insure bringing the router bits **25** up to speed before any engagement is made with the side boards **32**.

Thereafter, the rotation of the sprocket **67** coupled to the motor **53** turns the cam sprocket **69** to reciprocate the router carriage **21** and also to step the board carriage to the right in FIG. 1 by virtue of the camming pin **74** entering the various openings **75***a* in the ratchet rack **75**. In the operation of the machine, I prefer to have the pilot pin **87** control the operation, as compared to the cam pin **74**. Thus, there is a discrete time during each step when the cam pin **74** becomes disengaged from the ratchet rack **75** and wherein the engagement of the pilot pin **87** with the guide rack **84** governs the relative movement of the router bits **25** and the board carriage **22**.

The spring-loading of the ratchet rack **75** urges the same toward the motor carriage **23**, the edge of which as at **82** may provide a rail to insure proper setting of the block **76** thereagainst. The board carriage **22** is seen to be equipped with a slot **22***a* permitting the block **76** to depend into abutting relation with the motor carriage **23**.

The length of travel of the bits is indicated in FIG. 14 where the numeral **25***a* designates the maximum left position of the bits **25** during dovetailing. This results in a rounded tenon portion **33** for perfect mating with the rounded mortise portion **31**. As mentioned previously, the depth of the mortise portion **31** is fixed by the adjusting screw **63**.

While in the foregoing specification a detailed description of an embodiment of the invention has been set down for the purpose of explanation thereof, many variations in the details herein given may be made without departing from the spirit and scope of the invention.

I claim:

In a dovetailing machine for drawers, a frame equipped with first and second carriages arranged for orthogonal movement relative to each other in vertically-spaced horizontal planes, the first of said carriages being equipped with a pair of cutting bits mounted for rotation about vertical axes and positioned adjacent one edge of said second carriage, said second carriage being equipped with clamp means for supporting a first board in vertical condition and a second board in horizontal condition, with said first board being located closer to said one edge than said second board, a motor on said frame for moving both of said carriages, linkage means coupling said motor to said first carriage for reciprocating the same, cam and ratchet rack means coupling said motor to said second carriage for interruptedly stepping said second carriage in one horizontal direction, and a guide rack providing spaced entrance grooves and elongated fingers secured to said second carriage along said one edge, a pilot pin upstanding on said first carriage between said cutting bits cooperating with the grooves of said guide rack for controlling the relative movement of said carriages between steps of said second carriage said guide rack being equipped with upstanding integral projections on said fingers intermediate the length thereof adapted to support the orthogonally-related boards in spaced-apart relation so as to permit development of both flush and lip-type drawers on said machine without special adjustment.

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