Feb. 16, 1943. D. H. DUFFY 2,311,216

CONTOURING MACHINE

Filed May 18, 1942 5 Sheets-Sheet 1

Fig. 1

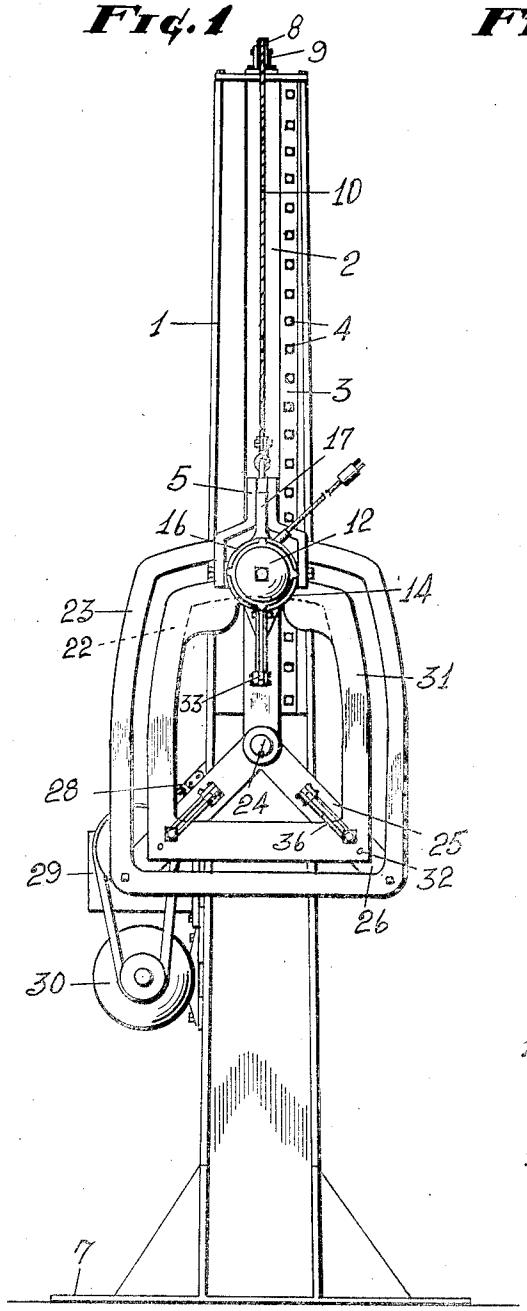
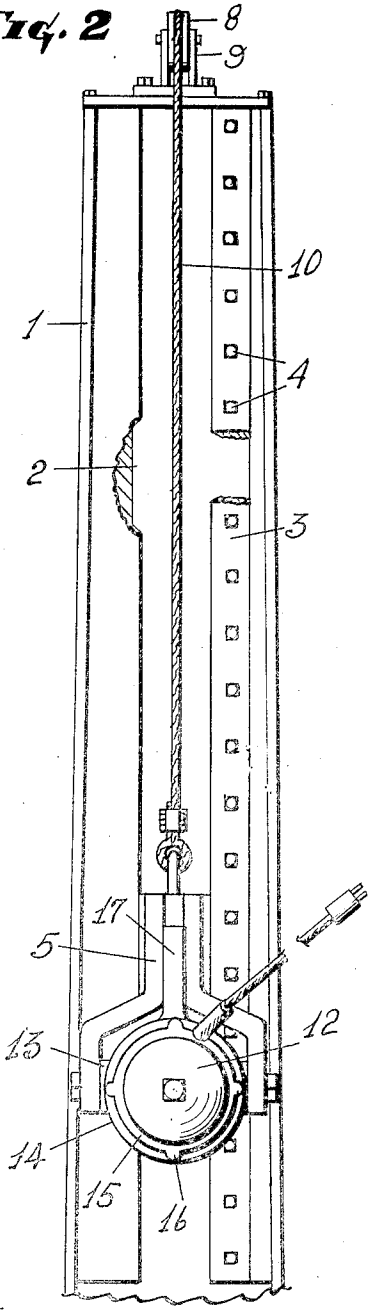


Fig. 2



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Fig. 3

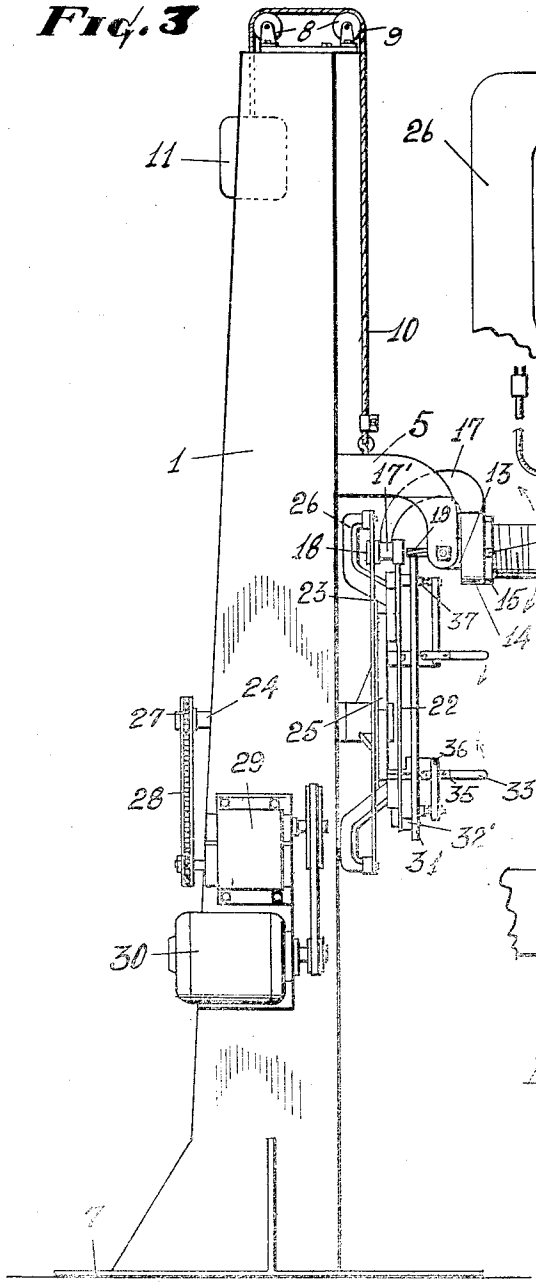


Fig. 4

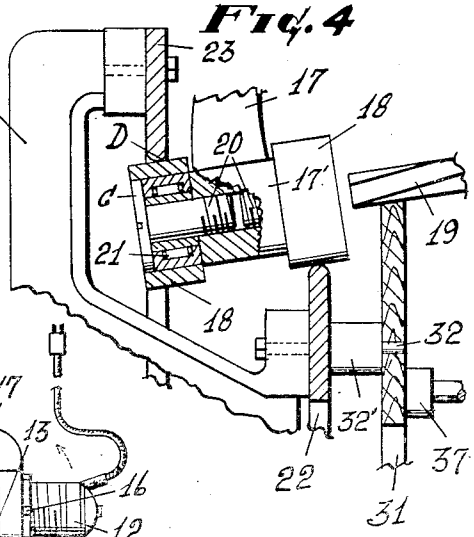


Fig. 5

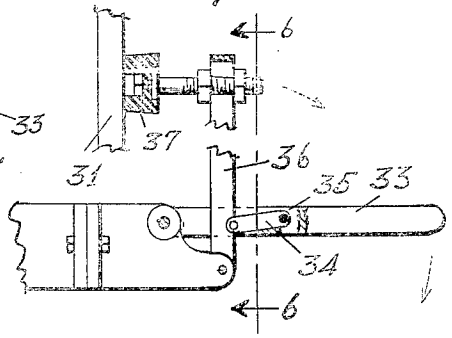
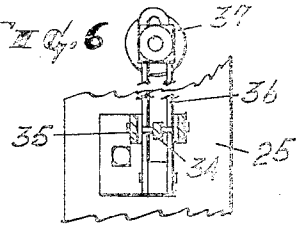


Fig. 6



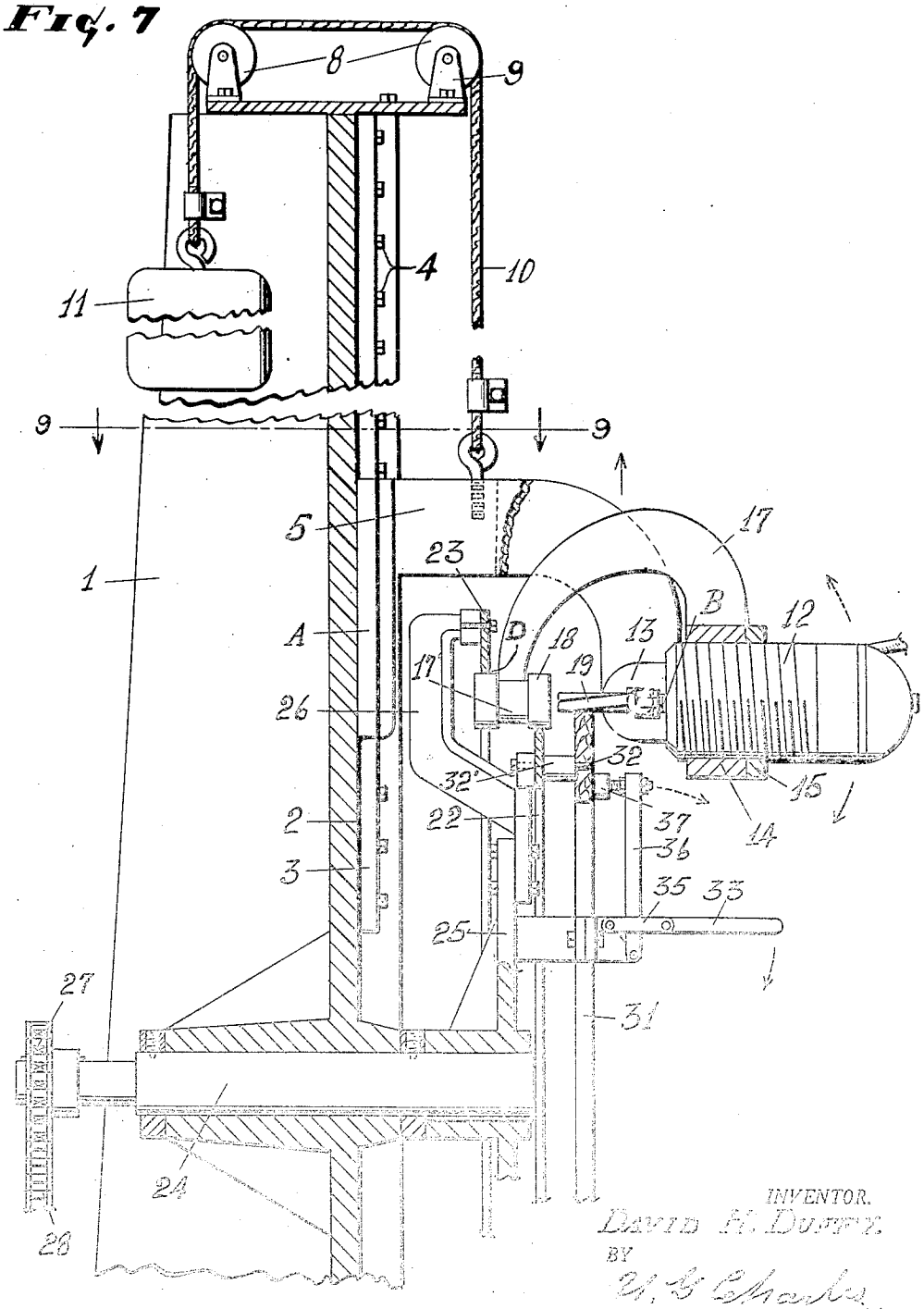
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CONTOURING MACHINE

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Fig. 7



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Fig. 8

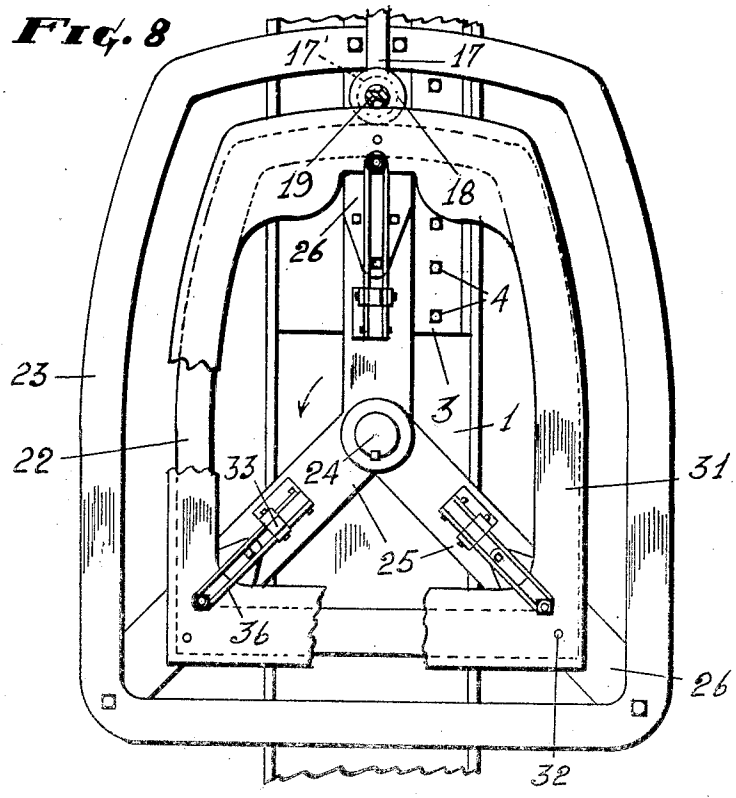


Fig. 9

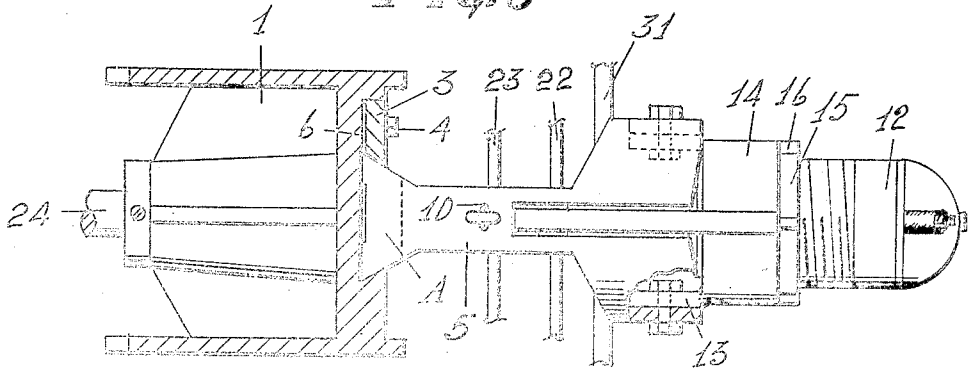
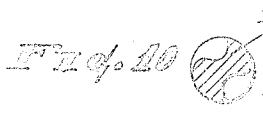


Fig. 10



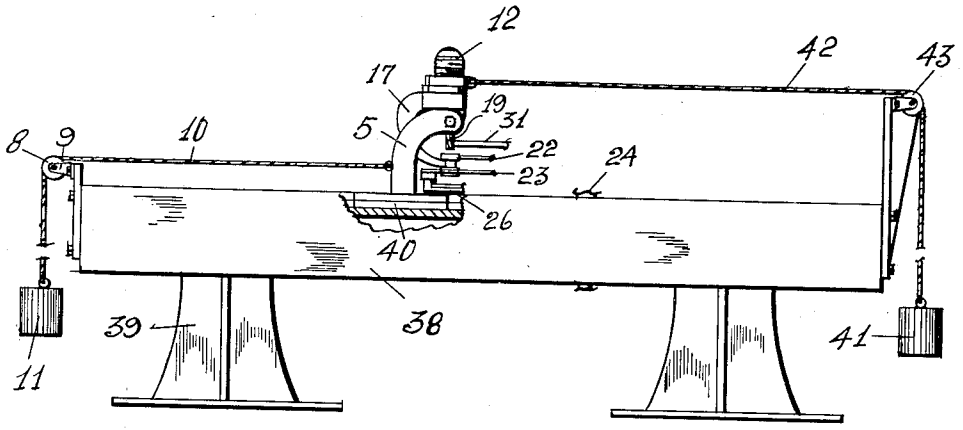
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CONTOURING MACHINE

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Fig. 11



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2,311,216

UNITED STATES PATENT OFFICE

2,311,216

CONTOURING MACHINE

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Application May 18, 1942, Serial No. 443,381

5 Claims. (Cl. 144—144)

This invention relates to a contouring machine, the principal object of which is for trimming blanks, such as bulkheads for aircraft fuselages, to a predetermined contour and simultaneously bevel the outer peripheral edges of the blanks to a predetermined angle at predetermined points therealong.

A further object of this invention is to produce articles of manufacture of an unlimited quantity of an exact predetermined form, size, and shape of their peripheral edges with respect to cross section.

A still further object of this invention is to construct a machine that will rapidly and accurately perform its function with respect to time and labor saving, whereby cost of production is greatly economized.

A still further object of this invention is to construct a machine having contour guides of predetermined forms that are easily attached and quickly removed and substituted by other guide forms selectively, and to which a bulkhead blank, or the like, is secured and contoured automatically as motive power actuates the machine.

A still further object of this invention is to construct an inexpensive machine that is simple and easily operated, and furthermore a machine reduced to a minimum size to economize floor space when installed in a factory.

These and other objects will hereinafter be more fully explained, reference being had to the accompanying drawings forming a part of this specification, and in which like characters will apply to like parts in the different views.

Referring to the drawings:

Fig. 1 is a front view of the machine.

Fig. 2 is an enlarged front view of the machine fragmentarily, parts removed for convenience of illustration.

Fig. 3 is a side view of the machine.

Fig. 4 is an enlarged fragmentary side view to illustrate the cutter, roller, and guides in their relative position, and partly in section.

Fig. 5 is a fragmentary plan view of the bulkhead locking device, partly in section for convenience of illustration.

Fig. 6 is a sectional view taken on line 6—6 in Fig. 5.

Fig. 7 is an enlarged sectional view through the column, and side view of the motor and guide rollers, parts removed for convenience of illustration.

Fig. 8 is an enlarged front view of the track guides and supporting spider.

Fig. 9 is a sectional view taken on line 9—9 in Fig. 7.

Fig. 10 is a cross section through the cutter.

Fig. 11 is a modification of the machine illustrating a horizontal position of the column and involving a weight substituting the gravity of the motor.

The invention herein disclosed relates to a contouring machine consisting of a column 1 vertically disposed, said column having a groove 2 on its front side, centrally disposed, extending from the top downward, and terminating a spaced distance upward from the shaft of the guide tracks later described. One side of the groove wall is integral with the column, while the other side is formed by a plate 3 seated in the groove, the edge of the plate and first said side of the groove being beveled convergently outward, said plate being secured by a series of cap screws 4 spaced therealong as shown in Fig. 7, whereby the trapezoidal portion A of an arm 5 will slidably engage vertically of the column and may be removed at any point longitudinally by removing said plate 3 to release the trapezoidal portion. The said plate is provided with a shim 6 to accommodate for a possible worn condition of the trapezoidal portion or its groove.

The said column at its lower extremity has a foot plate 7 as an erect supporting means therefor, while at the upper end there is provided a pair of sheaves 8 journalled on bearings 9 adjacent their respective front and rear portion of the column, the sheaves being engaged by a cable 10 having a weight 11 on one end thereof to counterbalance the motor 12, its carrying means and other component parts attached to the motor and to which the other end of the cable is secured.

The said arm 5 extends outward from its trapezoidal portion and being arched downward, the arched portion being bifurcated to straddle the motor, the legs of the bifurcation being rockably secured to ears 13, said ears being oppositely positioned diametrically and integrally joined to a collar 14 as rockable carrying means for the motor, the collar being threaded internally to engage with the externally threaded portion of the motor, and when screwed to a predetermined position in the collar the motor is secured against further rotation by a lock nut 15 in contact with the outer end of the collar, said collar having radially extending lugs 16 as turning means for the nut by the use of a punch or any suitable wrench. The said collar 14 is provided with an arm 17 arched upward and

toward the column and having a pair of rollers 18 co-axial with each other, a cutter 19, and turning axis of the motor, the cutter being removably secured to the shaft B of the motor, the cutting edges of which are spirally wound longitudinally, substantially as shown.

Each roller 18 is mounted on its respective shaft 20 through the medium of a roller bearing 21, said shaft threadedly engaging into the hub 17' at the terminal end of the arm 17, the inner race of the bearing being secured rigidly to the shaft while the outer race is secured rigidly to the roller 18, said roller and bearing being secured by the flanged head C of the shaft 20, whereby each roller may be removed from the arm for repair or replacement of other rollers.

Rotatably carried by the column beneath the motor is a pair of annular tracks 22 and 23, spaced apart to engage their respective aforesaid rollers, one roller engaging on the outer periphery of the track 22, while the other roller engages with the inside periphery of the track 23 to vary the turning axis of the cutter from a horizontal plane for the purpose later described.

Said tracks 22 and 23 are rotatably mounted to the column through the medium of a shaft 24, one end of the shaft being secured to the tracks by a hubbed spider consisting of arms 25, each arm having an extension 26 to space the tracks apart and in concentrical relation to engage each of the rollers simultaneously as the tracks revolve on their turning axis.

The other end of the shaft 24 has rigidly secured thereto a sprocket wheel 27 engaged by a link chain 28, said chain being connected to a transmission 29 that is power driven by a motor 30, each of which are secured to the column in working relation to the shaft, the transmission having a gear to reduce the speed rotation of the tracks and the said outer track 22 has a plurality of clamps spaced therearound as means to secure a bulkhead blank 31 or the like to said outer track, the periphery of the bulkhead being formed by the cutter as the bulkhead turns, the form of the bulkhead coinciding with the tracks, the cutter to turn with a high rate of speed and driven by the motor 12 that floats vertically as the periphery of the bulkhead is formed.

It will be understood that the peripheral contour of bulkheads in their assembly will vary in size as well as the peripheral shape with respect to cross section inasmuch as the said bulkheads are relied upon to form the varying contour of a fuselage of an airplane longitudinally and being spaced therealong, and the lower peripheral portion of the bulkheads may be at right angles to their sides while the other edge portions may be beveled to coincide with the pitch of the fuselage; therefore, guide plates must be shaped to conform for the peripheral requirement of each bulkhead, and each bulkhead being oversized with respect to its periphery to permit trimming to its predetermined finished form.

Inasmuch as the bulkheads may vary with respect to heighth and width, or in other words oblong, it will be understood that the tracks will be made to conform therewith, and the bulkhead to be concentrically attached as controlled by transversely extending pins 32 secured to the outer track to engage in their respective apertures through the bulkhead whereby placing the bulkhead on the track is speedily and accurately accomplished, and being secured by rockable clamps carried by the arms, said arms heretofore described. Each clamp has a lever 33 with a rockable pawl 34 positioned within the yoke portion 35 of the lever to maintain the rocked position of the lever and to compress an arm 36, one end of which is pivotally connected adjacent the lever while the other end of the arm 36 has a suitable means to carry a rubber compressor 37 to contact the bulkhead and bind the same to its track in spaced relation therefrom through the medium of spacers 32' positioned between the outer track and bulkhead and secured thereto by said pins 32.

It will now be seen that the motor, its cutter and rollers are adapted to float vertically, and rock from a horizontal plane with respect to their turning axis, the movements of which are smooth under the coaction of the rollers and the counterbalance of the weight heretofore described, while the cutter as controlled will follow the periphery of the bulkhead in its varying distance from its turning axis; furthermore the bevel or right angle of the peripheral edge of the bulkhead is accomplished by the rocking movement of the motor 12 that is controlled by the rollers engaging on their respective tracks as illustrated in Figs. 3 and 4, which is automatically accomplished. It will also be seen that the convexity D of the bearing edges of the guide tracks is means to engage the rollers uniformly as the motor rocks.

In Fig. 11 is illustrated a modification in which the column 38 is horizontally disposed, and in which the foot plate as heretofore described is eliminated while the said column has a pair of bearings 39 adjacent each end of the column to raise the same from a floor line to avoid interference with the sprocket and chain as shown in Fig. 1; otherwise the machine embodies the grooved column, motor and mounting means therefor, together with the guide elements, rollers and cutter, all of which are similar to that illustrated in the other views, except the trapezoidal portion 40 which is elongated, having its bifurcated arm centrally connected thereto as shown in Fig. 11, the purpose of which is to equalize a possible rocking tension at each end of the trapezoidal portion when moved in either direction. In this modification, it will be seen that the former described gravity action through the medium of the motor will be substituted by a weight 41 having a cable 42 connecting the same to the motor, the cable engaging on a sheave 43 that is journalled at one end of the column, by which means the motor, through the gravity of the weight, will counteract the weight 11, whereby when the tracks rotate, acting upon the rollers, the motor is easily moved to and fro longitudinally of the column. In this instance, one of the aforesaid sheaves at the top of the column is eliminated, the machine being so positioned will function with equal efficiency to that of its former vertical position, and such other modifications may be employed as lie within the scope of the claims.

To operate the machine herein disclosed, I first determine the contour of a bulkhead and then provide a pair of annular tracks coinciding with the contour of the bulkhead as guiding means for the rollers that in turn directs the position of the cutter coaxial therewith. It will be understood that the bulkhead is slightly oversized and being secured to the outside or lesser track of the two but spaced therefrom. I then start the motor 12 that operates the cutter to bed itself in the bulkhead, and immediately thereafter motor 30 is energized to rotate the tracks which

in turn carries the bulkhead therewith that is properly contoured in one or more revolutions of the track, after which the bulkhead is removed to place another in position. The counterbalance arrangement is automatic to avoid chatter and to rock the cutter for portions of the bulkhead are formed with a bevel transversely, furthermore the counterbalance carried by the column is means to float the motor for the varying contour of the bulkhead.

Having fully described this invention what is claimed as new and desired to secure by Letters Patent is:

1. In a contouring machine, a grooved column vertically disposed, an arm having means on one end of the arm to slidably engage in the groove carrying the arm therewith, a motor carried by the arm, a cutter actuated by the motor and another arm secured to the motor to extend toward the column, rollers coaxial with each other and with the cutter and carried by said arm, guide tracks rotatably journalled and carried by the column, said tracks to be engaged by the rollers to rock and move the motor vertically, and means to secure a bulkhead blank to the guide tracks in working relation to the cutter and being contoured thereby as the said tracks are revolved.

2. In a contouring machine of the class described, comprising a motor and a column having a groove longitudinally extending from one end of the column and terminating near the center thereof and being on one side of the column, the groove having a flat bottom and outward convergent sides, an arm having a trapezoid on one end thereof to slidably engage in the groove, the other end of said arm being bifurcated to rockably carry the motor, and collar means to connect the bifurcated portion of the arm to the motor, a counterbalance for the arm and motor operatively carried by the column, another arm, one end of which is rigidly connected to said collar means, an elongated spirally grooved cutter axially secured to the motor shaft, a pair of rollers journalled on the other end of last said arm coaxial with each other in spaced relation and being in axial alignment with the cutter, a pair of oblong guide tracks varying in size peripherally and spider means to carry the said tracks in spaced relation with respect to their sides and being concentrically aligned with each other, a shaft journalled on the column, one end of the shaft being secured to the spider as turning means for the oblong guide tracks, and the said pair of rollers to engage the guide tracks internally of one and externally of the other respectively as vertically moving and rocking means for the motor and its cutter as the oblong tracks rotate.

3. In a contouring machine as recited in claim 2, clamps carried by the spider as securing means for a bulkhead blank to one side of one of the said oblong guide tracks, the blank being carried in working relation to the said elongated cutter as contouring means for the blank peripherally, and means on the side of said guide track members to accurately position said blank prior to clamping the same to said guide track members.

4. In a contouring machine, a pair of annularly formed guide tracks for edge engagement made from comparatively thin material and being flat with respect to their sides, a spider to which the guide tracks are connected, the tracks being in spaced relation coacting with each other, a suitable supporting means on which the spider is journalled, a power-driven transmission to turn the said guide tracks at a comparatively slow rate of speed, one track being arranged for internal engagement while the other track is arranged for external engagement coacting with each other, a motor, an arm to carry the motor rockably thereon, said arm adjustably connected to the said supporting means in working relation to the said guide tracks, and another arm to rock the motor, a pair of rollers journalled on last said arm, the rollers to be engaged by said guide tracks to rock the motor, a cutter actuated by the motor, said rollers and cutter co-axial with each other as contouring means for a bulkhead blank carried by the guide tracks, said motor and parts connected thereto being gravitately tensioned to move the same in one direction and to cause simultaneous engagement of said rollers to guide the cutter for its predetermined contouring of said bulkhead blank.

5. In a device of the class described comprising an elongated supporting column, a rotatable drive shaft journalled therein, a carrying element fastened on said drive shaft and rotatable therewith, a frame-like wood blank to be worked upon and means to secure the same a spaced distance from the carrying element concentric to the shaft, a slidable element mounted on said column adapted to be moved toward and from the drive shaft to accommodate for oblong and different sized blanks, a spirally grooved rotatable cutter engaging on the blank for a desired cut, and means to rockably carry the cutter on said arm, rollers carried by the said last means, the turning axis of which is co-axial with the turning axis of the cutter, and track means rotatable with the carrying element to receive the rollers for controlling the turning axis of the cutter for a predetermined slanting cut on said blank.

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