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2,811,085

FORM BLOCK SHAPING AND BEVEL ANGLE CUTTING MACHINE

Filed June 10, 1955

4 Sheets-Sheet 1

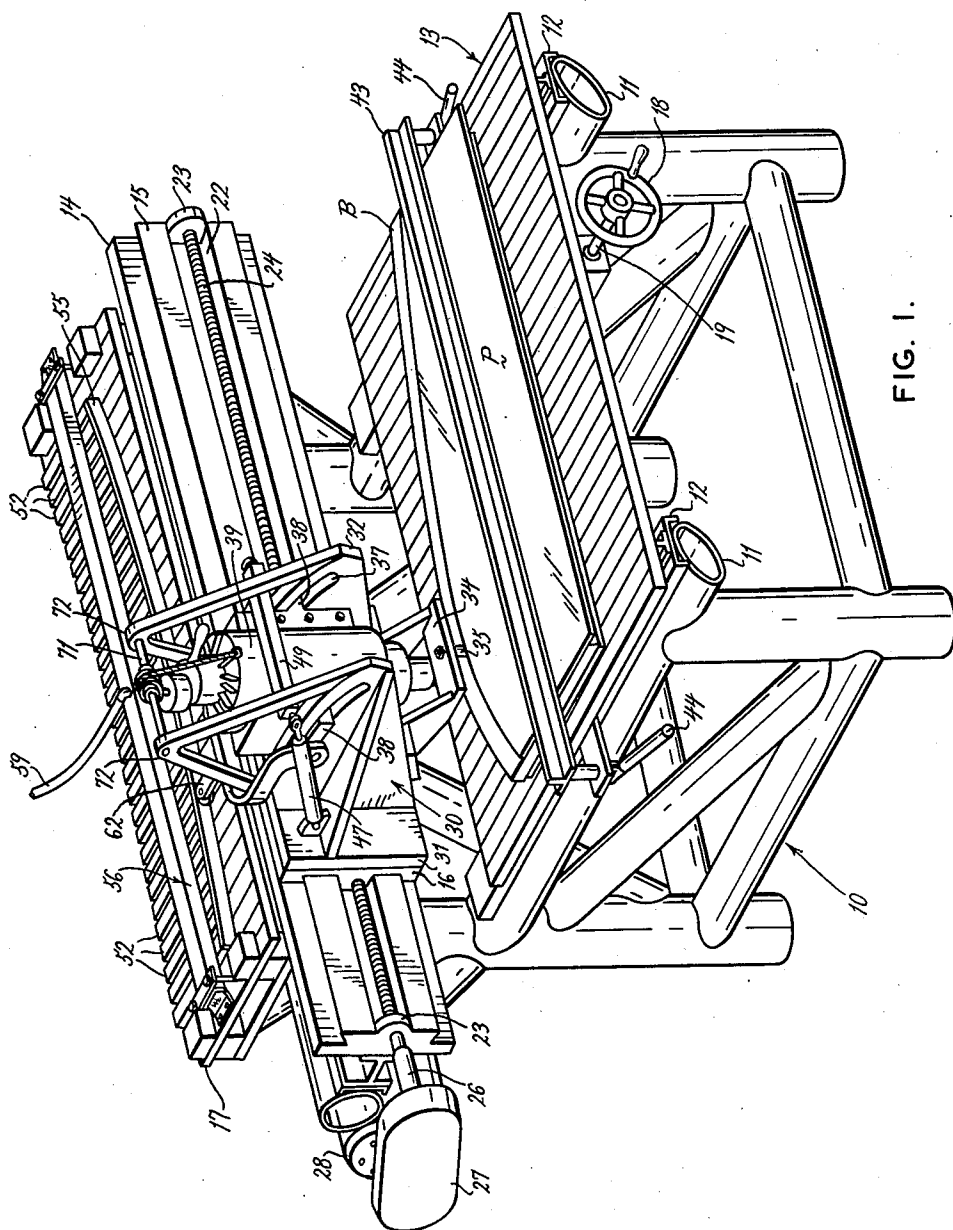


FIG. 1.

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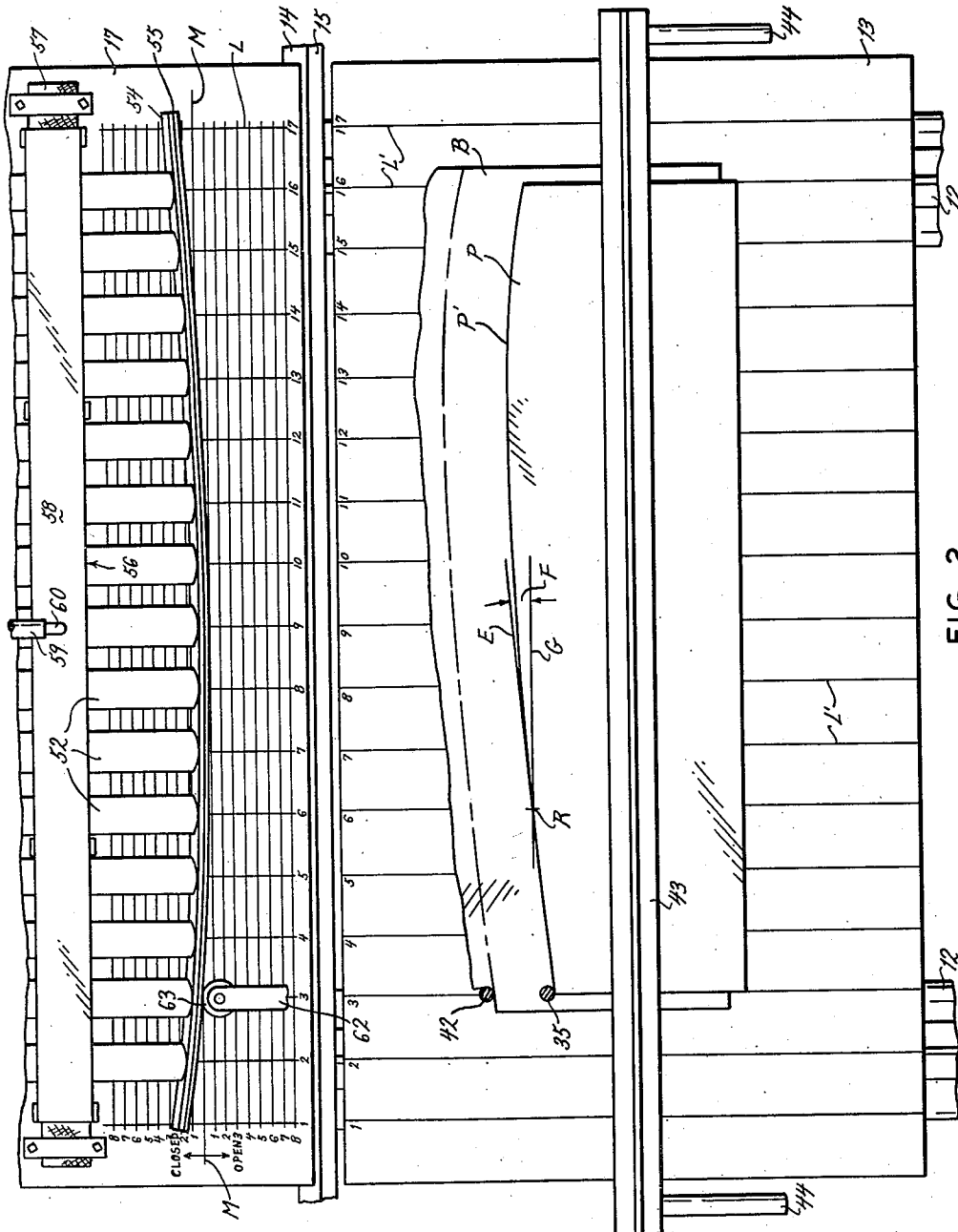
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4 Sheets-Sheet 2



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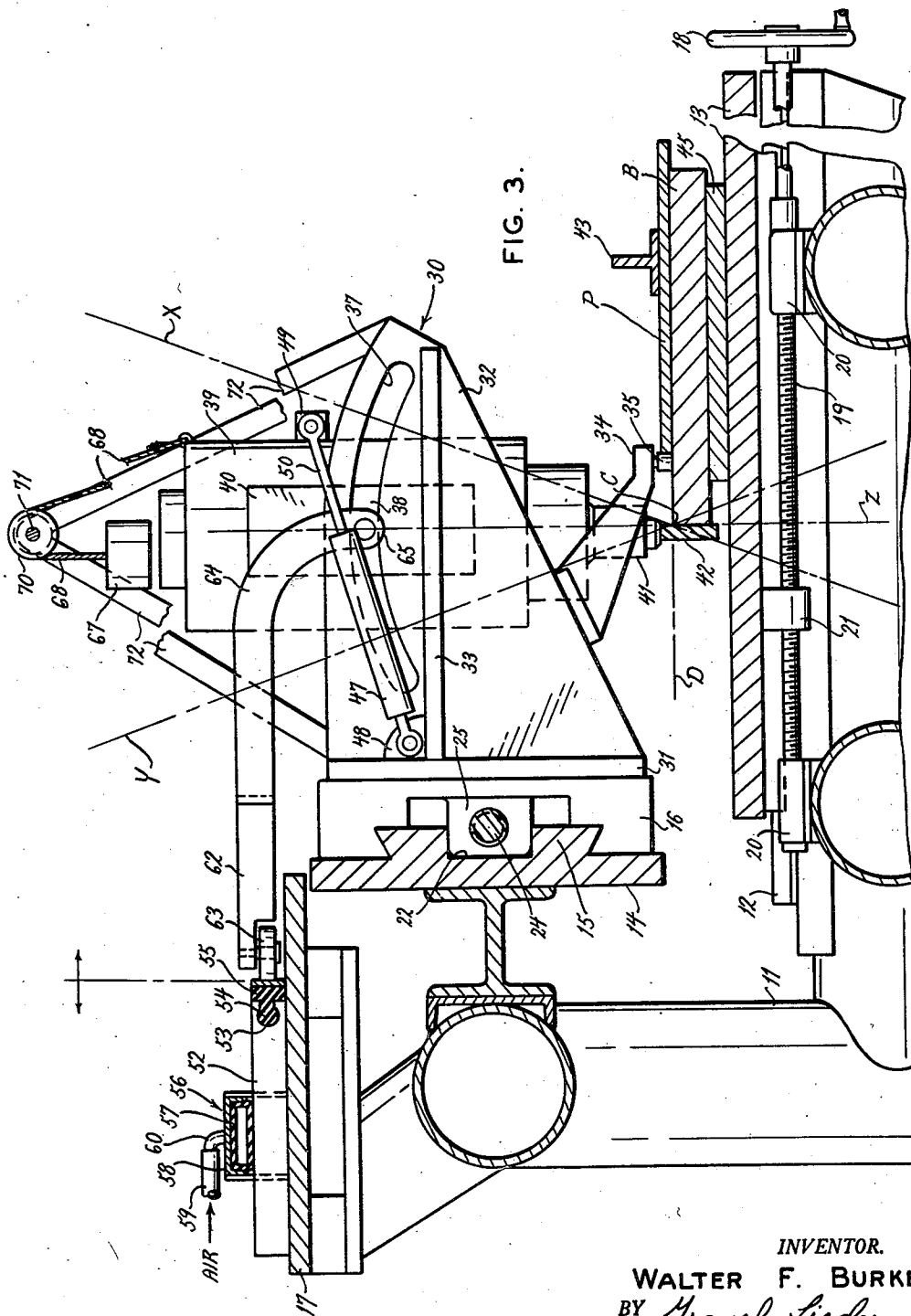
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FORM BLOCK SHAPING AND BEVEL ANGLE CUTTING MACHINE

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4 Sheets-Sheet 3



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4 Sheets-Sheet 4

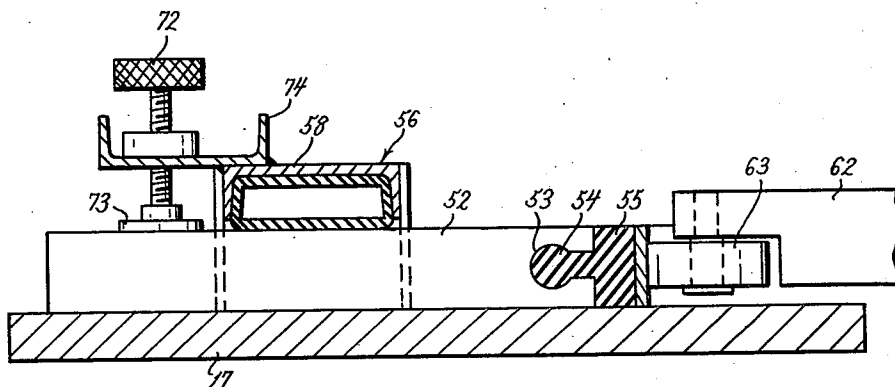


FIG. 4.

		CONTOUR-ANGLES					
DESIRED FORM BLOCK ANGLE		10°	20°	30°	40°	50°	60°
	0	0°	0°	0°	0°	0°	0°
	2	0°	0°-6'	0°-18'	0°-36'	1°-6'	2°-0'
	4	0°-6'	0°-18'	0°-36'	1°-12'	2°-12'	4°-0'
	6	0°-6'	0°-24'	0°-54'	1°-48'	3°-18'	5°-54'
	8	0°-6'	0°-30'	1°-12'	2°-24'	4°-24'	7°-42'
	10	0°-12'	0°-36'	1°-30'	3°-0'	5°-18'	9°-24'
	12	0°-12'	0°-42'	1°-48'	3°-30'	6°-18'	11°-0'
	14	0°-12'	0°-54'	2°-6'	4°-0'	7°-12'	12°-30'
	16	0°-12'	1°-0'	2°-18'	4°-30'	8°-0'	13°-48'
	18	0°-18'	1°-6'	2°-36'	5°-0'	8°-48'	15°-0'
	20	0°-18'	1°-12'	2°-48'	5°-24'	9°-30'	16°-6'

FIG. 5.

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2,811,085

FORM BLOCK SHAPING AND BEVEL ANGLE CUTTING MACHINE

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Application June 10, 1955, Serial No. 514,478

5 Claims. (Cl. 90—13)

This invention relates to improvements in form block shaping and bevel angle cutting machines in which simplicity of operation and accuracy of results are characteristic features.

The present machine has special significance in the aircraft art as it is well known that an aircraft project would require over 2,000 form blocks, in addition to the patterns or templates for these blocks. The present very expensive way of making them is by starting with a block of metal or Formica and filing it out by hand by following the pattern to very accurate dimensions. With this machine, it is possible to set up, on one portion of the machine, the dimensions from the drawing of the desired form block, and using these dimensions and the pattern as a guide the operator can make the usable form block by a simple method of following the pattern contours which are corrected for bevel angles which may be called for.

By the use of a machine of this type, it would not be necessary to store bulky, space consuming form blocks against the time when spares are ordered as it would be so easy to set up the present machine from the drawing and pattern and cut the block out from a new piece of material. These blocks are used on the bed of a hydraulic press with the thick rubber pad forming the sheet of metal to the contours of the block.

An object of this invention is to provide a machine which will in one operation shape a form block to any desired bevelled contour with a few simple preliminary machine set up steps.

It is also an object of this invention to provide a machine of the foregoing general character in which the principal operating components are arranged to permit a direct visual inspection of the set up on the machine prior to operation thereof.

It is a further object of this invention to simplify the arrangement of a form block contour and bevel angle cutting machine so that the contour cutting control is achieved by means separate from the bevel angle control means, whereby the latter control means can be simply constructed and located in a place for quick and easy access for the purpose of making adjustments thereto.

It is a further object of this invention to provide form block bevel angle control means in a form block contour cutting machine of the above character which will function automatically during cutting of the form block contour to produce open or closed bevel angles or variations of such angles throughout the length of the form block.

The present invention has as one of its objects the simplification of production and reproduction of form blocks for use in industry generally, and specifically for use in the aircraft industry where many thousands of form blocks are required for each aircraft model. The necessity for storage of form blocks has presented a serious problem to aircraft manufacturers as they must be able to reproduce on short notice any of the thousands of the aircraft parts which might be called for.

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This invention consists in a form block shaping and bevel angle cutting machine having a movable table on which the rough cut form block, together with the form block pattern, is suitably clamped, a relatively fixed support or table on which suitable bevel angle determinant means is adjustably carried, a motor driven form block cutter movable relative to the form block supporting table to reproduce the pattern shape on the form block, and means operatively connecting the bevel angle determinant means with the cutter for superimposing a predetermined angular cutting position on the cutter for the purpose of controlling the effective cutter position to reproduce on the form block a bevelled contour of a predetermined character.

The machine of this invention further consists in means for adjustably mounting the motor driven cutter so that it may rock or tilt about an axis located in a predetermined relation with the form block so as to produce accurate and precise results in the reproduction of form block contours and bevel angles for such contours. The invention herein further consists of the components thereof, and in the arrangement of such parts or components which will be hereinafter specifically described in connection with the accompanying drawings, wherein:

Fig. 1 is a perspective view of one form of the present invention disclosing the arrangement of parts and components therefor;

Fig. 2 is a fragmentary top plan view of the machine shown in Fig. 1, the view particularly illustrating certain features of the machine;

Fig. 3 is a fragmentary sectional elevational view of the machine of Fig. 1, this view particularly illustrating certain geometrical relationships and relative motion of components and parts thereof;

Fig. 4 is a modification for a part only of the machine shown in Fig. 1; and

Fig. 5 is a chart showing angular correction factors to produce the bevel angles at the given contour angles.

Reference will now be made to Fig. 1 for a detailed understanding of the present machine. This machine, as illustrated, consists in a suitable frame structure 10 made up of interconnection tubular parts of which horizontal members 11 provide suitable support for ways 12 on which a form block support or table 13 is operatively carried. The frame 10 further supports a suitable track means 14 having a gib 15 for the movable support of a carriage 16. In the present structure, the track 14 is located near one margin of the support 13 and above the plane of such support so that the support 13 may move toward or away from the track 14, and the carriage 16 may move along the track in a generally transverse direction. Another support or table structure 17 is located adjacent and somewhat above the track 14 so as to make it possible for the machine operator to view the table 13 and set adjustable control means on table 17 to whatever data appears upon the pattern on table 13.

In the machine above described, the support or table 13 on which the form block is mounted with its base or bottom surface uppermost is adapted to be operated along the ways 12 by means of a manually operated feed wheel 18 driving a screw shaft 19 (Fig. 3). The screw shaft 19 is suitably mounted in bearings 20 so as to be capable of rotation without axial displacement. The support or table 13, on the other hand, is provided at its under surface with a suitable threaded means 21 which is non-rotative, but acts as a nut for transmitting the thrust from the screw shaft 19 to the support, whereby the latter is caused to move on the ways 12 in known manner. The track 14 having the gib 15 thereon is formed with a longitudinal channel 22 and the bear-

ing means 23 for the purpose of permitting the operative mounting of a feed screw 24. The feed screw 24 is operatively connected with the carriage 16 by means of a threaded projection 25 (Fig. 3). Since this construction is well known in the art, it is believed unnecessary to provide a detailed disclosure thereof.

The feed screw 24 has a shaft extension 26 at one end for connection to a suitable drive assembly shown covered by a guard 27. The drive assembly may be a belt or a gear train of known character, either of which is powered by the motor 28, as indicated in Fig. 1.

Attention will now be directed to Figs. 1 and 3 wherein the details of the motor driven cutter are shown to advantage. The carriage 16 constitutes the means on which a support structure 30 is mounted. This support structure consists in a back plate 31, horizontally spaced and generally triangularly shaped and forwardly extending brackets 32, bracket braces 33, and a depending bracket structure 34 carried on the lower angular edges of the spaced bracket 32 in position to carry a contour guide element 35. The structure just described is adapted to move with the carriage 16 through the operation of feed screw 24.

A feature of the present invention is found in the provision in the brackets 32 of arcuate shaped tracks 37 which are precisely machined and accurately correlated to receive trunnion like slide blocks 38, the blocks 38 being movable along the tracks 37 for the purpose of rocking, tilting, or pivotally swinging a motor 39 carried in a suitable frame 40. The frame 40 includes the trunnion blocks 38. This motor carries a suitable chuck 41 in which the cutter bit 42 is mounted. The support table 13 is adapted to carry a block B which is to be turned into a form block, and this block, in rough shaped form (Fig. 2), is suitably secured to the support by means of the longitudinal clamping device 43 in which quick release clamps 44 of known character are used. One of the known geometric characteristics of the machine is the location of the reference plane represented by the broken line D in Fig. 3. This reference plane is utilized to locate the block B with its bottom face at the required distance above the support 13 so that a surface thereof is fixed at the point or center about which the arcuate tracks 37 are constructed. This center point for the track 37 is indicated at C in Fig. 3. An advantage for this geometrical relationship is that it is possible to consistently maintain the necessary clearance between the support 13 and the end of the cutter 42. Accordingly, as the form block B may differ in thickness, different thickness means 45 may be utilized to bring the under face of the form block into the plane D. The means 45 may consist in a number of blocks of selective thickness which can be placed on the support 13 and moved about as required to give proper under support to the support block B. Again referring to the center point C for the arcuate tracks 37, it is noted that the vertical position for the cutter 42 is obtained when the trunnion slide blocks 38 supporting the block motor 39 are centrally located in the tracks 37. This position may be referred to as the zero bevel angle position. When the drive motor 39 is moved outwardly (to the right in Fig. 3), the cutter 42 pivots rearwardly about the point C. This pivoting or rocking adjustment of the motor 39 results in producing a bevel on the margin of the form block B, which bevel has an open angle. An open angle is that angle formed between the cutter axis and the plane D which is greater than 90°. In a corresponding manner, rocking or pivoting displacement of the drive motor 39 rearwardly (to the left in Fig. 3) pivots the cutter 42 about point C forwardly to a closed bevel angle position, wherein the angle formed between the axis of the cutter and the plane D is less than 90°. In Fig. 3, an open angle position is illustrated by the reference line X, and the closed bevel angle position by the reference line Y. The zero

bevel angle position is represented by the reference line Z.

The arrangement above described for permitting rocking or tilting displacement of the drive motor 39 in opposite directions for determining desired open or closed bevel angles requires means by which the drive motor 39 and the parts connected to or carried by it become balanced or are held against imposing side thrust loads on the cutting load 42. A greater part of the weight of the drive motor 39 and associate parts is preferably carried by the trunnion blocks 38, and the disposition of this weight is located relative to the blocks 38 to reduce to a minimum the weight which needs to be resisted when the drive motor moves off of the vertical or zero position Z. One means for accomplishing the foregoing results consists in a double acting balancing spring cartridge 47 suitably pivotally connected to an anchor bracket 48, and operatively pivotally connected to a cross bar 49 connected to the motor frame 40. The latter connection is made through the cartridge rod 50 (Fig. 3). A balance spring cartridge of the type shown at 47 is believed to be well known and consists essentially in a plunger element maintained in a predetermined position by opposing springs, so that as the plunger moves in either direction from this position one or the other of the springs resists such movement. Therefore, this device when adjusted to the conditions of the present machine, always tends to restore the drive motor 39 to the vertical zero angle position and, since most of the weight of the drive motor is supported by the trunnion blocks 38, the cartridge 47 is not called upon to exert any great amount of restoring force. An arrangement by which the drive motor 39 can be balanced as above described makes the system practically weightless in any of its angled positions so that the cutter 42 is substantially free of side forces or loads and can be made to produce more accurate results.

The means provided for selectively controlling or adjusting the bevel angle position of the drive motor 39 and the cutter 42 is disclosed to advantage in Figs. 1 and 3, and certain details thereto have been disclosed in connection with Fig. 2. It should be pointed out that in Figs. 1 and 3 the preferred form of the present machine has been shown arranged with the table 17 located above and relatively behind the form block supporting table 13. It can be seen that the operator when adjusting the machine may stand behind the upper table 17 (Figs. 1) and look downwardly upon the table 17, simultaneously having a view of the movable form block supporting table 13. The view of table 13 may be partly obstructed by the power operated cutter mechanism carried on the supporting structure 30, but this is easily avoided by locating the supporting structure 30 at one extreme or the other of the feed screw 24 during the time when the operator is setting up the bevel angle for the form block.

With particular reference to Fig. 2, it is noted that the surface of the table 17 is provided with a longitudinally extending index line M and a series of longitudinally extending parallel lines, arranged in two groups numbered consecutively from 1 through 8, each group respectively denoting degrees of open or closed angles from the index M. The series of lines of angular value are crossed by right angularly arranged station index lines L. This latter group of index lines (numbered 1 to 17) is intended to provide a quick and simple means for locating linear distances or stations longitudinally in the direction of movement of the power operated cutter carriage 16. It has been pointed out above that the surface of table 17 and the surface of movable table 13 may be seen from the operator's position behind table 17. The surface of table 17 is also provided with a series of parallel station location index lines L'. It should be obvious that the station location lines L' on the table 13 line up with station location lines L on table 17 so that any line L selected on table 17 will have corresponding index line L' on table 13. It is always possible to

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start with any station location index line L' as a reference point from which to set up a form block on table 13 of the machine. The view of Fig. 2 shows the station location index lines L and L' in numerical correspondence, whereby station 3 on table 13 corresponds with station 3 on table 17.

In Fig. 2, the form block B is shown in an inverted position upon table 13 with the edge portion to be contoured only rough cut, the intended final contour being indicated by the broken line. The exact contour is obtained by arranging the pattern or template P upon the block B at a particular position which will now be described. The pattern P is provided with an accurately cut or formed edge P' which has been arrived at in the usual manner by methods known to the art. The pattern P, at the time it is made, is suitably marked with the station locations which are critical to the form of the edge P'. Additionally, contour information, such as the degree of bevel angle for each station location, is usually inscribed directly upon the pattern P so that the same may be related specifically to a particular part, section, bulkhead, or component of an aircraft, it being assumed that the final form block is to be used in forming an aircraft part. Once the pattern P has been created in this manner it may be stored away for future use at very little expense and with a minimum of storage space requirements. On the other hand, storage of the bulkier form blocks is to be avoided. This is particularly advantageous as the form block after use may be discarded and a new block reproduced in a short time when needed again.

In the example illustrated in Fig. 2, the form block B and the pattern P are shown in an arbitrary location with the left margin of the pattern P directly aligned with station 3 on table 13. The right hand margin of the pattern is then found to be at station 16. The machine operator may move the pattern forwardly and backwardly relative to the intended form block contour shown by the broken line until it is determined that the cutting of the maximum closed angle in the contour will not fall outside of the rough cut margin of the form block where material is lacking. One way of avoiding the foregoing difficulty is to provide excess marginal material to be cut away by the cutter 42. This is accomplished by locating the pattern P with its pattern edge P' spaced from the intended form block contour a predetermined distance. In the present machine this distance is approximately three inches.

During the cutting operation, the operator of the machine is required to turn the feed wheel 18 in the required direction to move the table 13 inwardly or outwardly to maintain the contour guide element 35 (Fig. 1) in contact with the edge P' on the pattern. Concurrently, the power operated cutter is caused to traverse the table 13, through the feed screw 24, from left to right as viewed in Fig. 1. The combination of motions of the cutter moving longitudinally of the form block B and the bodily displacement of the form block B with table 13 causes the cutter 42 to move parallel with the pattern edge P' represented by the broken line shown in Fig. 2.

The bevel angle determining and controlling means consists in a series of substantially identical backing slides 52 adjustably carried on the surface of table 17. In the present arrangement, a backing slide has been located at each of the station location index lines L so that the bevel angle for each station may be predetermined. The slides 52 are suitably formed at the forward ends (Fig. 3) with a socket 53 adapted to receive a bead 54 on the back face of a flexible spline element 55.

The operator of the machine may set the position of the bevel angle determinant means by reading the information appearing on the surface of the pattern P, thereby determining the position of each slide 52, either to the open angle side or the closed angle side of the bevel angle index line M. In the present example, the

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slide 52 for station 3 is located at a zero bevel angle. This means that the cutter 42 will be in its vertical position as shown in Fig. 3. At station 7, the spline 55 is adjusted by the corresponding slide 52 to an open angle bevel reading of one. The spline 55 at station 16 has been adjusted by the appropriate slide to a closed bevel angle position. Obviously, other positions of the slides 52 can be selected or a few key slides can be selected and the spline 55 adjusted at intermediate places to smooth out the spaces. The slides 52, once they have been adjusted to the desired settings, may be clamped in position by a pneumatic or hydraulic device generally shown at 56. This clamp (Fig. 3) includes a flexible and expansible element 57 suitably contained in a rigid housing 58 supported on the table 17 at its ends. The housing 58 has an open underside which is adapted to expose the flexible and expansible element 57 for direct contact on the slides 52. A source of pressure fluid is connected by a flexible hose 59 to the inlet elbow 60 in the housing 58, the elbow being connected into the element 57.

Fig. 4 shows an arrangement of a manually operated clamp screw 72 carrying a pressure plate 73 for engagement upon the slide 52. A number of these clamps can be adjustably carried in a longitudinal slot in the channel frame 74 on housing 58. The clamps are intended to fix the key slides 52 which are initially used to set the curvature for the spline 55.

The bevel angle determinant means shown and described herein is operatively associated with the power operated cutter frame 40 by means of a follower. The follower is formed with the arm 62 carrying a follower wheel 63 which is intended to engage the face of spline 55. The arm 62 is formed with a pair of widely spaced arms 64 which form a yoke, the outer extremities 65 of which are suitably pivotally connected to the trunnion slide blocks 38 on the motor frame 40. It is obvious from the foregoing details of operation of the present machine that, as the feed screw 24 drives the carriage 16 from left to right in Fig. 1, the follower wheel 63 through the arm 62 and the yoke arm extensions 65 will cause the motor driven cutter 42 to pivot or swing in the direction of tracks 37 (Fig. 3) to assume the corresponding bevel angle position predetermined by the spline 55. According to the example illustrated in Fig. 2, the bevel angle position of the cutter 42 at station 3 will be vertical, for succeeded stations 4, 5, 6, etc. the cutter 42 will move toward the open bevel angle shown in Fig. 3, and from approximately station 9 the cutter 42 will begin to move backwardly toward the neutral bevel angle line Z. Beyond station 14 it will finally move to the closed angle position. Any other bevel angle arrangement can be obtained by suitable adjustment of the slides 52, and it is important to note that the bevel angle position of the spline 55 is entirely independent of the contour control of the pattern P clamped on the form block, yet the contouring and the bevel angle cutting operation are co-operatively brought together in the present machine.

Returning now to the views of Figs. 1 and 3, it will be appreciated that the spring cartridges 47, there being one at each end of the cross bar 49, are intended to maintain the motor 39 in its substantially vertical position. This does not provide positive operative engagement between the follower wheel 63 and the face of the flexible spline 55. Accordingly, a slight amount of unbalance of the motor 39 counterclockwise (Fig. 3) about point C is needed to keep the follower wheel 63 on the spline. This slight unbalance may be conveniently obtained from a counterbalance weight 67 connected by a suitable flexible cable 68 to the front margin of the motor 39 at the anchor eye 69. The cable 68 passes over a pulley 70 which, in turn, is supported on a shaft 71 carried in a frame consisting of two side members 72. Each side member 72 may be attached at the upper edge of the brackets 32 so that the shaft 71 is fixedly positioned relative to the motor 39. This arrangement provides a con-

venient way to obtain the requisite degree of unbalance so that the follower wheel 63 rides on the surface of spline 55 with a positive engagement.

The present machine is entirely accurate in forming any bevel angle on a straight form block contour as well as for a contour which deviates angularly from the straight contour by only a few degrees. For slight deviations from the straight contour the error will not be sufficient to warrant correcting, but where it is necessary to make large deviations which may approach a cutting condition at right angles with the straight contour, represented by the index line M, a correction is required in order to produce accurately the desired beveled angle at all points on the contour of the block B. The correction varies with the deviation from a straight contour and is automatically attained by tilting the cutter from the center position used when cutting along an unbevelled contour. The amount that the cutter should be tilted in addition to the desired bevel angle will at any point on the contour depend upon the extent of the contour deviation from a straight contour. The following table gives the angular correction factors that must be added to the desired bevel angle to give an accurate bevel angle. Depending at any time upon the extent of the deviation the proper correction factors will be added. It is to be noted that the correction factor must be added in either direction from the vertical cutting position. The chart of Fig. 5 is illustrative of the correction factors which are useful.

Referring to Fig. 2, the correction factors given in Fig. 5 are used as follows: The point R on the pattern P has been selected for the purpose of illustration and corresponds to station location 6. A line E is determined for this point and is drawn tangent to the pattern at this point. Then extending this tangent line E so that it intersects with the line M, or any other line parallel to M, an acute angle is made. This angle which is shown as angle F is the contour angle and is then referred to the table for ascertaining the corresponding correction factor that should be used when establishing the correct bevel on that contour. In Fig. 2, angle F may be assumed equal to 10°, reference to the table of Fig. 5 shows that the corresponding correction factor should be 0°-6' for a desired bevel angle of 4°. As the block B, which is to be cut is now moved past the cutter 42, the cutter 42 will automatically be adjusted in its vertical plane to give an accurate bevel. Now the operator, in order to produce this 4° bevel angle at point R, automatically adjusts spline 55 at station 6 on table 17 to the corrected bevel angle reading of 4 degrees and 6 minutes (4°-6') arrived at by the above outlined procedure.

The advantage of this machine is that the bevel angle of the cutting head is charged automatically, while the contour of the piece is being produced. By so controlling both contour and bevel cuts simultaneously this machine replaces numerous set ups and hand work previously done in fabricating form blocks, contour boards, etc.

It should be appreciated that changes in the parts, components and sub-assemblies may be made to suit manufacturing conditions, and it is the object hereof to include all such changes within the scope of the claims.

What is claimed is:

1. In a form block contouring and bevel angle cutting machine, a frame, a fixed support, a form block and form block template support movable on the frame in a direction toward and away from said fixed support, a contour and bevel angle unit mounted on said frame adjacent said fixed support and arranged for movement transversely of said movable support said unit including a guide movable with the unit and a cutter also movable therewith and adapted for angular displacement in the direction of movement of said movable support, bevel angle determinant means on said fixed support including a flexible spline element adjustable relative to a zero bevel angle position thereon, follower means engaged between said determinant means and said cutter to translate the bevel angle

position of adjustment of said determinant means relative to the zero bevel angle position into corresponding angular displacement of said cutter, and means for moving said movable support selectively toward and away from said fixed support in accordance with engagement of said guide and form block pattern.

2. A machine adapted to produce form blocks having predetermined contours and bevel angles, said machine including a frame, a form block supporting table on said frame movable back and forth, means adapted to secure a form block and a template together on said table, a form block contouring and beveling unit, including a cutter operatively mounted on said frame to move in a direction across the direction of movement of said table and a template engaging guide fixed on said unit in position to be engaged by said template and determine the extent of table movement with movement of said unit, and bevel angle determining means on said frame comprising a flexible element adapted to be located to conform to predetermined bevel angles along the contour of the form block and a follower connected to said unit and operatively arranged to engage said flexible element and angularly displace said cutter in a direction transverse to the direction of movement of said unit.

3. A machine adapted to produce form blocks having predetermined contours and bevel angles, said machine including a frame, a form block supporting table on said frame movable back and forth, means adapted to secure a form block and a template together on said table, a form block contouring and beveling unit including a cutter and template engaging guide fixed on said unit in position to engage said template and determine the form block contouring action by said cutter, said unit being operatively mounted on said frame to move back and forth in a direction across the direction of table movement, said cutter being mounted to angularly rock about an axis parallel to the direction of movement of said unit and said guide being fixed against rocking, and bevel angle determining means comprising a flexible element adjustably located on said frame to conform to a desired bevel angle along the form block contour and a follower connected to said cutter and operably engaged with said flexible element, said follower being adapted to rock said cutter during movement of said unit.

4. A machine adapted to produce form blocks having predetermined contours and bevel angles, said machine including a frame having two ways thereon arranged to extend at right angles, a form block support table movable along one way, a cutter unit movable on the other way, said cutter unit including a support having a fixed guide thereon and a motor driven cutter in said support to angularly rock about an axis parallel to the said other way and at a fixed distance from said guide, means adapted to secure a form block and a template together on said table with said cutter engaging the form block at depths of cut guided by engagement of said fixed guide with the template, and means to determine the bevel angle and rock said cutter correspondingly, said last means including a flexible element adjustably secured to said frame to conform to predetermined bevel angles along the contour of the form block, and means riding said flexible element and more or less angularly rocking said cutter.

5. A machine adapted to produce form blocks having predetermined contours and bevel angles, said machine including a frame, a form block supporting table on said frame movable back and forth, means to secure a form block and a template together on said table in superimposed relation, a form block contouring and beveling unit movably mounted on said frame to move transversely to the direction of table movement, said unit including a template engaging guide having a fixed position to guide the back and forth movement of said table and a motor operated cutter rockably mounted thereon with the rock axis at said cutter and a fixed distance

from said template guide, and bevel angle determining means including an adjustably secured flexible element carried on said frame adjacent the path of movement of said unit and a follower connected to said rockable cutter in position to engage and follow the flexible element such that said cutter assumes angular positions corresponding to the bevel angles determined for the form block.

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