

Aug. 13, 1940.

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2,211,044

NIBBLING MACHINE

Filed Oct. 14, 1937

3 Sheets-Sheet 1

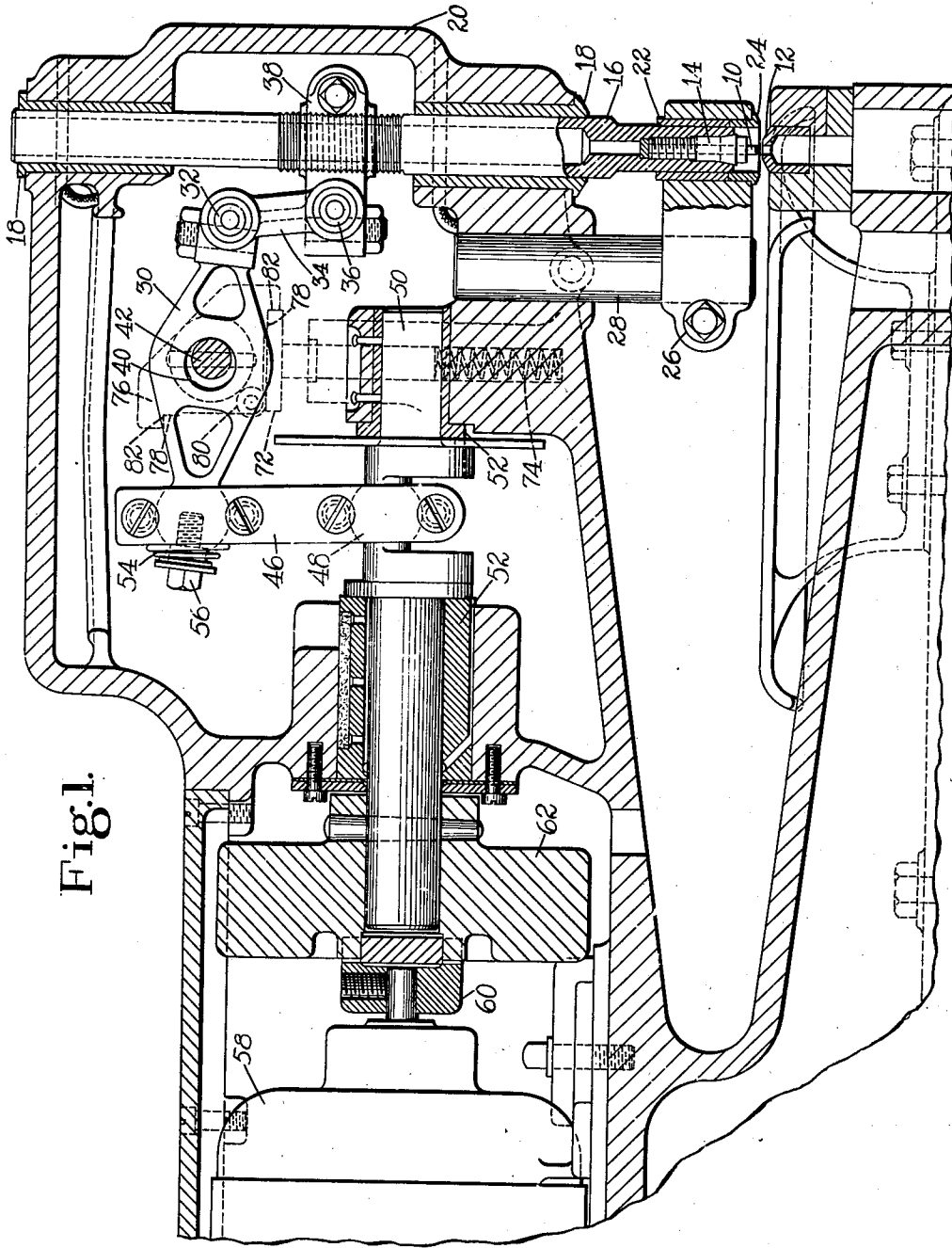


Fig. 1.

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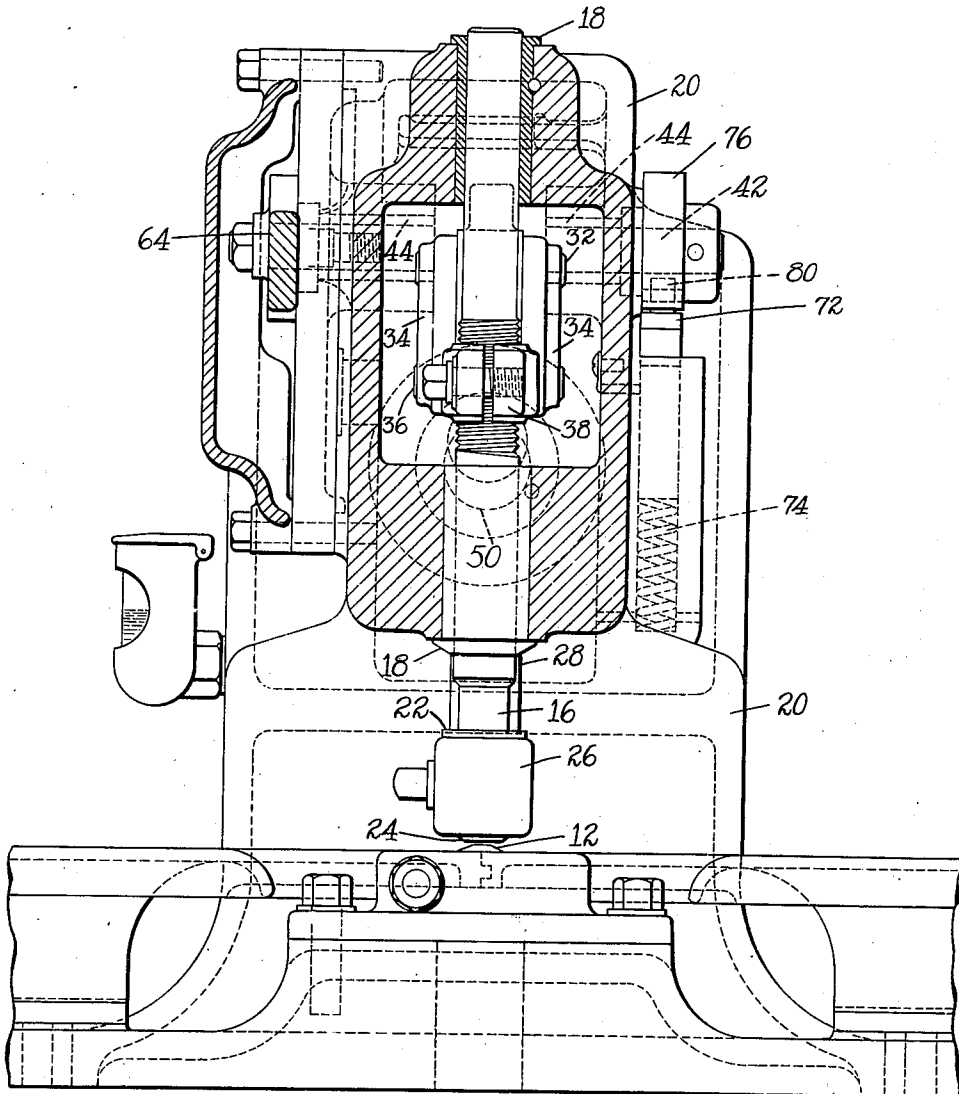
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Fig. 2.



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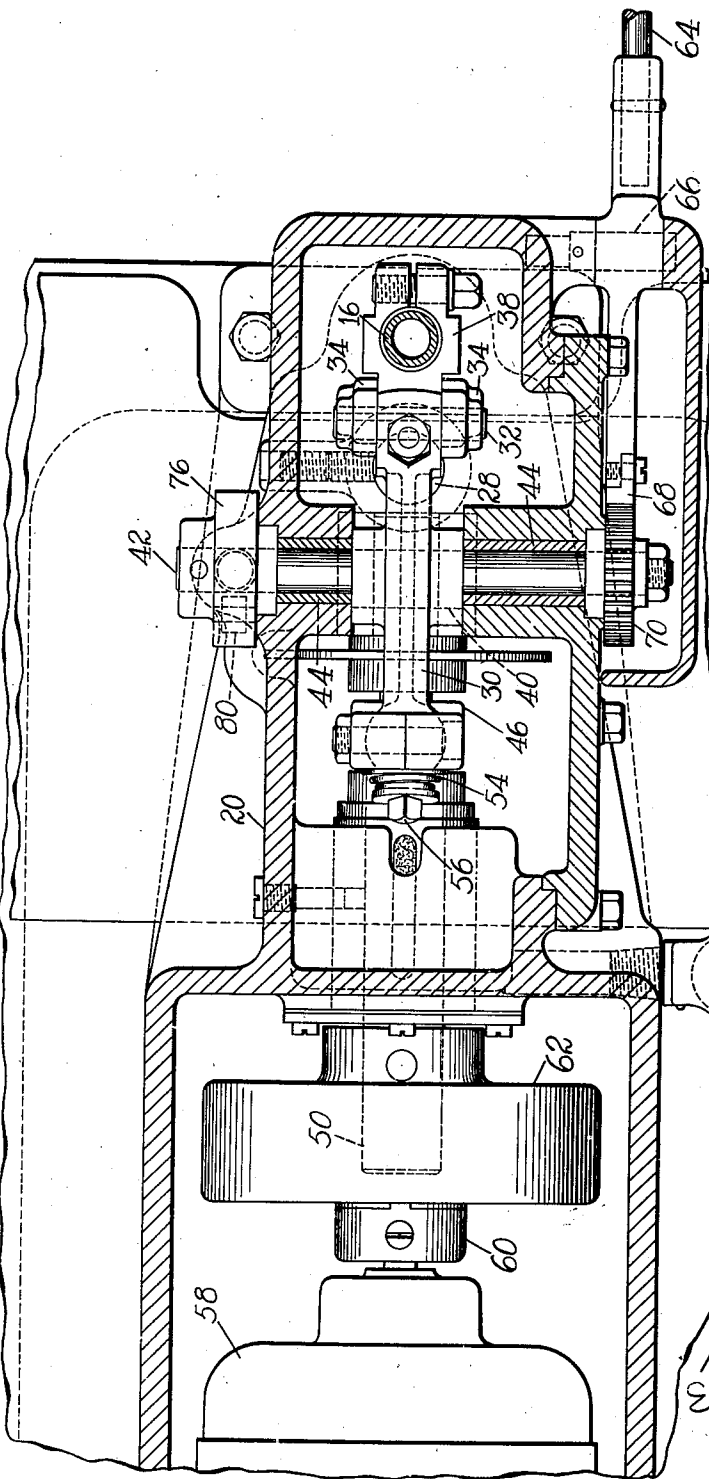


Fig. 3.

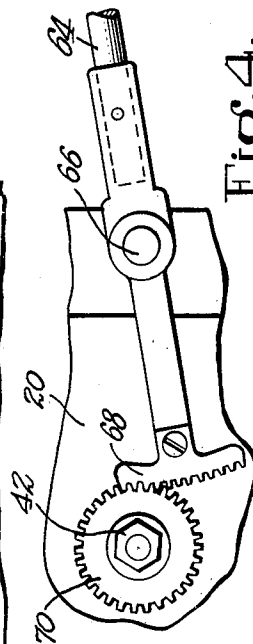


Fig. 4.

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2,211,044

NIBBLING MACHINE

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Application October 14, 1937, Serial No. 168,943

5 Claims. (Cl. 164—47)

This invention relates to nibbling machines and is herein illustrated as embodied in a machine adapted for cutting a blank from a piece of sheet material by punching a series of overlapping holes therein along a line corresponding to the desired shape of the blank.

Machines of this type commonly include a punch and die, the punch being arranged to reciprocate at a high speed in order to produce a smooth an edge on the blank as possible. It is apparent that the punch in such a machine must be retracted away from the work when it is desired to move the latter, as between successive blank-forming operations or in case a blank is to be cut along discontinuous lines. However, because of the momentum of the punch-operating mechanism resulting both from a sufficiently strong construction to withstand the stresses caused by operating upon metal, and its high speed, it is impracticable to stop and start the punch for this purpose.

The mechanism for operating the punch in a machine of this type, may include a member which is movable without inhibiting the movement of the punch to vary its stroke with respect to the die so as to enable the work to be moved between the punch and the die without being operated upon. This control of the punch is commonly effected, as in the illustrated machine, by the use of a rotatable supporting member for one element of the punch operating mechanism which upon being turned, alters the positions of the punch at the ends of its stroke for the purpose indicated above. It is important, however, that the supporting member be so constructed and arranged that it may be easily located in either its operative or inoperative position and that the force required to drive the punch through the work will not set up a reaction on the supporting member when in its operative position tending to move the latter toward its inoperative position and to cause the punch to be retracted from the work.

In view of the foregoing, one feature of the invention consists in the provision, in a nibbling machine having a punch operating mechanism including a member which is movable to vary the stroke of the punch, of indexing means cooperating with indexing surfaces on the member to locate it definitely in its operative or inoperative positions upon being moved toward one position or the other by the operator, this result being effected by spacing the indexing surfaces by the same distance as that through which the mem-

ber is moved between its operative and inoperative positions.

In the illustrated construction, the above-mentioned member is rotatable and has an eccentric which supports an oscillating element of the punch operating mechanism, and in accordance with another feature of the invention, the indexing surfaces referred to above are so arranged that when the member is in its operative position, the pressure of the oscillating element against the eccentric is exerted in a direction passing through the axis of rotation of the member whereby any tendency of the member to be rotated out of its operative position is avoided.

Invention is also to be recognized in the provision of a shoulder associated with each indexing surface with which shoulders the indexing means is arranged to cooperate positively to prevent any rotation of the member beyond its operative or inoperative positions.

These and other features of the invention will be apparent from the following description when read in connection with the accompanying drawings and will be pointed out in the claims.

In the drawings,

Fig. 1 is a view in sectional elevation of a machine embodying the invention;

Fig. 2 is a view in front elevation, a part of the machine being shown in section;

Fig. 3 is a plan view, the upper portion of the frame having been broken away to expose the operating mechanism; and

Fig. 4 is a view in side elevation showing a part of the mechanism for raising and lowering the tool with respect to the die.

The illustrated machine comprises a nibbling or cutting tool **10** which is adapted to be rapidly reciprocated toward and away from a die **12** in order to cut from a sheet of material interposed between the tool and die a blank having a shape corresponding to the path in which the sheet material and tool are moved relatively to each other. Ordinarily in machines of the type in which the present invention is adapted to be embodied the sheet material from which blanks are formed is clamped in a support and, under the guidance of a pattern corresponding to the shape of the desired blank, relative feeding movement between the punch and the work is effected whereby a definite similarity between the blank and the pattern is obtained. One machine of this type is disclosed in United States Letters Patent No. 2,148,506, granted February 28, 1939 on an application filed in the name of George F. Ryan. It is to be understood, however, that the invention

may also have application in a machine to which the work is presented by hand.

The tool 10 (Fig. 1), as illustrated herein, is a punch which is held by a spring collet 14 of usual construction in axial alinement with a spindle 16 mounted to reciprocate vertically in bearing bushings 18 carried by a frame 20. Further support for the lower end of the spindle 16 is provided by a bearing 22, the lower section 24 of which acts as a stripper in order to prevent the work from rising with the punch 10. The bearing 22 and stripper 24 are mounted in an arm 26 adapted to be clamped on a stud 28 fixed in the frame 20 in any desired heightwise position to accommodate various thicknesses of work.

The spindle 16 is adapted to be rapidly reciprocated by mechanism comprising an oscillating walking beam or arm 30 pivotally connected at one end by a wrist pin 32 to a pair of links 34, the latter also being pivotally connected by a wrist pin 36 to a member 38 threaded, and adapted to be releasably clamped, on the spindle 16 so as to permit vertical adjustment of the tool 10 with respect to the die 12. The arm 30 is pivotally mounted on a fulcrum member comprising an eccentric 40 formed on a shaft 42 the ends of which are rotatably mounted in bearings 44 (Fig. 2) in the frame 20. The arm is oscillated about the eccentric 40 by a link 46 which connects the left-hand end of the arm 30 (Fig. 1) with a crank 48 on a crank shaft 50 which is rotatably mounted in bearings 52 carried by the frame 20. Because the crank 48 and the arm 30 rotate about axes in different planes, ball-and-socket connections are provided between the link 46 and both the crank 48 and the arm 30, so as to permit movement of the link 46 in any direction with respect to the crank 48 or the arm 30. A spring 54 seated against the head of a screw 56 threaded in the arm 30 is arranged also to bear against the link 46 in order to prevent the latter from twisting about its longitudinal axis.

The shaft 50 may be driven by any suitable source of power, such as a motor 58 as illustrated herein, the latter being connected by a coupling 60 to a fly-wheel 62 fixed to the shaft 50 so as to render the operation of the punch 10 uniform.

It will now be understood that as the crank shaft 50 is rotated the tool 10 will be vertically reciprocated through a definite stroke of sufficient amplitude to cause the punch to pierce whatever thickness of sheet material is necessary to form a blank of the required strength.

In order to facilitate the insertion of sheet material between the punch 10 and the die 12 and its movement from place to place between the cutting of successive blanks or when a blank is to be cut along discontinuous lines, provision is made in the present machine, as will now be described, for moving the punch into and out of its operative relation with respect to the die without interrupting the reciprocating movement of the punch. This control of the punch 10 is effected by rotating the shaft 42 so as to move the eccentric 40 from its position as illustrated in Fig. 1, corresponding to the inoperative position of the punch, through 90° in a counterclockwise direction when the direction of the dead center of the eccentric is vertical. It will be noted in this connection with reference to Fig. 1 that at this time the direction of the forces exerted by the arm 30 on the eccentric 40 is substantially vertical and hence intersects the axes of both the eccentric 40 and the shaft 42 and therefore that the

shaft 42 will have no appreciable tendency to rotate out of its operative position because of the forces exerted against it by the arm 30. This movement of the eccentric 40 causes the fulcrum of the arm 30 to be raised or lowered whereby the limits of the stroke of the tool 10 are correspondingly varied. The shaft 42 is thus rotated by an operator-controlled lever 64 pivoted at 66 (Fig. 3) to the frame 20 and carrying at its left-hand end a segmental gear 68 which is arranged to mesh with a gear 70 fixed to the shaft 42.

However, in order to hold the shaft 42 in either its operative or inoperative position, an indexing plunger 72 mounted to yield vertically in the frame 20 against the resistance of a spring 74 is adapted to engage an angular flange 76 fixed to the shaft 42. The end of the plunger 72 is arranged to engage indexing or positioning surfaces on the flange 76 constituted by abutments 78 and a roll 80, the roll 80 being a common terminal of both of the positioning surfaces. Thus, when the shaft 42 is rotated from either its operative or inoperative position to the other, the roll 80 moves across the upper end of the plunger with a minimum of frictional resistance. The yielding plunger 72 first resists this movement of the shaft 42 but as soon as an intermediate position (when the roll 80 is over the axis of the plunger 72) is passed the plunger cooperates with the roll 80 to effect the movement of the shaft into its final position as determined by the engagement of the plunger with one of the abutments 78 and the roll 80.

Accordingly, once the yielding pressure of the plunger 72 against the roll 80 is overcome it thereafter results in the tool's being located in either its operative or inoperative position depending upon the direction in which the shaft 42 is first rotated. The above-mentioned indexing surfaces are spaced by the same angle as that through which the shaft 42 is turned to move the punch between its operative and inoperative positions with respect to the die 12.

The plunger 72 cooperates with the flange 76 not only to locate and hold the shaft 42 in either of its positions but also positively to prevent movement of the shaft 42 beyond these positions. For this purpose the flange 76 is provided with shoulders 82 which are adapted to engage opposite lateral surfaces of the plunger 72. Therefore, as the plunger 72 is arranged to yield endwise thereof only, it acts as a positive stop upon being engaged by either of the shoulders 82.

It is now apparent that, merely by swinging the lever 64 in one direction or the other until this movement is stopped by the plunger 72, the tool 10 is moved into and out of operative relation to the die 12 without interference with the reciprocating movement of the punch and that the tool is located and held in either of its positions without any attention on the part of the operator by the cooperation of the plunger 72 and the flange 76.

Having described the invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a nibbling machine, a nibbling means comprising a reciprocating punch and a die, means for operating said punch comprising an oscillating member connected to said punch, a support having an eccentric on which said arm is mounted, said support being rotatable between two positions to move said punch into and out of operative relation with respect to said die, and a plunger having an end surface cooperating with

said support to locate the latter in either of its said positions, said support having shoulders adapted to engage said plunger laterally thereof thereby positively to prevent movement of said support beyond its said positions.

5 2. In a nibbling machine having a nibbling tool and mechanism for reciprocating said tool, a member associated with said mechanism and being movable to vary the positions of the tool at the ends of its stroke, said member having an indexing surface and a shoulder at one end of said surface, and indexing means cooperating with said surface and shoulder yieldingly to locate said member in a predetermined position and 10 positively to prevent movement of said member in one direction beyond said predetermined position.

3. In a nibbling machine comprising a punch and die, means for reciprocating said punch comprising an oscillating arm, a rotatable member having an eccentric on which said arm is mounted, means for rotating said member to move said punch into operative relation with respect to said die, an indexing surface on said member, and an indexing member cooperating with said surface releasably to hold said rotatable member in such a position that the pressure of said arm against 20

said eccentric is exerted in a direction passing through the axis of rotation of said member.

4. In a nibbling machine comprising a nibbling tool and mechanism for reciprocating said tool, a member associated with said mechanism and 5 mounted for movement between operative and inoperative positions to vary the positions of the tool at the ends of its stroke, a yieldingly mounted plunger, and indexing surfaces on said member and plunger cooperating to locate said member in its operative or inoperative position, said plunger being arranged successively to resist and then aid the movement of said member from either of its said positions toward the other. 10

5. In a nibbling machine, a tool, means for reciprocating said tool comprising an oscillating member connected thereto, means for operating said member, a support on which said member is pivoted, said support comprising a pair of positioning surfaces having a common terminal and 15 movable between operative and inoperative positions to vary the positions of the tool at the ends of its stroke, and yielding means arranged to cooperate with said terminal to move said support into either of its said positions from an intermediate position. 20 25

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