United States Patent

[11] 3,610,439

[72] Inventor **Richard G. Hopkins**
Bennington Township, Shiawassee County, Mich.

[21] Appl. No. **23,363**
[22] Filed **Mar. 27, 1970**
[45] Patented **Oct. 5, 1971**
[73] Assignee **MWA Company**
Owosso, Mich.

[54] **BILLET MANIPULATOR**
7 Claims, 4 Drawing Figs.

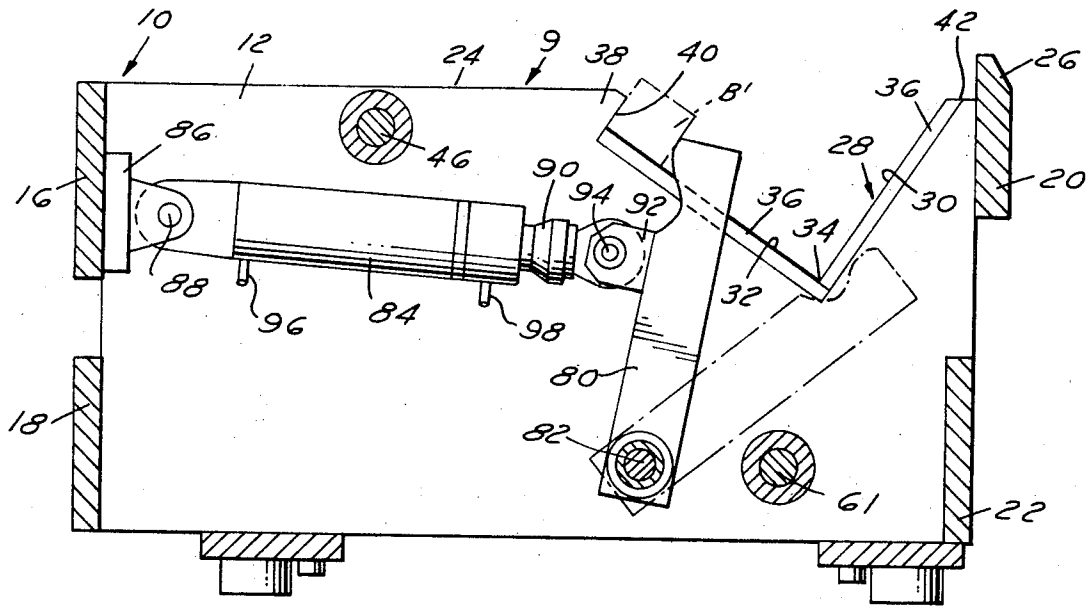
[52] **U.S. Cl.** ..... **214/1 QG**
[51] **Int. Cl.** **B65g 7/08**
[50] **Field of Search** ..... 214/1 R, 1 A, 1; 198/33 R X

[56] **References Cited**
UNITED STATES PATENTS

3,472,397	10/1969	Rhoads	214/1 R7
3,506,141	4/1970	Thomas	214/1 R7

Primary Examiner—Gerald M. Forlenza
Assistant Examiner—Frank E. Werner
Attorney—Whittemore, Hulbert & Belknap

ABSTRACT: A mechanism for supporting and turning a rectangular billet comprising an upright frame and a pivoted arm for supporting the billet in an elevated position to perform a grinding or other operation thereon and also for lowering the billet into a recess in the frame for turning. A clamp is provided for clamping the billet against an abutment in a position such that a corner of the billet projects above the frame to permit a grinding or other operation to be performed on the corner.



PATENTED OCT 5 1971

3,610,439

SHEET 1 OF 2

FIG. 1

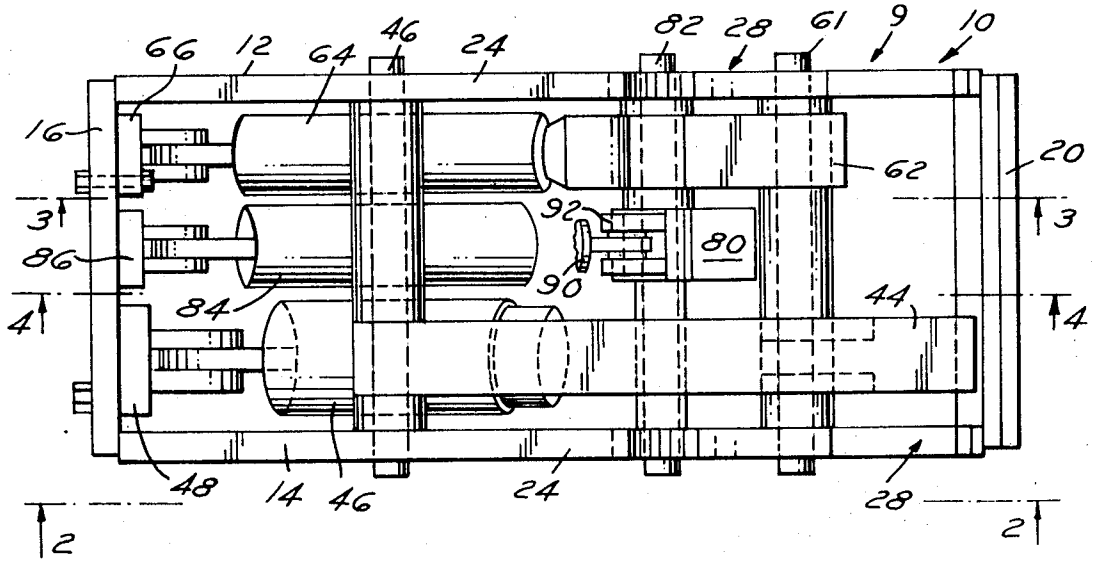
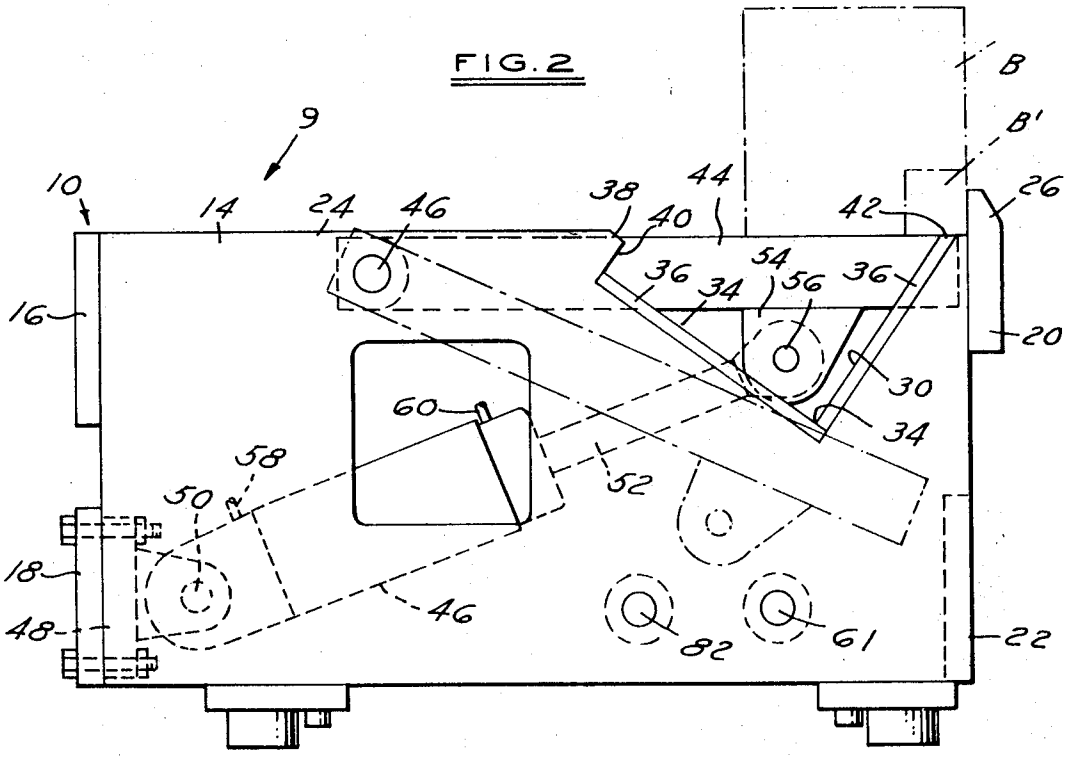


FIG. 2



INVENTOR.
RICHARD G. HOPKINS
BY
Whittemore, Hulbert & Belknap
ATTORNEYS

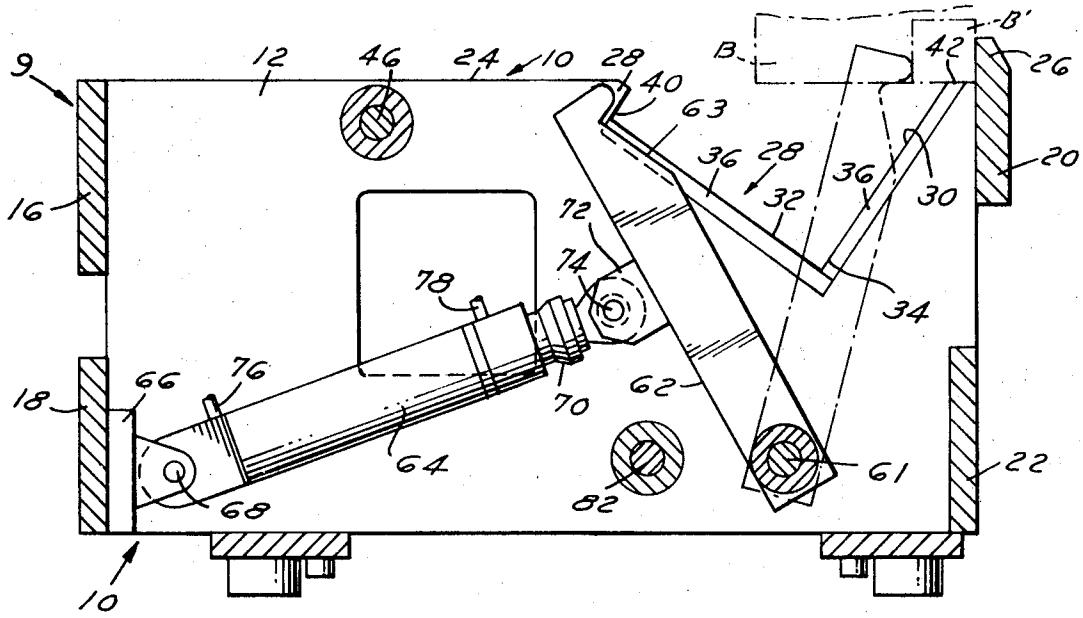


FIG. 3

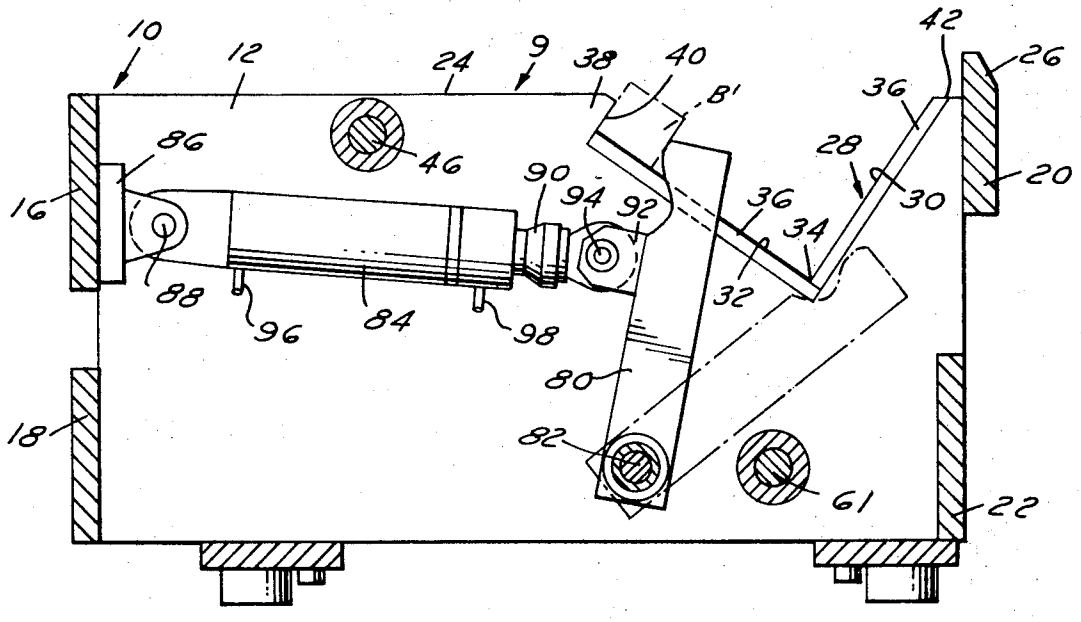


FIG. 4

INVENTOR.
RICHARD G. HOPKINS

BY

Whittemore, Hulbert & Belknap

ATTORNEYS

BILLET MANIPULATOR

BACKGROUND OF THE INVENTION

The mechanism of this invention is an improvement of the mechanism disclosed in U.S. Pat. No. 3,182,817. In that patent, a turning recess in the frame is disclosed into which the billet is lowered so that it may be turned and then elevated to a position for grinding a side of the billet. It is often desirable to grind the corners of a billet. This requires that the billet be clamped on edge so that a corner projects upwardly in a position suitable for grinding. Corner grinding could not conveniently be done on small billets, that is billets of relatively small cross section, with the mechanism disclosed in the aforementioned patent.

SUMMARY OF THE INVENTION

It is a primary object of this invention to provide mechanism for supporting and turning a rectangular workpiece or billet, having means for supporting billets of small cross section in position for corner grinding.

Another object is to provide mechanism for supporting and turning a rectangular billet comprising an upright frame having a turning recess in the top surface, and having means for clamping a billet in the recess in an elevated position such that a corner of the billet projects above the frame in a position suitable for grinding.

Another object is to provide the frame with means forming an abutment adjacent to the top of the recess, and clamping means for holding a billet against the shoulder in position for corner grinding.

Another object is to provide a clamping abutment which intersects a surface of the recess in a right angle to provide a notch in which the billet may be clamped for corner grinding.

Another object is to provide power means preferably in the form of a pivoted lever for clamping the workpiece against the shoulder for corner grinding.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a top plan view of mechanism embodying my invention.

FIG. 2 is a side elevational view of the mechanism shown in FIG. 1, taken substantially on the line 2—2 in FIG. 1.

FIG. 3 is a view with parts in elevation and parts in section taken substantially on the line 3—3 in FIG. 1.

FIG. 4 is a view with parts in elevation and parts in section taken substantially on the line 4—4 in FIG. 1.

Referring now more particularly to the drawings, the mechanism is generally designated 9 and comprises a frame 10 which includes a pair of substantially identical, laterally spaced, vertical, parallel sidewalls 12 and 14. The sidewalls are rigidly connected at the front end of the frame by the upper and lower end plates 16 and 18, and are rigidly connected at the rear end of the frame by the upper and lower plates 20 and 22. The upper plate 20 projects upwardly above the upper horizontal edges 24 of the side plates to provide a billet stop 26 which will be referred to more fully hereinafter.

Each sidewall 12, 14 is formed with a turning recess generally designated 28. The recesses 28 in the two sidewalls are laterally aligned and are identically formed. Thus each recess 28 will be seen to be generally V-shaped having the flat surfaces 30 and 32 which meet at a right angle at the bottom 34 of the recess. Actually, as seen in FIGS. 2–4, these surfaces 30 and 32 are provided by hardened liner plates 36 secured to the sidewalls 12 and 14 in the recesses thereof. An abutment or shoulder 38 is provided as an integral portion of each sidewall between the top edge 24 thereof and the surface 32 of the recess, such abutment having a flat surface 40 which intersects and forms a right angle with the flat recess surface 32 and extends upwardly from the surface 32 in a rearward direction to its intersection with the top edge 24 of the sidewall.

Thus it will be seen that the recess proper is V-shaped and formed by the right angle surfaces 30 and 32, and that the shoulder or abutment 38 provides a surface 40 which intersects the surface 32 of the recess in a right angle. While the surfaces 30 and 32 are at right angles to one another, the surface 32 lies at a greater angle to the vertical than the surface 30 to facilitate the turning of a billet, as will be more apparent from the following description. The recesses 28 are close to the rear ends of the walls 12 and 14 but are spaced slightly therefrom to provide the horizontally aligned surfaces 42.

An arm 44 is provided for supporting a billet in a position for grinding when it is elevated to the horizontal position shown in solid lines in FIG. 2. The arm 44 is disposed between and parallel to the sidewalls 12 and 14 and its front end is pivoted on the horizontal pivot shaft 46 extending between and carried by the sidewalls. In its elevated or horizontal position, the arm 44 is substantially level with the surfaces 42 of the sidewalls 12 and 14 so that a billet such as the rectangular billets B or B′ may be supported thereon in position for its top surface to be ground. The billets B and B′ may or may not be square, as shown. In the position shown in FIG. 2, the billet B or B′ is against the stop 26 and is supported on the arm 44 with its rear edge portion also supported on the surfaces 42. Actually the surfaces 42 may be slightly below the level of the top surface of the arm 44 when the latter is horizontal so that the surfaces 42 do not support the billet during grinding but serve merely as trips for turning the billet when it is lowered.

The arm 44 is moved between its horizontal position shown in solid lines in FIG. 2 to its lower position beneath recesses 28 shown in dotted lines, by the piston-cylinder assembly 46. The cylinder is pivoted to a support 48 mounted on the end plate 18 by the pivot pin 50. The piston rod 52 of the piston-cylinder assembly 46 is pivoted to a bracket 54 on the arm 44 by a pin 56. Suitable air or hydraulic lines 58 and 60 are provided for alternately delivering fluid under pressure to opposite ends of the cylinder and exhausting the same so that the arm 44 may be raised and lowered as desired.

A clamp arm 62 is provided for moving and clamping a billet supported on the horizontal arm 44 against the stop 26 so that the top surface of the billet may be ground. The clamp arm 62 is parallel to the sidewalls and is pivoted at its lower end on a horizontal shaft 61 between and carried by the sidewalls. The clamp arm 62 is shown in dotted lines in FIG. 3 in an advanced position clamping billet B′ against the stop 26. The clamp arm 62 of course may also be used to clamp larger cross section billets against the stop 26 such as the billet B. The clamp arm 62 is shown in a retracted position in solid lines in FIG. 3. The clamp arm is notched where indicated at 63 to clear recesses 28 when retracted.

The clamp arm 62 is moved between its advanced and retracted positions by the piston-cylinder assembly 64, the cylinder of which is pivoted to a support 66 mounted on the end plate 18 by a pivot pin 68. The piston rod 70 of the piston-cylinder assembly 64 is pivoted to a bracket 72 on the clamp arm 62 by a pin 74. Suitable air or hydraulic lines 76 and 78 are provided to alternately deliver fluid under pressure to opposite ends of the cylinder and to exhaust the same so that the clamp arm 62 may be moved between its advanced and retracted positions.

When it is desired to rotate a billet B or B′ 90° to present another surface for grinding, the arm 44 is lowered to the dotted line position of FIG. 2 clearing recesses 28 and permitting the billet to descend into the recesses. The billet will drop into the recesses with its lower left corner in FIG. 3 contacting the bottoms 34 of the recesses and with its front or left surface in FIG. 3 resting upon the surfaces 32 of the recesses. The billet will thus rest upon surfaces 32 rather than surfaces 30 of the recesses because surfaces 32 lie at a greater angle to the vertical. The sidewall upper surfaces 42 serve as fulcrums or trips to cause the billet to turn as the arm 44 initially descends. Then upon return of the billet support arm 44 to its elevated horizontal position, the billet is further turned to complete the 90° rotation so that what was its rear or right sur-

face in FIG. 3 now is uppermost for grinding. Then by operation of the piston-cylinder 64 to advance the clamp arm 62, the billet may be firmly clamped against the stop 26 for grinding.

When corner grinding billets or relatively large cross section, such as the billet B, the operation is carried out while the billet is in the recesses 28 with its lower corner resting on the apex 34 at the bottom of the V. Billet B is obviously large enough that its uppermost corner, when the billet is thus supported in the bottoms of the recesses, projects above the frame 10 in a position convenient for grinding. However, a billet of relatively small cross section, such as the billet B', could not be conveniently corner ground while disposed in the bottoms of the recesses 28 of the frame, because such a billet is not large enough to project above the recesses and it would be difficult to position a grinding wheel in contact with the corner of a small billet in the bottoms of the recesses.

In order to corner grind relatively small billets, such as the billet B', such billets are clamped against the shoulders 38 in the position shown in FIG. 4. For this purpose, a clamp arm 80 is provided. The clamp arm 80 is shown in an advanced position in solid lines in FIG. 4 with its upper end clamping the billet B' against the surface 40 of shoulder 38. The billet in this position is resting upon the upper portions of surfaces 32 of the recesses in the right-angle notch provided between the surfaces 32 and surfaces 40 of the shoulders 38. Clamp arm 80 is a pivoted member parallel to sidewalls 12 and 14, its lower end being pivoted on the horizontal pivot shaft 82 extending between and carried by the sidewalls.

The clamp arm 80 is moved between its advanced and retracted positions by the piston-cylinder assembly 84, the cylinder of which is pivoted to a support 86 mounted on the end plate 16 by a pivot pin 88. The piston rod 90 of the piston-cylinder assembly 84 is pivoted to a bracket 92 on the clamp arm 80 by a pivot pin 94. Suitable air or hydraulic lines 96 and 98 are provided to alternately deliver fluid under pressure to opposite ends of the cylinder and to exhaust the same so that the clamp arm 80 may be moved between its advanced and retracted positions. The arm 80 is notched as shown at 99 to clear the recesses when retracted.

In order to corner grind the billet B', the billet is lowered from the FIG. 3 position to the bottom of the recess by lowering arm 44 to the dotted line position of FIG. 2, and then advancing the clamp arm 80 from the dotted line position of FIG. 4 to the solid-line position thereby sliding the billet B' up along surfaces 32 of the recesses and finally clamping the billet B' against surfaces 40 of shoulders 38 in the position for corner grinding shown in FIG. 4. In this position, the uppermost corner of the billet B' is well above the recesses 28 and the sidewalls 12 and 14 so that it is in a position suitable for grinding.

Only one of the mechanisms 9 heretofore described need be employed for relatively short billets, but preferably two such mechanisms are provided in laterally spaced relation to support and turn opposite ends of an elongated billet, with suitable means being provided to insure the simultaneous operation of the cylinders 46, 64 and 84.

What I claim as my invention is:

1. Mechanism for supporting and turning a rectangular workpiece, comprising an upright frame, a recess in the top surface of said frame into which the workpiece may be lowered to turn the same, means for supporting the workpiece above said recess to enable an operation to be performed thereon, said frame having means forming an abutment adjacent the top of said recess, and clamping means for holding the workpiece in said recess up from the bottom thereof against said abutment in a position such that a corner of the workpiece projects above the top surface of said frame in position to enable an operation to be performed thereon.

2. Mechanism as defined in claim 1, wherein said recess has a workpiece-supporting surface inclined in one direction and said abutment has a surface against which the workpiece may be held as aforesaid which is inclined in the opposite direction.

3. Mechanism as defined in claim 2, wherein said inclined surfaces form substantially a right angle.

4. Mechanism for supporting and turning a rectangular workpiece, comprising a frame having a pair of laterally spaced upright sidewalls, aligned identical recesses in the top surfaces of said sidewalls into which the workpiece may be lowered to turn the same, means for supporting the workpiece above said recesses to enable an operation to be performed thereon and for lowering the workpiece into the recess as aforesaid, said sidewalls having means forming abutments adjacent the tops of said recesses, and clamping means for holding the workpiece in said recesses up from the bottoms thereof against said abutments in a position such that a corner of the workpiece projects above the top surfaces of said sidewalls in position to enable an operation to be performed thereon.

5. Mechanism as defined in claim 4, wherein each recess is defined by inclined workpiece-supporting surfaces forming a V, and each shoulder overlies the upper end portion of one of said inclined work-supporting surfaces against which the workpiece may be held as aforesaid.

6. Mechanism as defined in claim 5, wherein each shoulder has an inclined surface forming substantially a right angle with said one inclined surface of the associated recess.

7. Mechanism as defined in claim 6, wherein said holding means includes a lever pivoted on said frame and engageable with the workpiece to clamp it against said shoulders, and power means for pivoting said lever.