United States Patent [19]

McPherson

[11] **3,724,837**

[45] **Apr. 3, 1973**

[54] RETRACTING CLAMP

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[52] **U.S. Cl.** **269/32**, 269/93, 269/135

[51] **Int. Cl.** **B23q 3/08**

[58] **Field of Search** 269/32–35, 91–94, 269/239, 134, 135, 25

[56] **References Cited**

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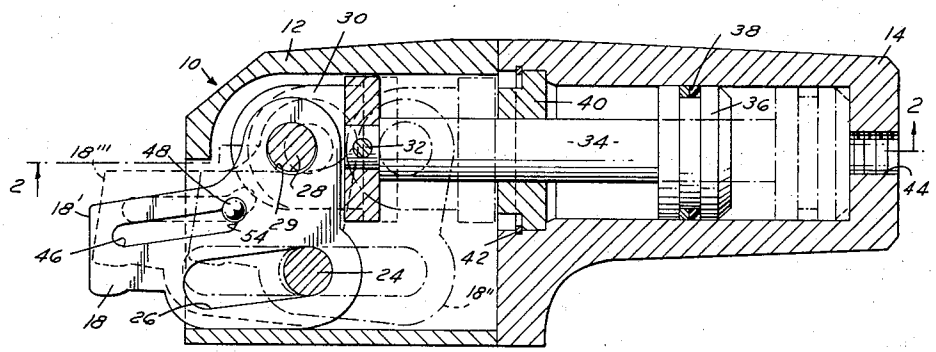
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[57] **ABSTRACT**

A retracting clamp for firmly holding work pieces on the bed of a machine tool or the like and incorporating a clamping arm which pivotally releases and linearly retracts inside the body guided by a ball detent in the body which engages a groove in the clamping arm.

5 Claims, 4 Drawing Figures



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FIG. 1

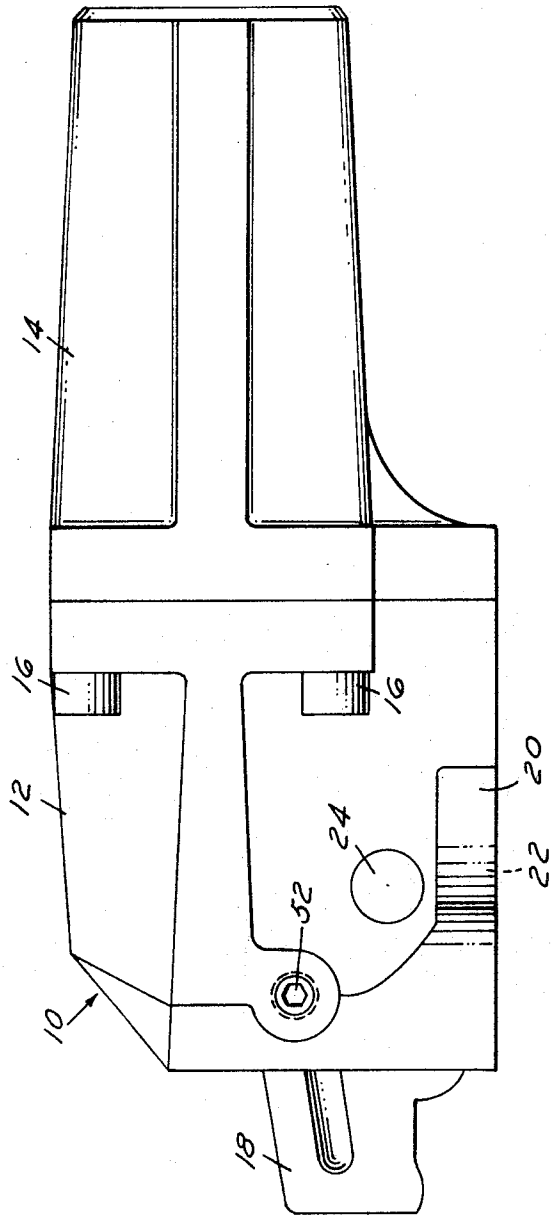
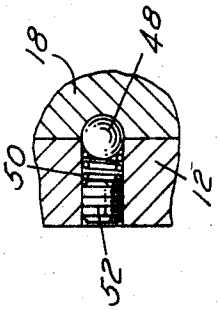


FIG. 4



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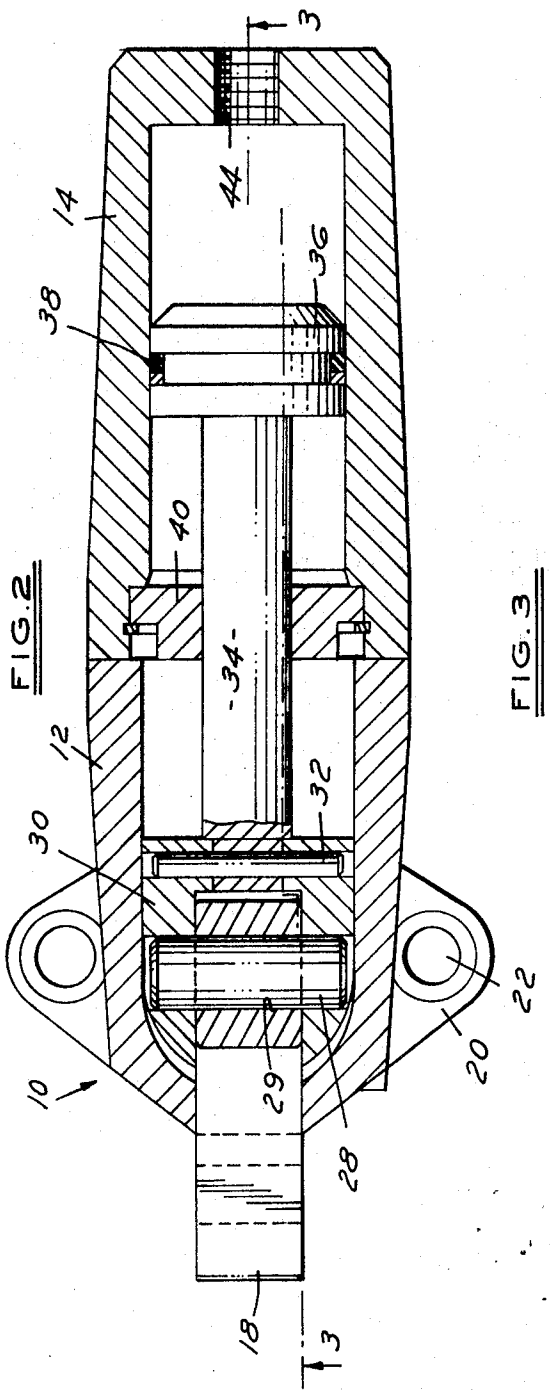


FIG. 2

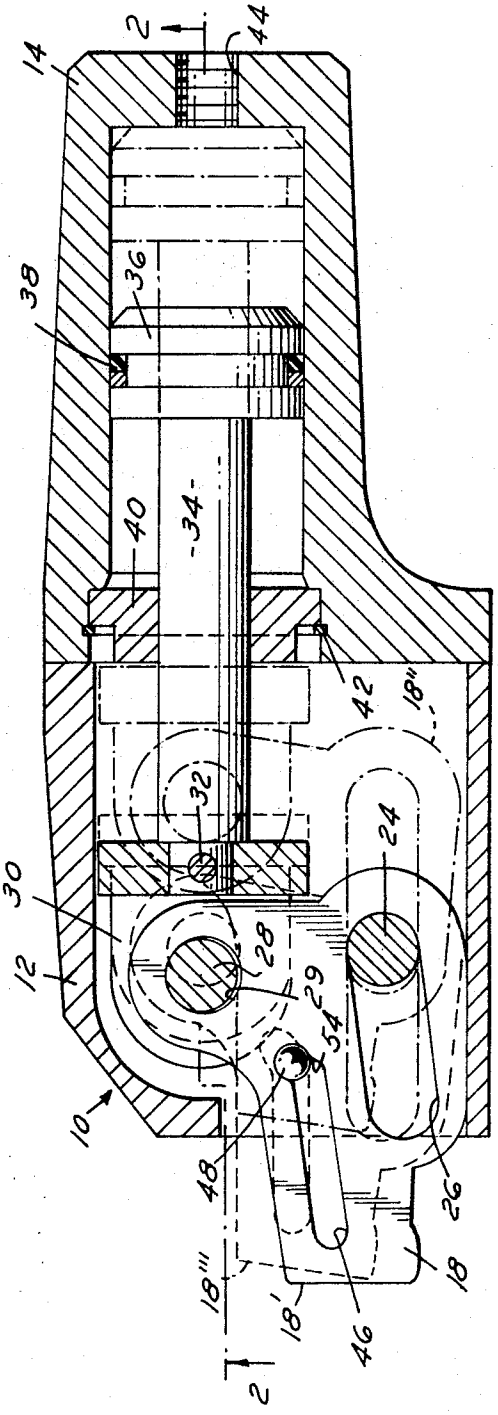


FIG. 3

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RETRACTING CLAMP

BACKGROUND OF THE INVENTION

Power operated clamps utilized for holding work pieces in place on machine tools and the like enable the operator to quickly place a work piece in position and clamp the work piece securely with one or multiple simultaneously actuated power operated holding means. Conventional clamps employ pivoted swinging clamp arms which traverse a wide arc in retracting to a clearance position. Frequently, the work piece configuration provides limited access to the clamping surface which will not accommodate a full arcuate arm movement for clamping and retraction, but rather includes adequate clearance only for a compound arm movement - preferably normal to the clamping surface during final clamping and initial release and generally parallel to the clamping surface for retraction and approach.

SUMMARY OF THE PRESENT INVENTION

In the present invention, the clamping arm has an arcuate path provided by spaced actuating and reaction pivots only during final clamping and initial release, a slot for the reaction pivot accommodating linear retraction and approach movement of the clamping arm, and interacting guide means between body and arm assuring such linear movement. A power cylinder has a piston connection with the actuating pivot and complete retraction within the body results in full clearance for workpiece loading and removal. All of the moving parts are located inside of the body of the clamp with the exception of the portion of the clamping arm that extends and clamps the work piece in place. The guiding means of the clamping arm which provides the proper motion for extension and retraction of the clamping arm and initiation of the retraction with an unclamping movement is separate from the moving parts of the retracting clamps that undergo the highest loading.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of the retracing clamp;

FIG. 2 is a top cross-section of the retracting clamp taken along the line 2—2 of FIG. 3;

FIG. 3 is a side cross-section of the retracting clamp, taken along the line 3—3 of FIG. 2; and,

FIG. 4 is a partial section showing the ball detent.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 is shown the body **10** of the clamp comprising two castings **12** and **14** bolted together at **16**. Protruding from the end of the retracting clamp body is the clamping arm **18** shown fully extended and lowered into clamping position. The casting **12** includes flanges **20** with holes **22** provided for attachment of the clamp to the base of a machine tool, or the like.

In FIGS. **2** and **3** is shown the interior of the working parts of the retracting clamp. In FIG. **3**, a pivot pin **24** engages an elongated slot **26** formed in the portion of the clamping arm located inside of the retracting clamp body **10**. The clamping arm **18** thus may either pivot or slide about the pivot pin **24**. A second pivot pin **28** connects the clamping arm **18** to yoke elements **30** likewise

inside of the body **10** in turn connected with pin **32** to the piston rod **34** of a fluid cylinder formed within the casting **14** of the body **10**. The piston head **36** has a seal **38** and a guide **40** for the piston rod **34**. The guide **40** in turn is held in place by snap ring **42**. Hydraulic piping may be connected to the threaded hole **44** provided in the end of the casting **14**.

To insure the proper motion of the clamping arm, a linear groove **46** with semi-circular cross section is formed in the clamping arm **18** on one side. This groove **46** engages a bearing ball **48** which is part of the ball detent shown in FIG. **4** in fragmentary section. The ball **48** is held properly in position by a spring **50** adjusted by an allenhead set screw **52** and which in turn is accessible from the outside of the retracting clamp body as shown in FIG. **1**. The groove **46**, as shown in FIG. **3**, is essentially straight except for a short curved portion **54** formed in the clamping arm **18** at the inside end of the groove **46**. This short curved portion **54** has a radius centered on the center of the pivot pin **24**.

In FIG. **3** the motion of the clamping arm is shown by three positions, the solid line **18'** fully extended, the dotted line **18''** fully retracted and the dashed line **18'''** raised at the juncture between arcuate and linear movement prior to clamping or retraction. Starting with the fully clamped position, shown by the solid line **18'**, the curved portion **54** of the groove **46** permits the clamping arm **18** to pivot about the pin **24** as the actuating means begins to retract. Once the clamping arm **18** has reached the position shown by the dashed line **18'''** the ball **48** is in the portion of the groove **46** which joins the curved portion **54** and the clamping arm **18** may retract into the body **10** of the retracting clamp. The groove **46** formed in the clamping arm **18** is substantially parallel to the elongated slot **26**, thus allowing the retraction of the clamping arm **18** until it reaches a position inside the body **10** shown by the dotted outline **18''** of the clamping arm **18**. The hole **29** in the clamping arm **18** for the pivot **28** is elongated to provide the necessary freedom of motion for the clamping arm as it pivots about the pin **24**.

The movement is reversed when a part is to be clamped into position. The clamping arm **18** moves from the dotted position **18''** by extending out to the position shown by the dashed line **18'''** and then the ball **48** engaging the curved portion of the groove **54** and the pivot pin **24** permit the clamping arm **18** to rotate about the pin **24** to clamp a work piece in position.

I claim:

1. A retracting clamp, comprising:

a body, a first pivot means in said body, a clamping arm having an elongated slot formed therein and engaging said first pivot means, fluid pressure linear actuating means on said body and having a second pivot directly thereattached laterally spaced from said first pivot, said second pivot directly engaging an enlarged hole formed in said clamping arm, a substantially straight groove formed in said clamping arm and having a relatively short arcuate portion at one end thereof, and a ball detent in said body engaging said groove to provide for substantially linear reciprocably extension of said clamping arm followed by a pivotal clamping movement relative to a mounting surface for said body.

2. The retracting clamp of claim 1 wherein the radial center of said arcuate portion substantially coincides with the axis of said first pivot means.

3. The retracting clamp of claim 1 wherein said clamping arm reciprocably retracts substantially inside of said body.

4. A retracting clamp, comprising:

a body, a clamping arm, fluid pressure linear actuating means having a piston rod aligned with and pivotally connected directly to said clamping arm adapted to provide initial linear and final rocking movement to the clamping arm, a lost motion interconnecting means between the body and clamping arm laterally spaced from said linear actuating means providing for linear motion during said initial movement and a pivotal fulcrum during said rocking movement, one of said connections to said clamping arm including a clearance accommodating simultaneous straight line actuating and arcuate rocking arm movements.

5. A retracting clamp as set forth in claim 4 wherein said lost motion means comprises interconnecting slot and pin means.

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