United States Patent

Gilmour et al.

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[54] DIE UNLOADER

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[52] **U.S. Cl.** .....**83/112,** 83/135, 83/159, 214/1 BB

[51] **Int. Cl.** **B26d 7/18**

[58] **Field of Search**.....83/111, 112, 135, 129, 153, 83/157, 159; 214/1 BB

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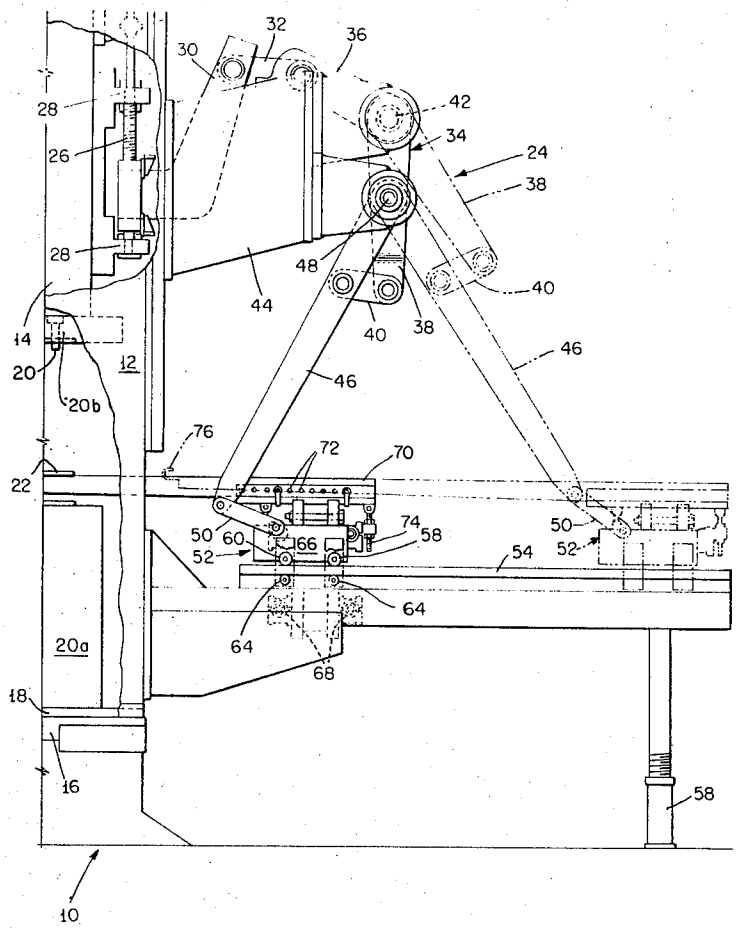
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[57] **ABSTRACT**

A ram driven, mechanically synchronized die unloader for extending into a blanking press under the upper die of a positive knockout die for receiving and removing the stamped blank from the die.

5 Claims, 2 Drawing Figures



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SHEET 1 OF 2

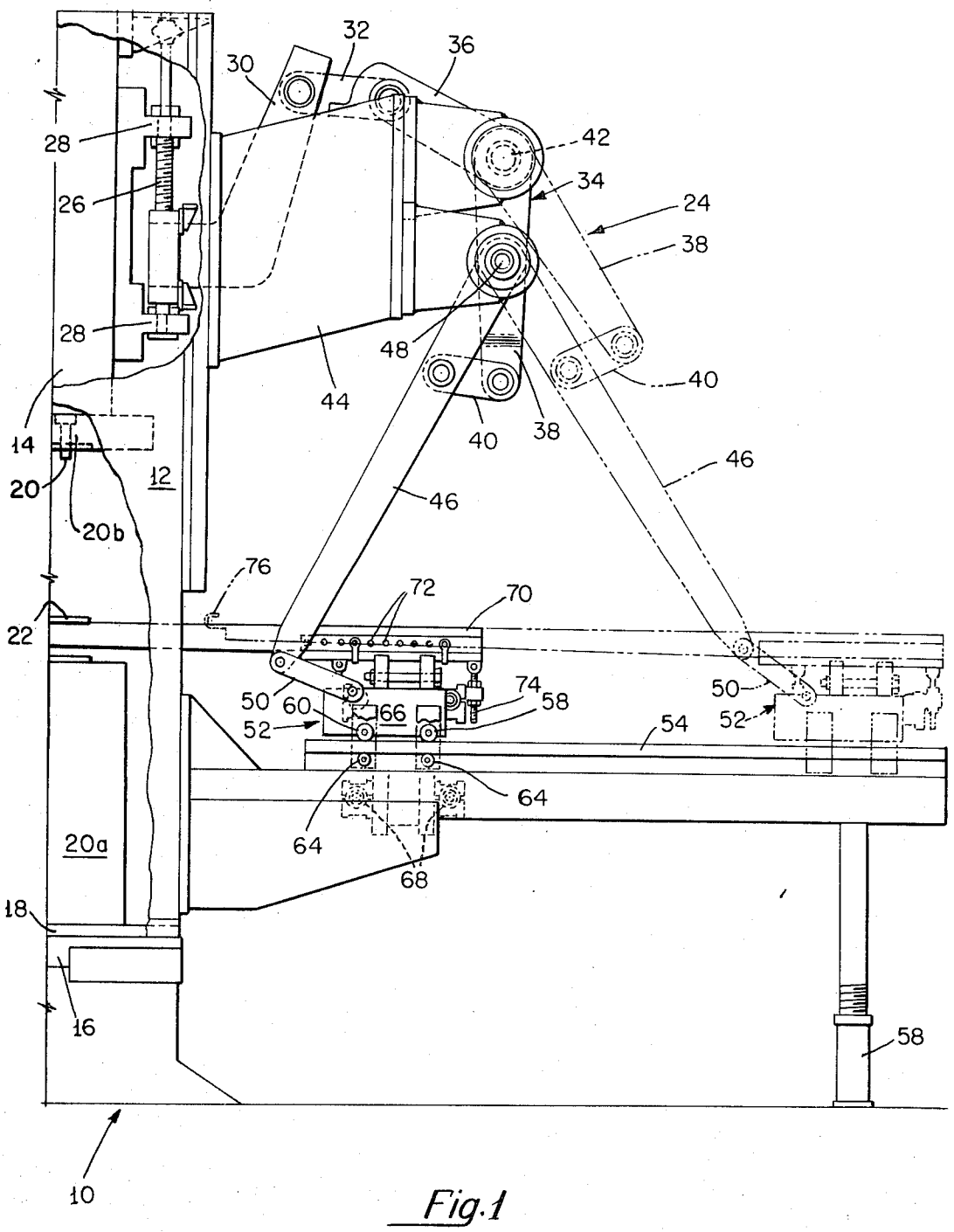


Fig. 1

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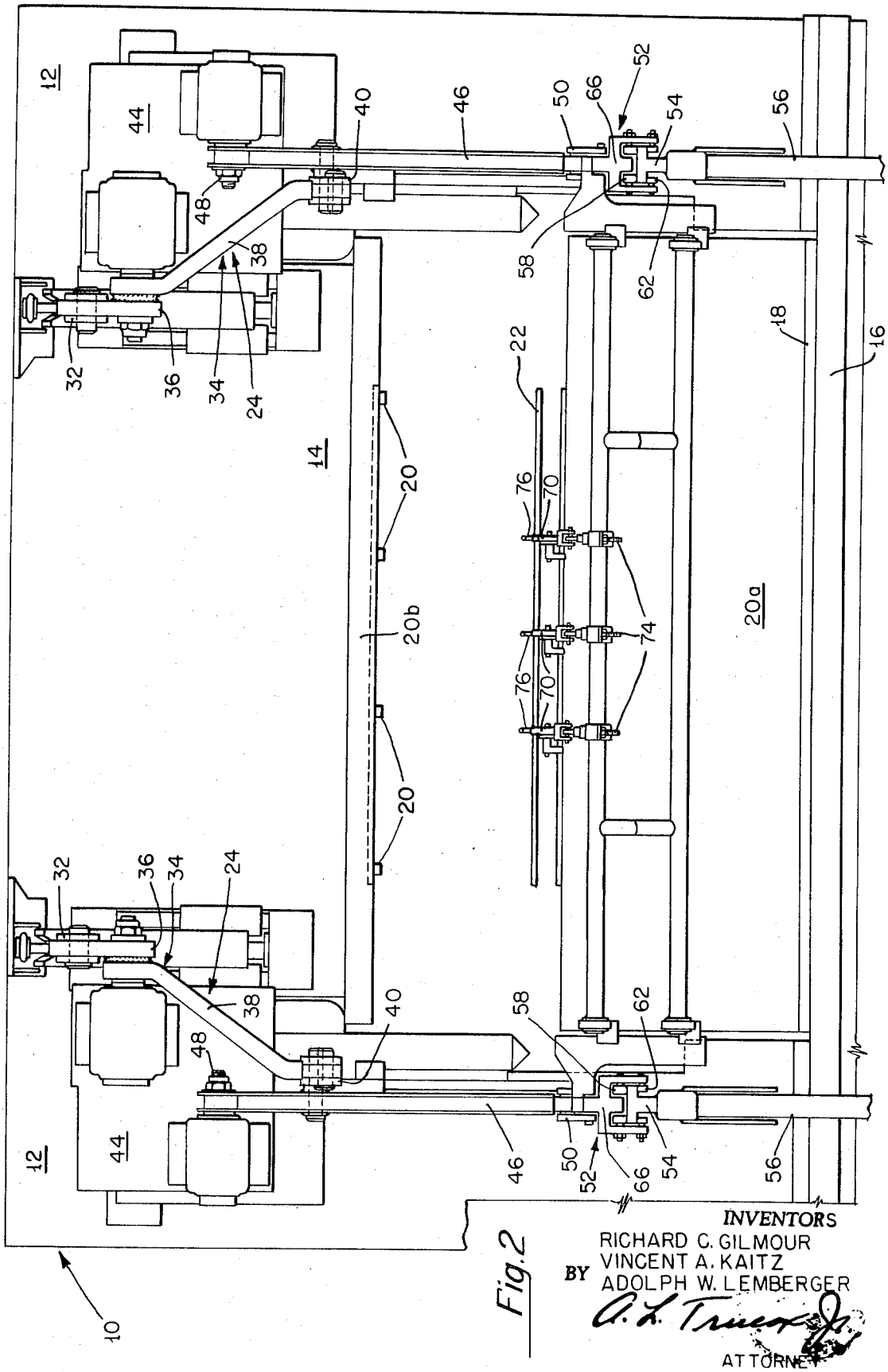


Fig. 2

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DIE UNLOADER

This invention relates to work handling apparatus and more particularly to a ram driven die unloader that is mechanically synchronized with the blanking press, to be unloaded, for movement into the press during the opening stroke of the press, for receiving the ejected stamped blank therefrom, and for removal of the stamping from the press.

A widely used die unloader is driven by racks mounted on the ram that meshingly engage oscillating sector gears fixed to long drive arms for moving the receiving carriage into and out of the press for the unloading thereof. In such an arrangement, an increment of ram motion causes a corresponding movement of the carriage and does not permit any dwell time under the upper die for receiving the ejected stamping.

An object of this invention is to provide a smoothly operable die unloader that has a substantially motionless dwell within the press during the ejection of the stamped blank.

Another object of this invention is to provide an economical die unloader that has easily and cheaply replaceable components.

These and other objects of this invention will become apparent as reference is made to the following specification and drawings wherein:

FIG. 1 is a side view, with portions broken away, of the novel die unloader mounted on the press frame;

FIG. 2 is a view of FIG. 1 substantially along line 2—2 in the direction of the arrows.

The die unloader illustrated is provided with duplicate sets of apparatus on the right and left side of the carriage and duplicate members will be used to interchangeably identify duplicate apparatus on the right or left of the die unloader.

Referring now to the drawings, a conventional blanking press **10** includes a frame **12** with a ram **14** mounted therein for reciprocating motion toward and away from the press bed **16**. A bolster plate **18** secured to the press bed **16** supports the male lower blanking die **20***a* and the female upper blanking die **20***b* and ejector pins **20** are secured to the ram **14** for forming a sheet metal stamped blank **22** therebetween during mating engagement thereof as the ram **14** approaches the press bed **16**.

A die unloader, indicated generally by the numeral **24**, is mounted on the press frame **12** and operably connected to the ram **14** for synchronized movement thereby.

An air motor driven adjustment screw **26** is secured to the ram **14** by bearing blocks **28** which permit rotation in place of screw **26**. A drive arm **30** has one end threadably engaging adjustment screw **26** for movement therealong as the screw is rotated and the other end is pivotally connected to one end of drag link **32**. The other end of the drag link **32** is pivotally connected to one arm **36** of bell crank **34**. The other arm **38** of bell crank **34** is pivotally connected to one end of a second drag link **40**. A pivotal connection **42** at the juncture of arms **36, 38** of the bell crank **34** connects and supports the bell crank on a linkage support member **44** connected to the frame **12**.

The other end of second drag link **30** is pivotally connected to drive link **46** intermediate the ends thereof. A pivotal connection **48** at one end of link **46** connects and supports the drive link **46** on the linkage support

member **44** and the other end of drive link **46** is pivotally connected to one end of connecting link **50**. The other end of connecting link **50** is pivotally connected to a track guided carriage **52**.

The carriage **52** is supported on a T shaped track **56**. The track **56** has one end supported on the frame **12** and the other end is supported by an adjustable leg **58**.

The carriage **52** includes two sets of upper rollers **58, 60** and two sets of lower rollers **62, 64** rotatably attached to the carriage body **66**. The upper rollers **58, 60** bear on the upper surface of the T track **54** and the lower rollers **62, 64** are directly below rollers **58, 60** and bear on the lower side of the T track **54**, thus supporting and retaining the carriage on the track. Attached to and extending between the left and right carriage bodies **66** is an open box tubular structure **68** for supporting the blank receiving arms **70** attached thereto. A series of adjustment apertures **72** are formed along the arms **70** for adjusting the length needed to reach into the press to remove the blank **22**. Vertical adjustment is accomplished by bolt and nut attachment **74** between the carriage and arm. A hook **76** is attached to the end of each arm **70** to contact the blank **22** for removal from between the dies **20***a,b*.

Proper positioning of the carriage **52** for cooperation with the ram **14** is adjusted by vertical adjustment of the drive arm **30** by rotation of adjustment screw **26**. The travel distance of the carriage **52** is easily calculated and adjusted by varying the length of drive link **46**, drag link **32** and the linkage support member **44**.

In operation, with the ram **14** in the uppermost position, as shown in FIG. **1**, after conventional ejector pins **20** have moved the stamped blank **22** from the die **20b**, the carriage **52** is adjacent the press **10** and the arms **70** to extend between the dies **20***a,b* and receive the blank **22** for removal. As the ram **14** descends, the drive arm **30** moves therewith moving the drag link **32** and causing the bell crank **34** to pivot counter-clockwise about pivotal connection **42**. Such movement of the bell crank **34** acting through drag link **40** moves drive link **46** counter-clockwise about pivotal connection **48**. The counter-clockwise movement of drive link **46** acting through connecting link **40** drives the carriage **52** to the right, as seen in FIG. **1**, from the receiving position to the discharge position shown in phantom lines, as the ram **12** brings the dies **20***a,b* together to form another blank **22** therebetween. The blank **22** is removed from the carriage **52** and the carriage is then ready to be returned between the dies for receiving the next newly formed blank **22** as it is ejected from the die **20***b* as the ram approaches the top of its stroke.

The linkage of the drag link **32** and bell crank arm **36** provides a non-uniform movement of the carriage **52**. The carriage **52** is substantially at rest under the die **20***b* for approximately 2¼ inches of movement of the ram **14** on either side of top center. Thus, when the stamped blank **22** is ejected from the die **20***b*, the carriage **52** is substantially stopped and is held steady for sufficient time for the blank to settle on the arms **70** for removal from between the dies. The dwell of the carriage **52** while receiving the blank overcomes the problem of constant motion of the sector gear actuated die unloader.

It can also be seen that replacement of links and pivot pins would be much less expensive than replacing

rack and sector gear sets when parts of the die unloader become worn.

While but one embodiment of this invention has been shown and explained, it is not intended to be limited by such arrangement but by the prior art and the scope of the following claims.

We claim:

1. A die unloader for forming press having a frame, a die bed, a reciprocating ram, an upper die secured to said ram for movement therewith, a lower die secured to said die bed for cooperatively engaging said upper die to form a stamping at the bottom of the ram stroke and ejector pins for removal of a stamping from said die, said die unloader including a support bracker secured to said frame, a carriage having a receiving position and a discharge position and being movable therebetween linkage means operably interconnecting said ram and said carriage for moving said carriage between said positions during reciprocal movement of said ram, and a track means for supporting and guiding said carriage between said positions, said track means includes a T shaped track having one end supported on said frame and the other end supported on an adjustable member for vertically adjusting the height of one end of said track for proper alignment of said carriage relative to said dies.

2. The die unloader is claimed in claim 1 wherein said carriage includes upper rollers and lower rollers for engaging the respective upper and lower surfaces of said T shaped track cross member.

3. The die unloader as claimed in claim 1 wherein said linkage means includes a bell crank having a first arm and a second arm and a pivotal connection at the juncture of said arms, a support member secured to said frame, said pivotal connection supported on said support member, a first drag link having one end pivotally connected to said first arm and the other end pivotally connected to said ram for pivoting said bell crank about said pivotal connection as said ram reciprocates, a second pivotal connection supported on said support member, a drive link having one end pivotally connected to said carriage for moving said carriage between said positions, and the other end pivotally secured to said second pivotal connection, a second drag link having one end pivotally connected to said second arm of said bell crank and the other end pivotally secured intermediate the ends of said drive link for moving said drive link and said carriage as said bell crank is pivoted by the reciprocal movement of said ram.

4. The die unloader as claimed in claim 3 including a drive arm adjustably secured to said ram for movement therewith, said drive arm having a portion thereof pivotally secured to said other end of first drag link whereby adjustment of said drive arm relative to the ram adjusts the positioning of said carriage relative to the ram.

5. The die unloader as claimed in claim 3 wherein said carriage includes tubular box structure, a plurality of arms adjustably supported on said box structure for entering between said dies as the ram approaches the top of its stroke and for receiving the stamping ejected from said upper die for removal from said press.

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