Nov. 2, 1971 R. H. D. ARMBRUSTER ET AL 3,616,675

BLANK EJECTOR ASSEMBLY FOR PRESSES

Filed Aug. 26, 1969 5 Sheets-Sheet 1

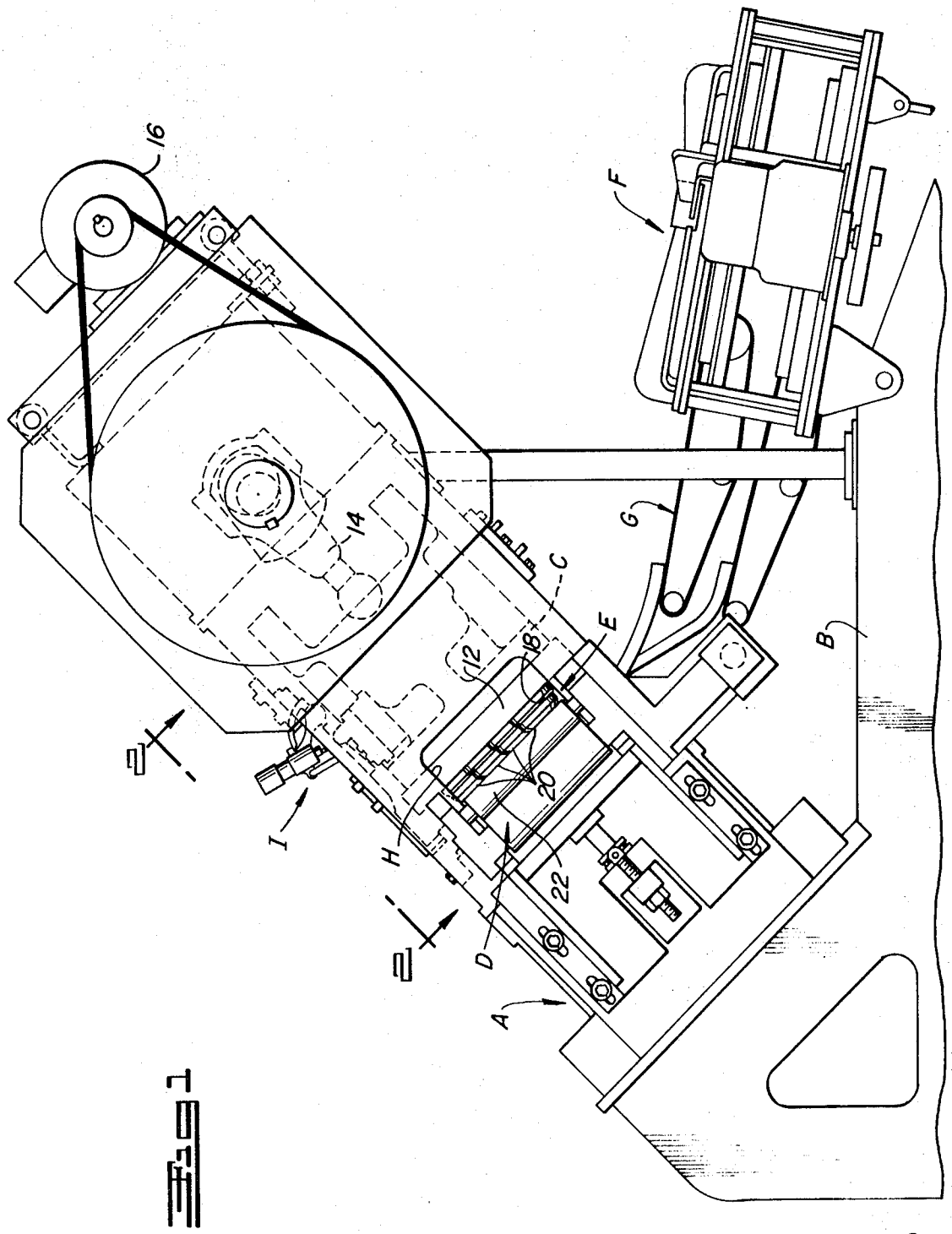

FIG. 1

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BLANK EJECTOR ASSEMBLY FOR PRESSES

Filed Aug. 26, 1969 5 Sheets-Sheet 2

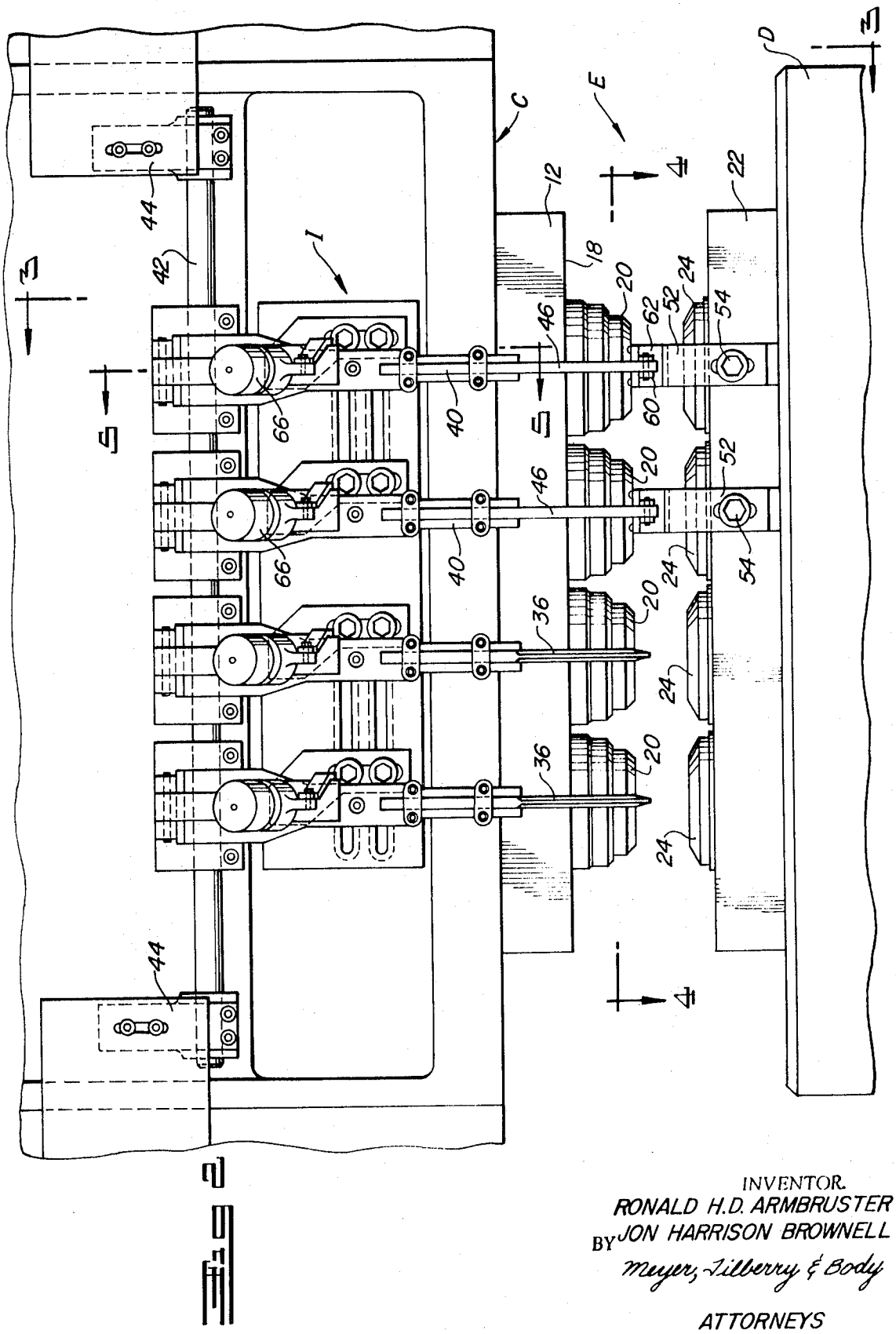

FIG. 2

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BLANK EJECTOR ASSEMBLY FOR PRESSES

Filed Aug. 26, 1969 5 Sheets-Sheet 3

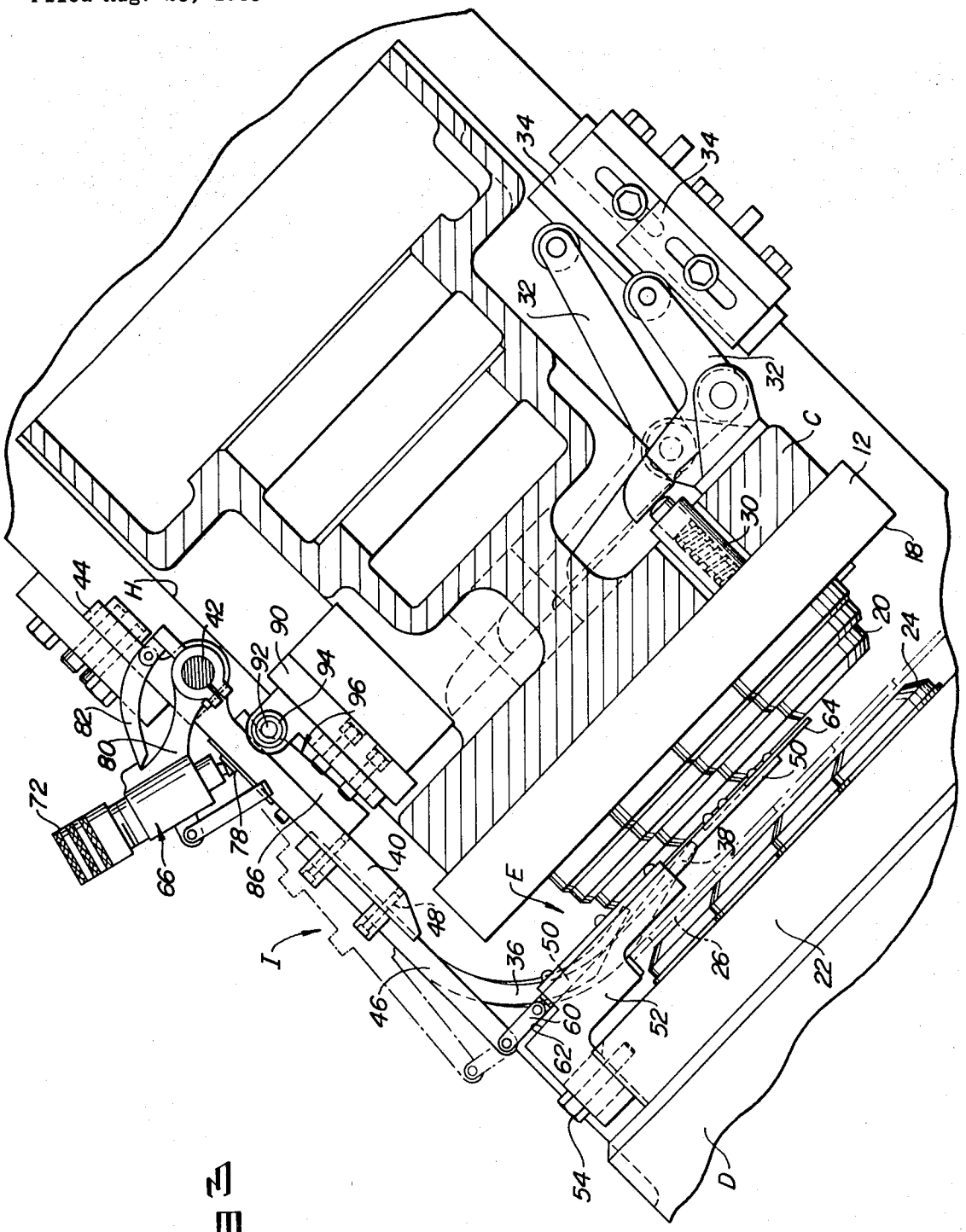

Fig. 3

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BLANK EJECTOR ASSEMBLY FOR PRESSES

Filed Aug. 26, 1969 5 Sheets-Sheet 4

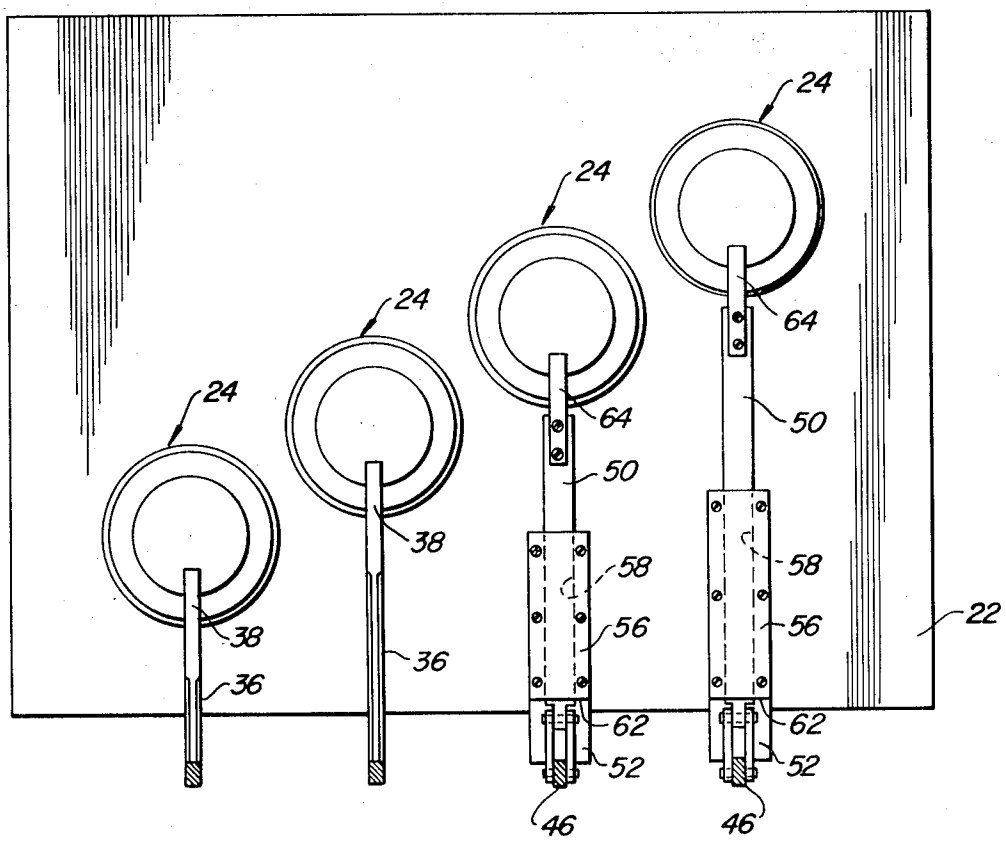

Fig. 4

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BLANK EJECTOR ASSEMBLY FOR PRESSES

Filed Aug. 26, 1969 5 Sheets-Sheet 5

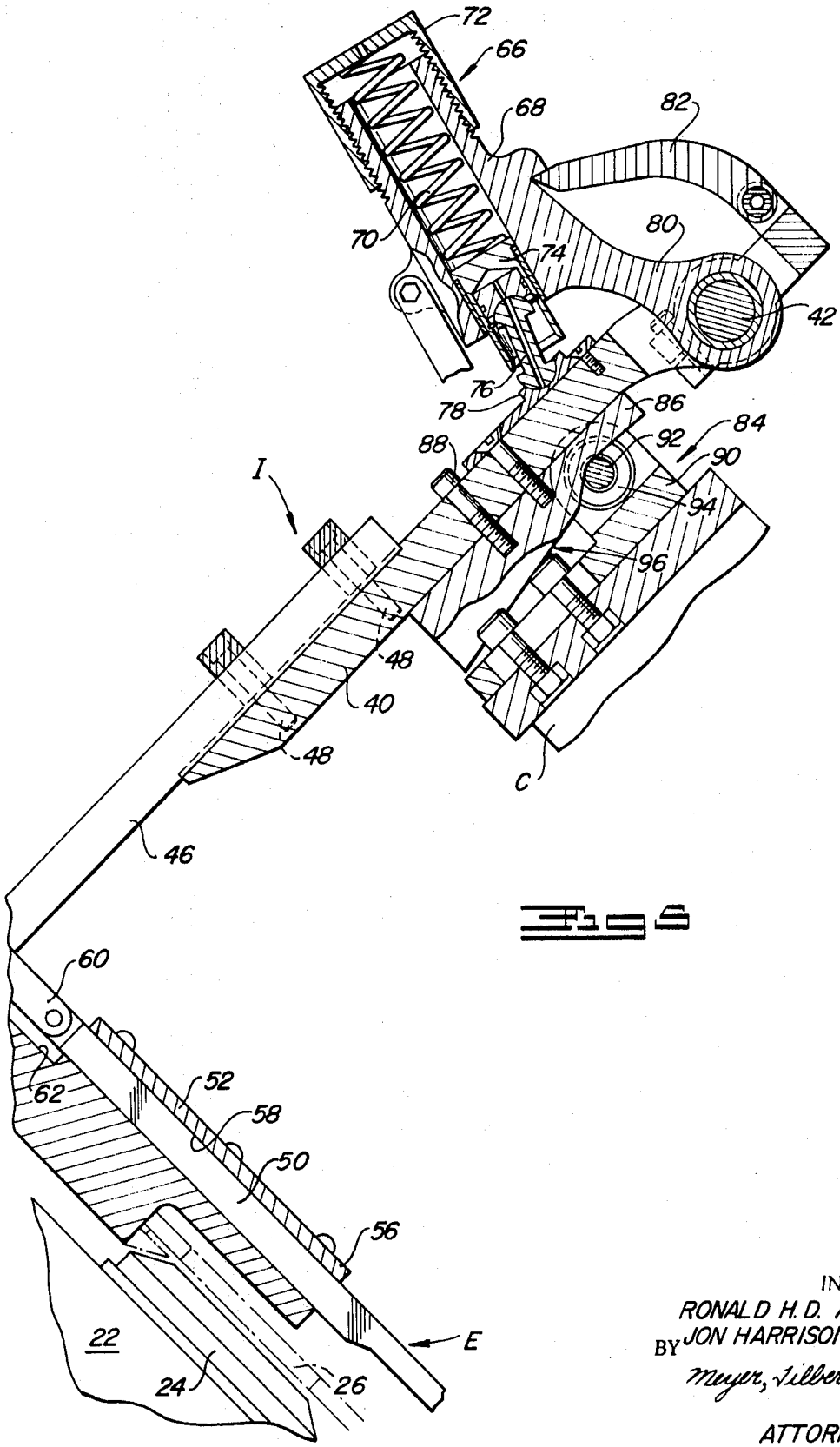

Fig 5

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United States Patent Office

3,616,675
Patented Nov. 2, 1971

3,616,675

BLANK EJECTOR ASSEMBLY FOR PRESSES

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Filed Aug. 26, 1969, Ser. No. 853,144
Int. Cl. B21d 45/00; B26d 7/00
U.S. Cl. 72—427 3 Claims

ABSTRACT OF THE DISCLOSURE

An ejector assembly for ejecting blanks from the die area of a press having multiple dies. The dies are arranged diagonally across the press bed, and the ejector assembly is positioned on one side of the press so that some of the dies are remote from the assembly. The assembly comprises a kicker arm pivotably suspended from the press above the die area, an elongated kicker slide, a stationary slide holder mounted on the press on which the kicker slide is guided into an out of the area of the remote dies, and linkage means connecting the kicker arm with the kicker slide to translate arcuate motion of the arm into linear motion of the slide. A cam means on the press ram actuates the kicker arm in timed relationship therewith whereby the slide ejects blanks from the die area.

The present invention relates to a blank ejector assembly for use with presses, and particularly to an ejector assembly for use with presses of the type having an inclined press bed and multiple die sets.

The invention is particularly applicable to the manufacture of can ends and other flat parts formed in combination blanking and drawing dies. The invention will be described with reference to the ejection of such can ends from the die area after knockout of the can ends from the dies, although it will be appreciated that the invention is useful in other blanking and drawing applications.

In the can making art, it is conventional practice to form can ends from a coil of strip material which is fed into one end of the press and withdrawn at the opposite end. By forming, it is meant both blanking and drawing the can end with a single combination die set. In order to optimize production, a sufficiently wide strip of material is fed into the machine so that an array of multiple dies can form several can ends with each stroke of the press ram.

However, the dies cannot be arranged laterally in a straight line across the width of the strip. The presses are usually inclined in a direction at right angles to the direction of movement of the strip, at least in the die area, so that following forming and knockout of the can ends from the dies, the can ends can drop by gravity from the die area onto a conveyor or other means for further processing. It is necessary to prevent interference of one can end with another during removal of the can ends from the die area, so that in a multiple die press, the dies are arranged in a diagonal line which extends from one corner of the die area or press bed to another. In this way, the flow of the multiple can ends from the die area is in side-by-side linear paths. At the same time, the least wastage possible in the coil of strip material is obtained.

In an effort to increase production, it is desirable to reciprocate the press at as fast a speed as possible. With gravity removal of the can ends from the die area, the speed of reciprocation of the press is limited in that the can ends remain in the die area too long. Accordingly, it is known to provide a means for forceably ejecting the can ends from the die area.

One such means comprises one or more arms suspended on the front side of the press, opposite the lower rear side

of the press through which the can ends fall. The arm or arms are suspended from above the die area and are provided with an arcuate shaped portion which extends downwardly into the die area. The arms are cam actuated on pivot centers so that the free ends of the arcuate portions traverse arcs towards and away from a point directly beneath the dies with which they are associated. Following knockout of the can ends from the dies, when the can ends are suspended in space, the motion of the arms is timed so that the arm ends contact and forceably eject the can ends from the die area.

These ejectors have been found to be satisfactory where perhaps only two die sets are used. However, in the case of a four-out die configuration or greater number of dies, at least two of the dies are too far removed from the ejector assembly to be reached by the arm free ends. The reason for this is that the clearance in the die area between die shoes clearly is limited, and insufficient to accommodate that arcuate movement of the arm free ends which would be required for can ends so far removed horizontally from the arm pivot centers.

In addition, the arcuate movement of the arm free ends in question would be in an upward direction. Even if the can ends could be reached, the direction of contact would cause the can ends to flutter and follow an untrue path from the die area.

Accordingly, in such four-out die configuration presses, the speed at which the presses can be operated is still limited by gravity drop-out of can ends formed by the remotely positioned die sets.

Accordingly, it is an object of the present invention to provide an ejector assembly useful with all press die configurations.

It is further an object of the present invention to provide an ejector assembly by which the speed of reciprocation of the press ram, and accordingly production of the press, can be increased.

In accordance with the present invention, there is provided an ejector assembly for use at least with the remote dies of a multiple die configuration press, adapted to be positioned on the side of the press opposite the drop-out side through which the parts being formed are removed, the improvement comprising at least one downwardly extending kicker arm pivotally suspended on said press from above the die area, on said side opposite the drop-out side; a stationary slide holder mounted on the press; an elongated kicker slide; the slide holder guiding said kicker slide linearly into and out of the area of the remote dies; and linkage means connecting the kicker arm with the kicker slide to translate the arcuate motion of the kicker arm into the linear motion of the kicker slide. A cam means on the press ram actuates the kicker arm whereby the slide ejects parts pushed from the dies of said remote die sets.

Preferably the kicker slide is extendable linearly for universal application with the die sets of all die configurations.

In accordance with a further preferred aspect of the present invention, the ejector assembly comprises means forceably biasing the kicker arm for pivotable movement towards the die area, the cam means comprising a cam surface on the kicker arm, and cam follower means on the press ram engaging said cam surface to actuate the kicker arm in a direction away from the die area.

Preferably, the biasing means is a spring-loaded dashpot.

The invention and advantages thereof will become apparent upon consideration of the following specification, with reference to the accompanying drawings, in which:

FIG. 1 is a side elevation view of a typical press on which an ejection unit in accordance with the present invention is used;

FIG. 2 is a section view taken along line 2—2 of FIG. 1;

FIG. 3 is a section view taken along line 3—3 of FIG. 2;

FIG. 4 is a section view taken along line 4—4 of FIG. 2; and

FIG. 5 is a section view taken along line 5—5 of FIG. 2.

Referring to FIG. 1, the press illustrated is for forming can tops, and is of the inclined type consisting of inclined frame A affixed to a base or support B. A reciprocating ram C and stationary platen D supported by the frame define therebetween die area E. The press has a front side which is to the left in FIG. 1 and a rear side which is to the right. On the rear side of the machine, there is located a curler machine F. Parts formed in the die area E drop onto conveyor means G for further processing in the curler machine.

On the opposite sides of the machine between the front and rear sides, the frame A defines window H. A strip of material from which can ends are to be punched and drawn in the die area of the machine is fed from a coil through one of the windows H into the die area, and is withdrawn through the opposite window.

The ejector assembly according to the present invention is broadly designated with the letter I and is positioned on the lefthand or front side of the machine.

FIGS. 2 and 3 illustrate further details of the press. The ram C is of conventional shape, generally rectangular in configuration, having connected to the bottom surface thereof a rectangular upper die shoe **12**. The ram is guided by posts of the frame A, and is actuated to reciprocate up and down along its axis by means of connecting rod **14** and motor **16** (illustrated in FIG. 1) of the press. Affixed to the lower surface **18** of the die shoe **12** are a plurality of upper dies **20**.

Opposite the upper die shoe **12** is a lower die shoe **22** positioned on stationary platen D which is stationary at least relative to the ram C. The lower die shoe supports a plurality of lower dies **24**. Both the upper and lower dies are positioned on the respective die shoes in a diagonal array between opposite corners of the die shoes, as illustrated in FIG. 4, the upper dies having the same array as the lower dies and being opposite the lower dies. In addition, a cover plate and stripper plate assembly **26** schematically illustrated in dotted lines in FIGS. 3 and 4 covers the lower dies **24** except for the die sockets thereof.

In operation, the coil of strip material is fed between the cover plate and stripper plate of the lower die shoe, over the upper surface of the lower dies. The upper dies are brought downwardly on the reciprocating ram C, and, in cooperation with the lower dies, blank and draw a can top from the strip material. By design of the dies, the formed can parts are carried upwardly by the upper dies with retraction or ascendency of the upper dies and ram.

Penetrating the ram C and upper die shoe **12** are a plurality of knock-out pins **30**, FIG. 3 which are biased upwardly, and actuated downwardly by a plurality of rocker arms **32**. The rocker arms engage stationary cams **34**, mounted on the press frame, and at a predetermined point in the ascendency of the ram C, the knock-out pins are actuated to push the formed can parts from the upper dies and into the space between the upper and lower dies.

It is evident that the formed can parts will leave the die area E in the direction to the right in FIGS. 1 and 3. In this respect, the reason for the diagonal array of dies should now be more evident. In particular referring to FIG. 4, the dies are spaced lengthwise along the line of movement of the strip material being fed between the dies; that is, from left to right in FIG. 4, parallel to the front and rear sides of the press, so that when the can parts leave the press die area at the rear side, there is no interference of one can top with another. The rear or leaving side of the press is the upper side in FIG. 4.

The same could be accomplished by aligning the dies in a straight line parallel with the rear side of the machine, but then this would result in wastage of material. For minimum wastage, the die sets could be aligned in a straight line at right angles to the front and rear sides of the machine, but then there would be interference of one can top with another leaving the machine. The diagonal array avoids interference, and achieves the minimum wastage possible.

Clearly it is desirable to reciprocate the press at as fast a speed as possible to obtain optimum production from the press. If force of gravity is relied upon alone for removal of the formed can tops from the die area E, reciprocating the press at too high a speed would cause the upper dies to contact the can tops before their complete removal from the die area. To speed up production, it is known to use a plurality of ejector mechanisms for ejection of the formed can parts.

Conventionally the ejector mechanism is positioned on the front side of the machine, opposite the rear side, to avoid interference with removal of the can tops. Accordingly, referring to FIG. 4, the dies of the die array can be classified as those adjacent the ejector mechanism, and those remote from the ejector mechanism. The latter constitute the third and fourth dies of the array, to the right in FIG. 4, and the former are the first and second dies to the left in FIG. 4.

A conventional ejector mechanism is shown schematically in FIG. 3. This mechanism consists of a pair of curved kicker arms **36** having a relatively flat forward end **38**. The arms are pivotally connected at their upper ends on a post of the press frame, so that the lower forward ends **38** travel in an arc into and out of the die area.

Whereas there is no difficulty in designing the kicker arms so as to contact the space suspended formed can tops from the first and second dies, to eject the can tops from the die area, it is impossible to design the kicker arms to forceably eject formed can tops from the third and fourth dies. The reason for this is that the third and fourth dies are so far removed from the pivot point of the kicker arms that the arc of travel is too great. There is not sufficient room between the shoes of the dies, which of necessity are still close together immediately following knock-out of the can ends from the upper dies. Geometrically, the vector of movement of the arm ends in a direction parallel to the axis of movement of the press ram would exceed the spacing between the die shoes. In addition, the angle of upswing on the kicker arm forward ends would be so great as to cause the cam ends to flutter and follow an untrue path from the die area.

Accordingly, it has been conventional practice in the four-out die configuration of FIG. 4 to use the ejector mechanisms only with the first and second dies, and to allow the can tops from the third and fourth dies to drop out by gravity. Since the third and fourth dies are on the lowermost side of the machine, the speed of the machine is improved, over the use of no ejector. However, it is still limited and less than the potential of the press.

The present invention resides in a novel kicker arm ejector assembly shown in detail in FIGS. 2, 3 and 5 which is capable of ejecting formed can tops from the third and fourth dies, or from the dies of any die array or configuration. There are two ejector assemblies, one for each of the two remote dies.

In accordance with the present invention, each ejector assembly comprises a downwardly extending upper kicker arm part **40** which is fastened to pivot shaft **42**, the latter being held in bracket means **44** fastened to the front side of the press. (The same pivot shaft supports rocker arms **36**.) The pivot shaft is parallel with the front side of the press, the upper kicker arm part being oscillatable towards and away from the die area E. Attached to the lower end of the kicker arm part **40** is a

lower arm part **46**. The two arm parts are connected together by means of bolts **48**, the lower arm part being in the form of an extension of the upper arm part.

An elongated kicker slide **50** in the form of a rectangular shaped narrow bar extends inwardly towards the third and fourth dies in a plane parallel to the facing surfaces of the die shoes. The kicker slide is guided by means of a slide holder **52** fastened to the lower die shoe by means of bolts **54**. The slide holder is L-shaped, having a cantilevered portion **56** extending for a short distance over the lower die shoe and defining a guide slot **58** in which the kicker slide reciprocates. The orientation of the guide slot is substantially at right angles with the front and rear sides of the press.

The end of the kicker slide which is on the front side of the press is pivotally connected to a link element **60** which in turn is pivotally connected to the lower end of the kicker arm part **46**. The pivotal connection of the link with the arm and kicker slide permits the arm end to travel in an arc and the kicker slide to travel in a straight line path.

The slide holder is recessed at **62** to permit movement of the component parts without interference.

At the free end of the kicker slide **50**, there is provided an extension **64** which actually contacts the formed can ends suspended in the space between the forming dies. The extension is fastened to the kicker slide by means of a plurality of bolts and can be moved towards the front side of the machine or towards the rear side of the machine to adjust the overall length of the kicker slide for proper contact with the formed can ends.

The kicker slide holder **52** also is adjustable vertically by releasing bolts **54** to set the elevation of the kicker slide to coincide with movement of the press ram.

Actuation of the kicker upper arm **40** is provided by means of a spring-loaded dashpot **66** (FIG. 5) consisting of a spring barrel **68** and coil spring **70**. A spring adjustment cap **72** provides a means for adjustment of the compression force of the spring. The latter bears against a piston **74** which in turn forces a pin **76** against a piston wear plate **78** mounted on the front face of the ejector arm.

By means of connection **80**, the dashpot also is pivotally supported on the ejector arm shaft **42**, but is prevented from rotating on the shaft by latch **82**.

Normally, the dashpot biases the ejector arm towards the die area. The exact position of the kicker arm is set by a cam mechanism broadly indicated with the numeral **84** in FIG. 5. This mechanism consists of a cam plate **86** fastened to the kicker arm by means of screws **88**. A cam follower plate **90** is mounted on the press ram, and supports a cam follower **92** rotatable in an outer annular cam bearing ring **94**. The cam follower **92** rolls against the cam surface **96** of the cam plate with up and down movement of the press ram, positioning the ejector kicker arm against the spring force of the dashpot **66**.

In operation, the ejector assembly including the kicker slide **50**, slide holder **52**, and actuating mechanism therefor for each die is adjusted for movement in timed relationship with movement of the press ram and knock-out of formed parts.

Instead of a spring loaded dashpot, a pneumatic biasing dashpot could be used against which the cam assembly would operate.

These actuating components of the ejector assembly have proven to be durable, and also have the advantage of smoothly actuating the ejector kicker arm and slide with no vibration, even at high speeds of the press.

Other advantages of the invention should now be apparent, a principal advantage being that by forceably ejecting the formed can ends from the third and fourth dies much higher speeds and greater production are obtainable from the press. Thus, the full potential of the press can be realized.

In addition, the invention permits the use of a larger number of dies, and any die configuration. In this respect, the number of dies is limited only by the width of the coil strip which can be fed into the press, and a die configuration of more than four dies is very feasible.

Although the invention has been described with reference to a specific embodiment, variations within the scope of the following claims will be apparent to those skilled in the art.

We claim:

1. In a press having a die area and reciprocating ram means mounted for reciprocation toward and away from said die area along a ram axis, an ejector assembly for ejecting parts from said die area, said ejector assembly including elongated kicker arm means pivotally mounted on said press above said die area in downwardly extending relationship thereto for pivotal movement toward and away from said die area, yieldable biasing means yieldably biasing said kicker arm means toward said die area, cooperating cam means and cam follower means on said ram means and said kicker arm means for effecting pivotal movement of said kicker arm means during reciprocation of said ram means, said biasing means yieldably holding said cam means and said cam follower means in engagement with one another during reciprocation of said ram means, said cam means being sloped for cooperation with said cam follower means to pivot said kicker arm means away from said die area against biasing force of said yieldable biasing means during reciprocating movement of said ram means toward said die area and to release said yieldable biasing means for pivotally biasing said kicker arm means toward said die area during reciprocating movement of said ram means away from said die area, the improvement comprising; elongated kicker slide means for ejecting workpieces from said die area during reciprocating movement of said ram means away from said die area, guide means mounted on said press in stationary relationship to said ram means for guiding said kicker slide means, said kicker slide means having a longitudinal axis and being mounted for reciprocating movement on said guide means in a substantially straight line axially of said longitudinal axis in a direction transverse to said ram axis toward and away from said die area, and link means pivotally connected to said kicker arm means and said kicker slide means for pushing and pulling said kicker slide means toward and away from said die area during pivotal movement of said kicker arm means toward and away from said die area.

2. The device of claim **1** and further including adjustable mounting means mounting said slide guide means for adjustment in a direction parallel to said ram axis to vary the elevational position of said kicker slide means relative to said die area.

3. The device of claim **2** wherein said kicker slide means includes an arm having an end portion facing said die area and further including an extension adjustably attached to said end portion for adjustable movement toward and away from said die area relative to said arm for varying the length of said kicker slide means.

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U.S. Cl. X.R.

72—420