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Connors et al.

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[54] **GUARD FOR MECHANICAL POWER PRESS**

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[52] **U.S. Cl.** **74/612,** 83/546, 100/53

[51] **Int. Cl.** **F16p 3/00**

[58] **Field of Search** 74/612, 613, 608; 83/544, 83/545, 546; 100/53

[56] **References Cited**

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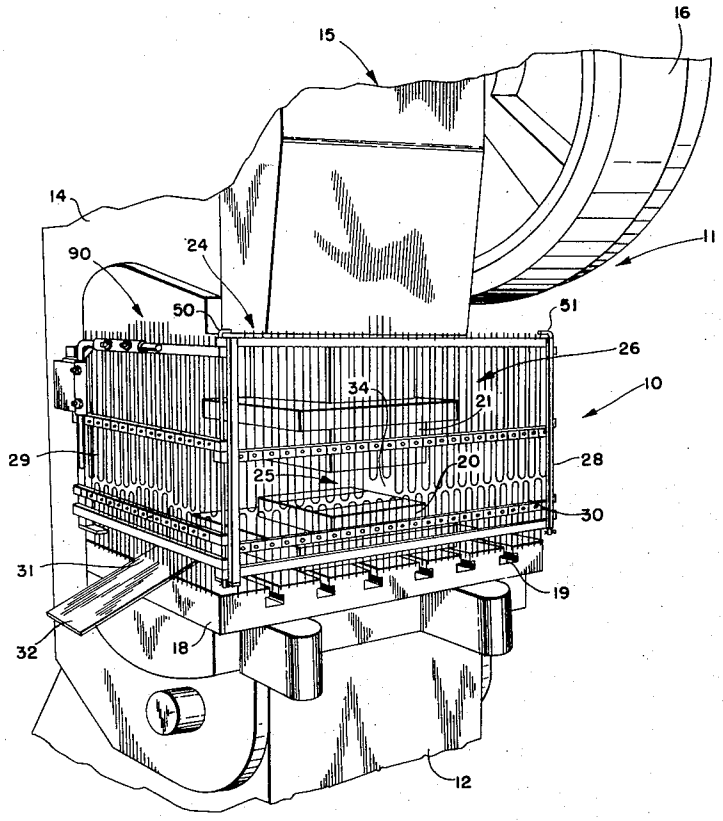
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Primary Examiner—Charles J. Myhre
Assistant Examiner—F. D. Shoemaker
Attorney, Agent, or Firm—Donnelly, Maky, Renner & Otto

[57] **ABSTRACT**

An adjustable barrier guard on a mechanical power press consisting of a three-panel cage for enclosing the sides and front of the point of operation of the machine. The side panels are hinged to the press and pivotally support the front panel with all swingable to fully open positions for set up purposes, being mechanically locked and electrically interlocked in the operating position. Each panel is a rectangular frame supporting upper and lower rows of vertically disposed facing loops being individually vertically adjustable and clamped to form a closed protective barrier or any aperture configuration between the rows.

9 Claims, 4 Drawing Figures



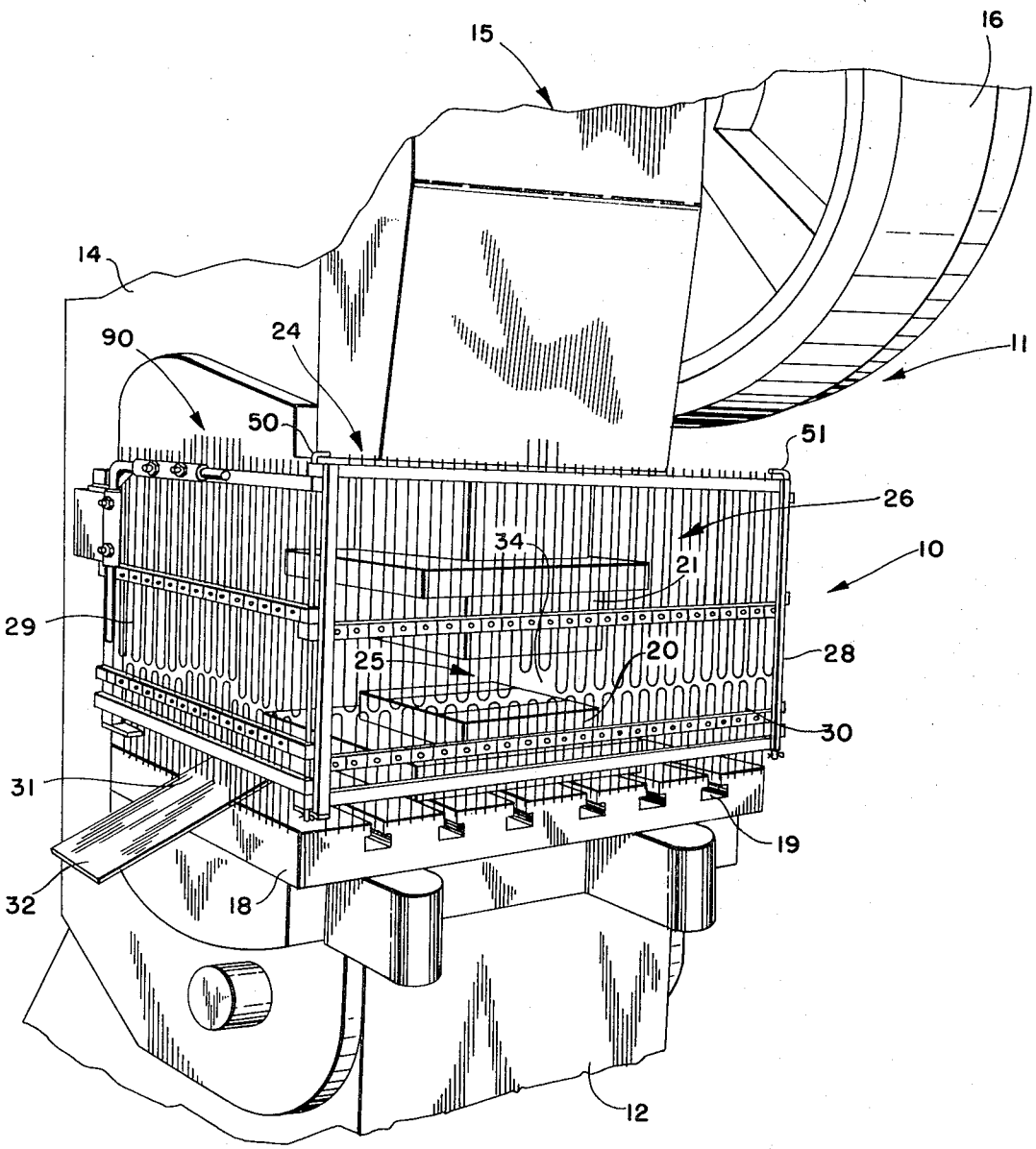


FIG. 1

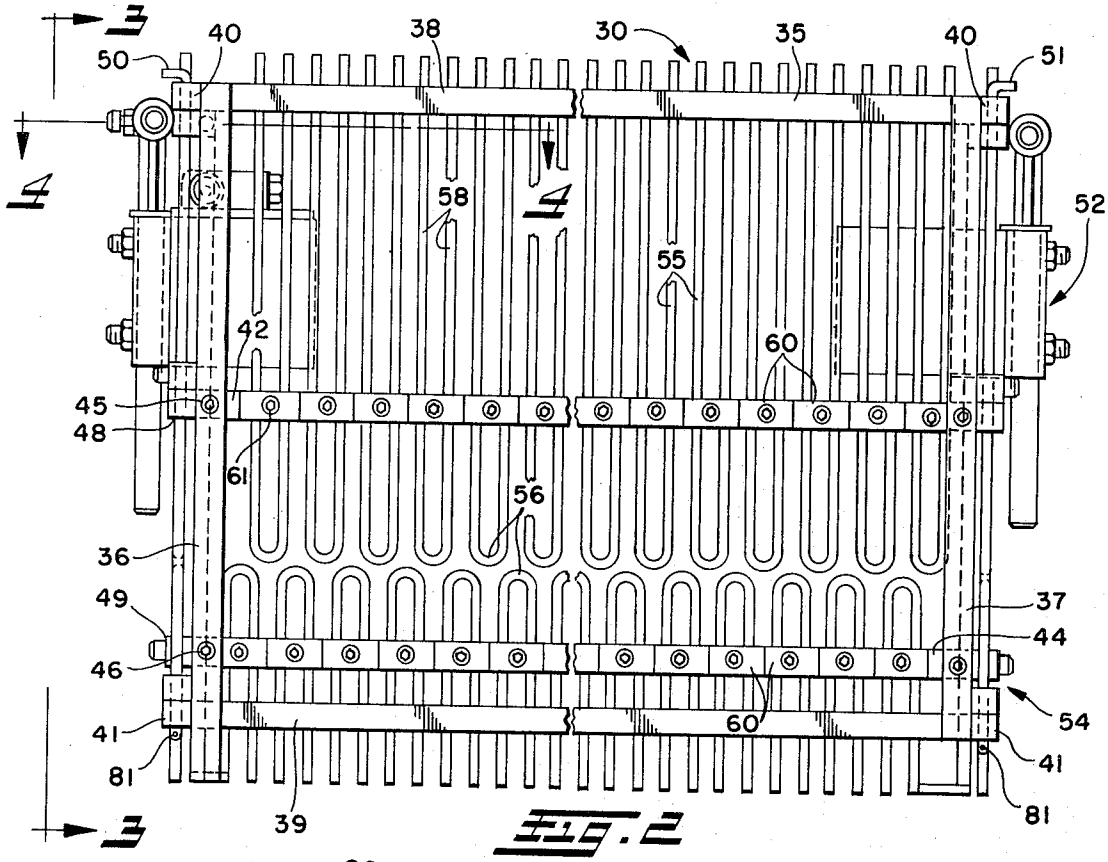

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FIG. 2

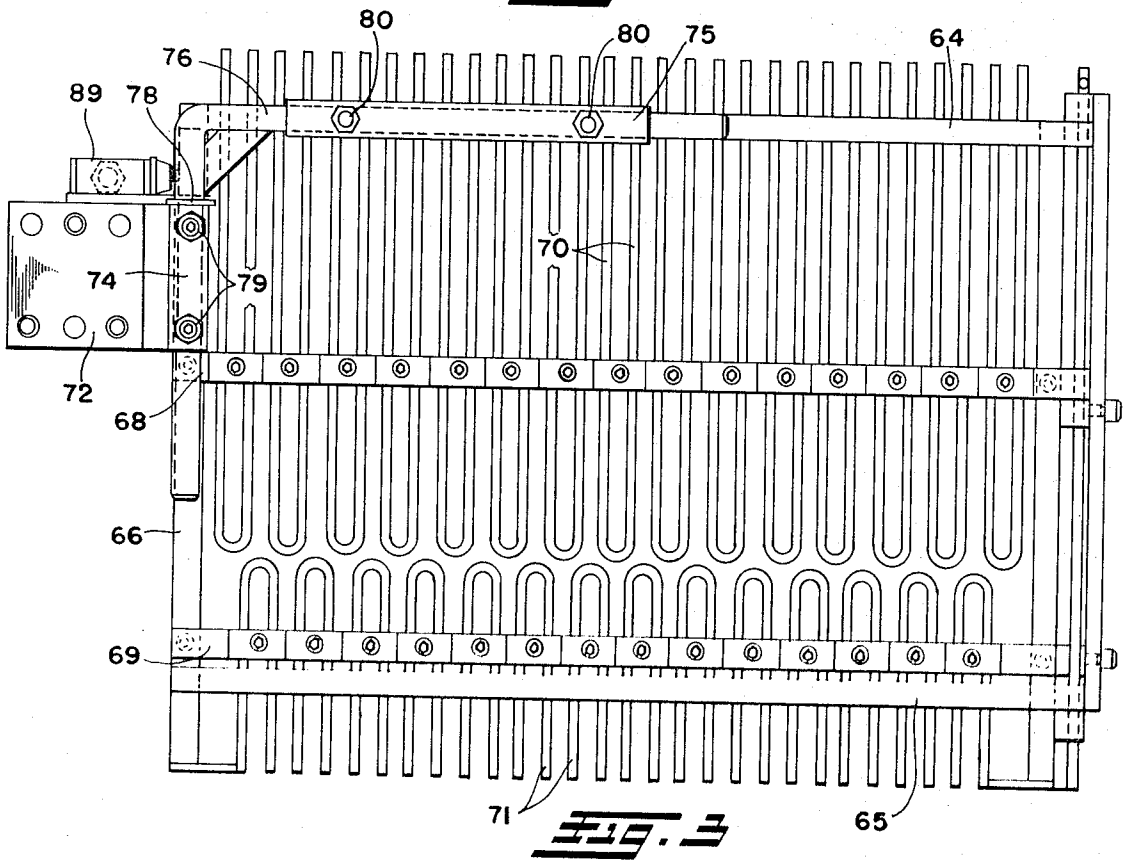

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FIG. 3

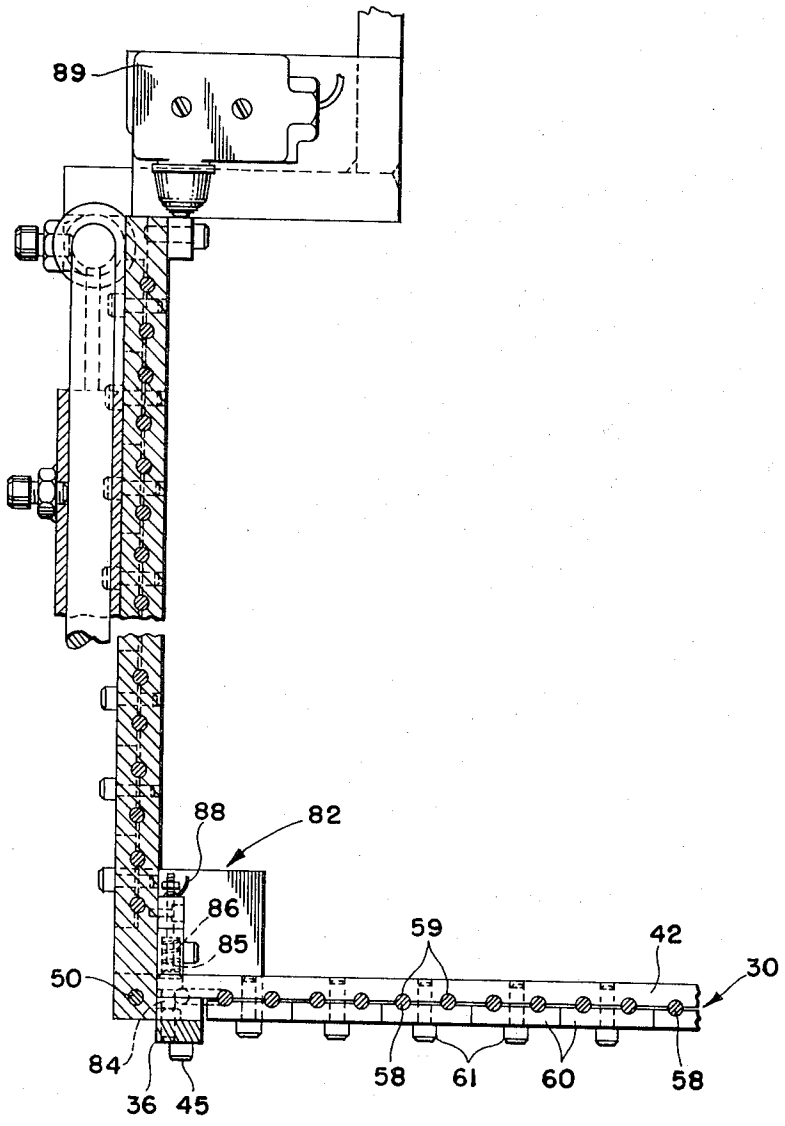


Fig. 4

GUARD FOR MECHANICAL POWER PRESS

BACKGROUND OF THE INVENTION

This invention relates to guards for mechanical power presses wherein material is positioned and work performed by shearing, punching, forming or assembling, and more particularly to a barrier type of guard to enclose the point of operation of such a machine and thereby protect against intrusion of a part of the body of the operator between the moving parts of the press.

The use of point of operation and barrier type guards for power presses has become widespread in the industry and in fact is essential and required to assure operational safety for this class of machines. It is of course possible to completely isolate the operating area with non-penetrable barriers and in conjunction with mechanical and electrical interlocks assure that safe operating conditions exist. However, it is also essential to the production capabilities of the machine that the point of operation be viewable by the operator, so that control can be exercised over the manufacturing process to assure proper operation and to avoid damage to the machine. The cage type of enclosure has been found readily suitable for these purposes and it is known to provide some degree of adjustment in setting the configuration of the cage so as to facilitate the placing and removal of parts from the press and some degree of access for clearing supervision. Most of these devices, however, are quite limited in versatility and thus are not safely amenable to a wide range of manufacturing processes or part configurations that may be desired to perform.

SUMMARY OF THE INVENTION

Therefore it is one object of this invention to provide an improved barrier guard for such power presses and the like having improved versatility than prior known devices within rigid point of operation safety standards.

It is another object of this invention to provide an improved barrier guard for power presses and the like which provides access openings variable in elevation relative to the point of operation and of minimum needed degrees of access.

It is a further object of this invention to provide an improved barrier guard for power presses and the like in which various configurations of access apertures can readily be formed in setting up the press for particular operations.

It is a still further object of this invention to provide such an improved barrier guard for power presses which is readily disengaged from the machine during down time for complete access to the operating area.

It is a yet further object of this invention to provide an improved barrier guard for such power presses which is especially suited for high production manufacturing and provides greater safety than prior known devices which it replaces.

These and other objects of the invention are realized in the embodiment of the invention to be described in detail in apparatus which forms a three-panel cage type of barrier guard, each panel consisting of two rows of opposed and adjustably mounted facing loop elements which are individually relatively movable toward one another to form various desired locations and configurations for access apertures to the point of operation. The side panels are pivotally mounted to the frame of the press and in turn pivotally support the front panel, being secured in the operating position by clamps and hinge pins which are releasable to allow swinging movement of the panels for full access to the operating area of the machine.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, the following description and the annexed drawings setting forth in detail a certain illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principles of the invention may be employed.

BRIEF DESCRIPTION OF THE DRAWINGS

In said annexed drawings:

FIG. 1 is a partial isometric view of a mechanical power press having the adjustable barrier guard of the instant invention in closed position about the point of operation of the same;

FIG. 2 is an elevational, broken vertically for convenience, view of the barrier guard of the invention removed from the press;

FIG. 3 is an elevation of one side of the barrier guard of the invention also removed from the press; and

FIG. 4 is a horizontal sectional view taken generally along the lines 4–4 of FIG. 2 showing the hinge arrangement of one side panel and an electrical interlock system.

DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

Referring now to the drawings and more particularly to FIG. 1 there is shown an embodiment of the barrier guard **10** in placement in operating position on an open back inclinable (OBI) power press **11** open at the front and both sides.

It will be clear from the following that such barrier or gate guards can be adapted to different types of presses, as well as other types of machines which may require comparable protection for safe operation.

The OBI press **11** comprises a typical base structure **12** inclinably supporting the press body **14**, the latter adjustable by means of an inclining mechanism, not shown, located at the rear of the press and capable of varying the degree of both forward and backward inclination. The drive mechanism generally indicated at **15** includes a flywheel **16** located at the top portion of the press **11** and is inclinable therewith as is the typical bed and bolster **18**, the latter including slots **19** therein for attachment of a lower die **20** adapted to receive formed parts for example. An upper die **21** is supported for reciprocation relative to the lower die **20** by means of a conventional mechanism therebove receiving impetus from the flywheel **16**. The body **14** of the press **11** is of generally C-shaped configuration including a portion **24** overhanging the bolster **18** and exposing the latter on three sides thereof for access to the point of operation indicated generally at **25** between the upper and lower dies **20, 21.**

The adjustable barrier guard **10** of this invention is a three-panel unit comprising side panels **28, 29** and a front panel **30** substantially fully enclosing the work performing area **26** of the press, the position of the pan-

els being electrically sensed to prevent operation of the press in other than the completely closed condition as will be described. All of the panels **28–30** of the guard are substantially the same, varying in dimensions however if needed to span the related portions of the operating point **25**, the mounting arrangement therefor, and including slight constructional difference to accommodate folding together of the panels to form a secure enclosure in the fully closed condition.

It is apparent, however, that suitable apertures may be provided in the barrier guard **10** to allow for operation of the press **11** in a production manner without the necessity for opening any of the panels **28–30** to expose the operating point **25**, such apertures including for example an exit aperture **31** in the left side panel **29** where sheets of scrap material **32** for example are discharged in a punching operation. Similarly, an entry material aperture would be included on the opposite side panel **28** for feed of the stock to be processed in a right to left feeding operation. Other apertures may be included as, for example, an aperture **34** in the front panel **30** for operator access to the work performing area **26**. Well established standards have been formulated for size, shape and location of apertures in barrier guards and the like to preclude the possibility of pinch points and any other inadvertent entry of hands or fingers to the point of operation with the barrier in place. The requirements of these standards are often stringent and have been devised having in mind the conventional forms of barrier guards.

The barrier guard **10** of the instant invention is especially advantageous in this regard in meeting these standards, not only in providing a secure guard, but also in providing a structure which can be readily varied by the operator during the set-up procedure to accommodate a wide range not only of size of parts but also of shape or configuration of same and path of movement into and out of the operating point **25** with respect to the work performing area **26** of the machine. Thus, for example in FIG. **1** it is seen that an exit aperture **31** has been provided which closely conforms to the configuration of the run-out material **32**, leaving only minimal spacing thereabout so as to preclude operator access physically to the area **26** without fully opening at least the front panel **30** forming the barrier, which by the interlock system referred to assures stopping of the press.

Referring now to the various detailed views of the barrier guard **10**, the front panel **30** of same comprises a generally rectangular frame **35** consisting of a pair of vertically disposed side bars **36, 37** and upper and lower bars **38, 39** welded or otherwise rigidly fastened together and dimensioned to conform approximately to the dimensions of the front projection of the operating area **25** of the press **11** defined by the overhang portion **24** and the bolster **18**. The bars **36–39** are preferably formed of steel and are generally of square cross-section, with the upper and lower bars **38, 39** having respective extensions **40, 41** laterally beyond the side bars **36, 37** which form a part of hinging and/or locking mechanism for such front panel. A pair of straps **42, 44** also preferably being bars of steel span the width of the front panel **30** and are secured thereto by means of bolts **45, 46** respectively, also including extensions **48, 49** thereon beyond the side bars **36, 37**. All such bar extensions **40, 41, 48, 49** are vertically apertured to receive rods **50, 51** forming side hinge pins. The vertically spaced apart straps **42, 44** thus serve to add further rigidity to the front panel **30**, but primarily serve as a part of the guiding or clamping means for the two rows **52, 54** of adjustable elongated loop members **55** forming the screen or barrier face of the panel **30**.

The elongate members **55** comprise loops of approximately one-fourth inch diameter cold rolled steel rods, each loop **55** having a curved end portion **56** and an elongated pair of parallel legs **58** dimensioned to be received in equidistantly drilled holes in the upper and lower bars **38, 39**, extending beyond same and positioning the curved portions **56** adjacent one another between the straps **42, 44**.

As seen most clearly in the sectional view of FIG. **4**, the straps **42, 44** also include vertically extending arcuate notches **59** respectively in line with the drilled holes of the upper and lower bars **38, 39** and further receive a plurality of clamps **60** consisting of bar segments of generally rectangular configuration having mating arcuate notches therein to conform to the legs **58** of the loops **55**. The bar segments **60** are retained in place by bolts **61** passing through the central portion thereof and threaded into the straps **42, 44** between the legs **58** of the respective loops **55**. Thus for example, it will be clear that a bolt **61** may be loosened to allow vertical adjustment of the associated loop **55** in the upper row **52**, being limited in upward adjustment by the abutment of the curved portions **56** of the loops **55** with the strap **42** and in lower adjustment by the length of the legs **58** of the loops **55**.

As seen most clearly in FIG. **2**, the upper strap **42** is located approximately midway between the upper and lower bars **38, 39** of the front panel **30**, with the lower strap **44** a relatively short distance above the lower bar **39**. The lengths of the legs **58** of the loops **55** are so dimensioned to extend beyond the upper and lower bars **38, 39** respectively when the curved portions **56** of the loops are approximately central of the straps **42, 44** and to allow the curved portions **56** of the loops to be brought to positions closely adjacent the opposite straps. It is evident also from FIG. **2** that although the drilled holes in the bottom bar **39** are substantially in alignment with the drilled holes in the upper bar **38**, the loops in the lower row **54** are offset between the loops in the upper row **52**, with the lower clamp members **60** similarly positioned to allow each loop **55**, except for end loops, to abut two opposed loops to provide a tightly closed configuration for the panel surface. It is apparent that the loops **55** could alternatively be positioned in alignment with one another with some degrading of the closing capability of the barrier guard **10** or that different configurations for the curved portions **56** in the loops could be utilized. It will be evident also that almost any configuration and size of aperture can be formed between the upper and lower rows **52, 54** of loops in the panels of the barrier guards, including a curved aperture and critical control over the width and heighth of the aperture and the elevation with respect to the point of operation **25**.

The side walls **28, 29** of the barrier guard are of almost identical configuration dimensioned to conform to the side access to the point of operation **25** and having upper and lower bars **64, 65** dimensioned by the length of the side bars **66, 67** to fit between the upper and lower bars **38, 39** of the front panel **30** when adjacent thereto. The straps **68, 69** on the side panels **28, 29** wre similarly offset with respect to the front panel straps **42, 44**, extensions thereon again forming a part

of the hinge assembly between the side and front panels. In other respects, however, the side panels **38, 29** are similar to the front panel **30** and include upper and lower rows of loops **70, 71** which are individually adjustable to form apertures between the straps **68, 69** or between the rows of loops **70, 71** themselves and portions of the press.

Support of the complete barrier guard **10** is provided by plates **72** bolted to the sides of the body of the press **11**, and each having a section of vertically oriented pipe **74** welded thereto. A somewhat longer section of pipe **75** is horizontally disposed and welded to the top bar **64** of each of the side panels **28, 29** and a steel hinge pin **76** of right angle configuration is received in the respective pipe sections **75**. A flange **78** is welded to the hinge pin **76** to seat on each vertical pipe section **74** for support of the side panels allowing pivotal movement of same. A pair of bolts **79** are threaded into the vertical pipe sections **74** and may be drawn into abutment with the hinge pins **76**, preventing rotation of the hinge pin in the pipe sections **74** and forming the locking mechanism for the side panels. Similar bolts **80** in the horizontal pipe sections **75** serve to retain the side panels against lateral movement but allow removal of same, if desired, by sliding off the hinge pins **76**.

As previously indicated, the extensions of the upper and lower bars **38, 39, 64, 65** of the side and front panels are apertured to receive the hinge rods **50, 51** to support and retain the front panel **30** in position. It will be apparent in this construction that the front panel **30** may be swung either right or left upon removal of one of the hinge pins **50, 51**. Preferably one hinge rod **51** is secured in place by means of a cotter pin **81**, with the other rod **50** removable to gain access to the operating area **25**. In this arrangement of the invention an electrical contact making device **82** is mounted on the inside of the panel **29** adapted for abutment by the front panel **30** when the latter is in the completely closed condition to establish an electrical circuit and assure that the press clutch is operable only in such condition, such interlock devices being well understood in the art. The device **82** includes a bolt **84** mounted on the front panel **30** and engageable with a plunger **85** loaded by a spring **86**, to move the plunger **85** and make an electrical circuit via wires **88**. Similarly, a pair of microswitches **89** are located on the body of the press **11** adapted for abutment and actuation by the side bars **66** of the side panels **28, 29** to establish an electrical circuit only when the side panels **28, 29** are in the fully closed position.

Referring again to FIG. **1**, it is clear then that apertures may be provided not only between the strap members **42, 44** of the front panel **30** and between the straps **68, 69** of the side panels **28, 29**, but also that apertures can be provided between the legs **58** of any of the loops and portions of the press structure itself. Thus as seen in FIG. **1** a central group of loops **90** in both rows of loops **70, 71** in side panel **29** is elevated to establish the aperture **31** to the point of operation **25**, in this instance between the ends of the legs of the loops in the lower row of loops **71** and the edge of the bolster **18** of the press.

Similar openings can be formed in other area of the barrier guard **10** and different dimensions for panels **28–30** can be utilized for specialized forms of presses. However, it is apparent that great versatility is afforded by the apparatus of the instant invention and that a single configuration of barrier guard **10** is adaptable to many types of jobs or press configurations and that superior safety features can be realized. An example on this last order would be a straight side press in which only the front is open for insertion and removal of the material being processed.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An adjustable barrier guard for mechanical power presses and the like, comprising a frame, barrier means supported on said frame to form a protective enclosure for a side of the press and providing at least one limited access opening therein, said barrier means including multiple vertical members individually adjustable relative to the frame in upper and lower series movable by such adjustment toward and away from each other to locate and determine the size and configuration of the access opening or openings within said frame.

2. A guard as set forth in claim **1**, wherein said frame is provided with means for pivotally mounting the same on said press for swinging movement relative to the operating area thereof, and further including means for locking said frame in closed condition.

3. A guard as set forth in claim **2**, wherein said frame forms one side of a cage enclosing the machining area of the press, second and third similarly formed frames are provided with means for pivotal mounting to the press frame to swing between open and closed positions relative thereto.

4. A guard as set forth in claim **3**, wherein said first frame is pivoted and lockable in closed condition to one of the second and third frames, with the former at the front and the latter at the respective sides of the press operating area.

5. A guard as set forth in claim **1**, wherein said vertical members comprise loops of rigid material slidably mounted and lockable in said frame, the loops of said first series being offset with respect to and facing the loops of said second series of said frame.

6. A guard as set forth in claim **4**, wherein each said frame comprises a generally rectangular structure having upper and lower straps spanning the same, with said vertical members thereof being guided in said straps, and clamping means for respectively engaging the upper and lower series thereof for locking the same releasably in vertically adjusted positioning at intermediate elevations within the frame.

7. A guard as set forth in claim **1**, wherein said frame comprises a generally rectangular structure having upper and lower straps spanning said structure, with said vertical members being guided in said straps, and clamping means for respectively engaging the upper and lower series for locking the same releasably in vertically adjusted positioning at intermediate elevations within the frame.

8. A guard as set forth in claim **7**, wherein said vertical members comprise loops of rigid material slidably mounted and lockable in said frame, the loops of said first series being offset with respect to and facing the loops of said second series.

9. A guard as set forth in claim **8**, wherein said frame comprises a generally rectangular structure having upper and lower straps spanning said structure, with said vertical members being guided in said straps, and clamping means for respectively engaging the upper and lower series for locking the same releasably in vertically adjusted positioning at intermediate elevations within the frame.

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