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Scott et al.

[11] **3,805,658**

[45] **Apr. 23, 1974**

[54] **PUNCH PRESS WITH SAFETY DOOR**

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[73] Assignee: **W. A. Whitney Corp.**, Rockford, Ill.

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[21] Appl. No.: **274,391**

[52] **U.S. Cl.** **83/545**, 83/571, 83/DIG. 1, 100/53, 192/134, 192/135

[51] **Int. Cl.** **B26d 7/24**

[58] **Field of Search** ..... 83/58, 68, 544, 545, 571, 83/572, DIG. 1, 573; 100/53; 192/134, 135

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Primary Examiner—Frank T. Yost

Attorney, Agent, or Firm—Wolfe, Hubbard, Leydig, Voit & Osann, Ltd.

[57] **ABSTRACT**

The punch is surrounded by a tubular housing carrying a stripper plate and having a hinged door which is latched closed unless the punch is retracted to a tool change position. In addition, means sense the position of the door and prevent automatic cycling of the punch if the door is not closed. To adjust the stripper plate vertically, provision is made of compactly nested threaded rings and, to orient the punch angularly, provision is made of an adjusting mechanism which acts on a rod projecting from the upper end of a hydraulic cylinder and connected to a downwardly projecting ram for reciprocating the punch.

10 Claims, 8 Drawing Figures

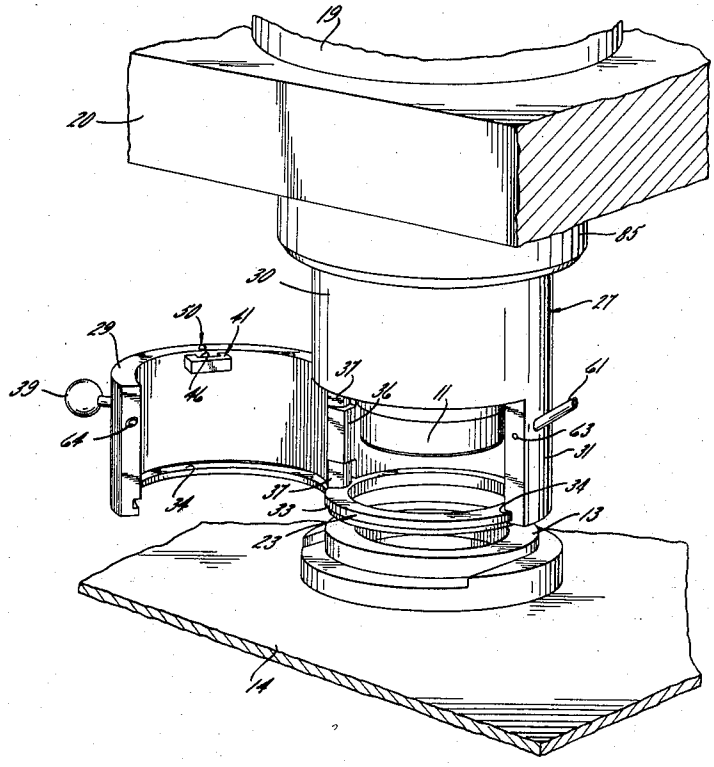


Fig. 1

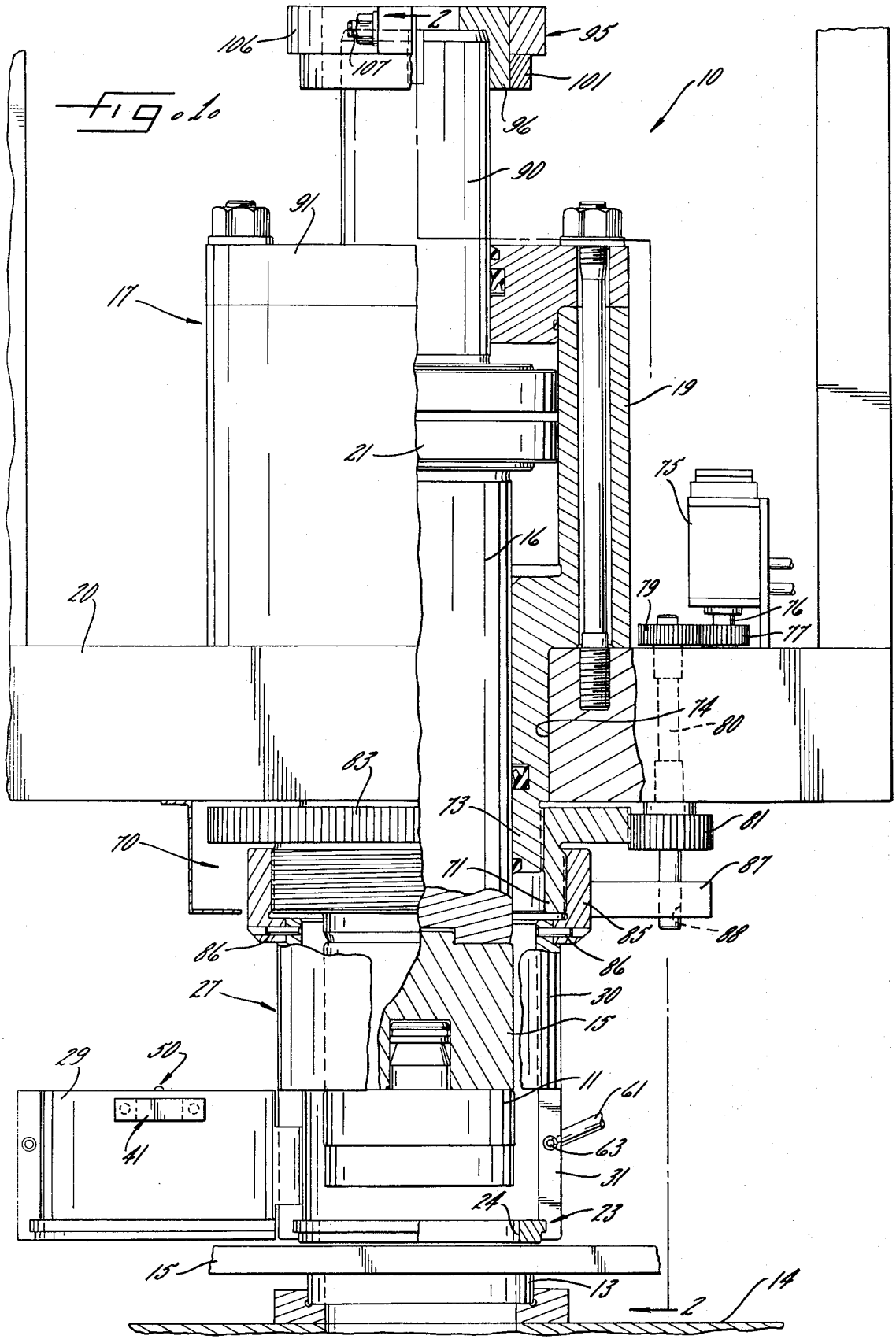

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Fig. 2a

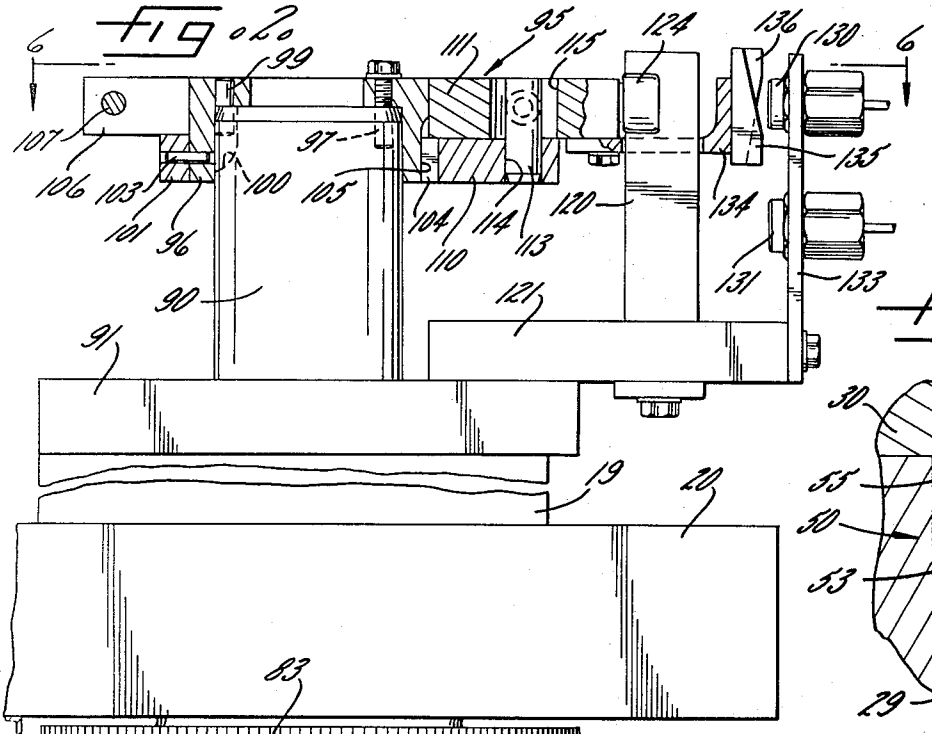


Fig. 2a

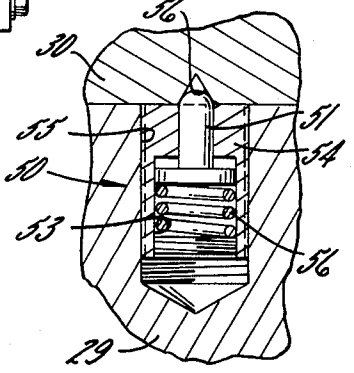


Fig. 3

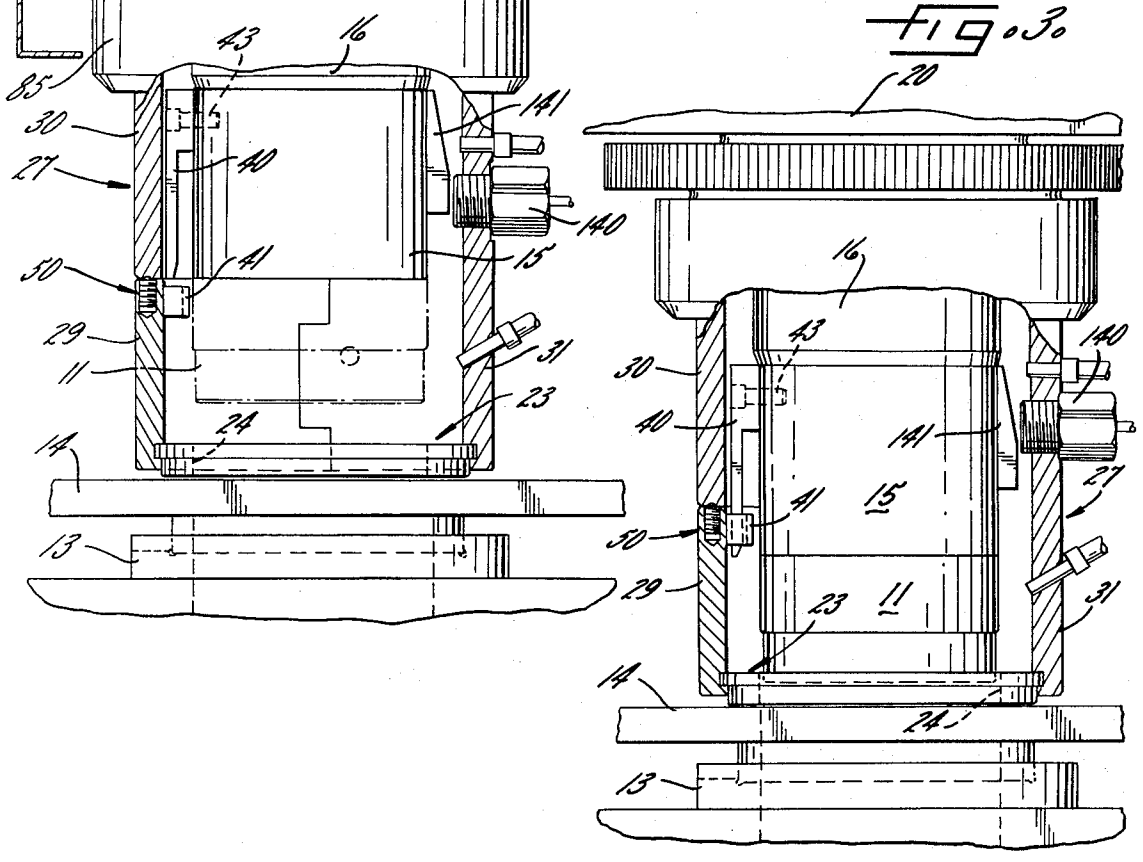


FIG. 4

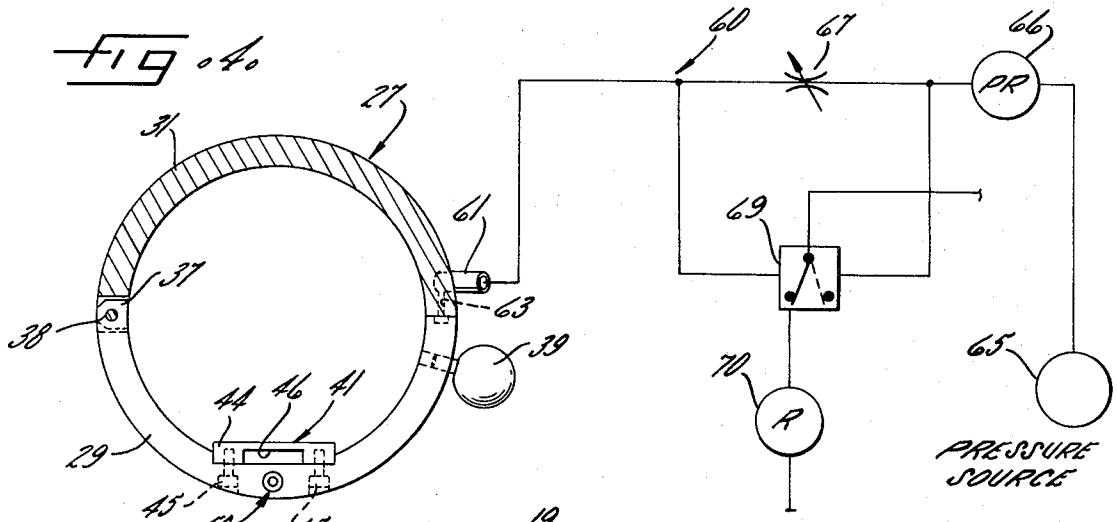
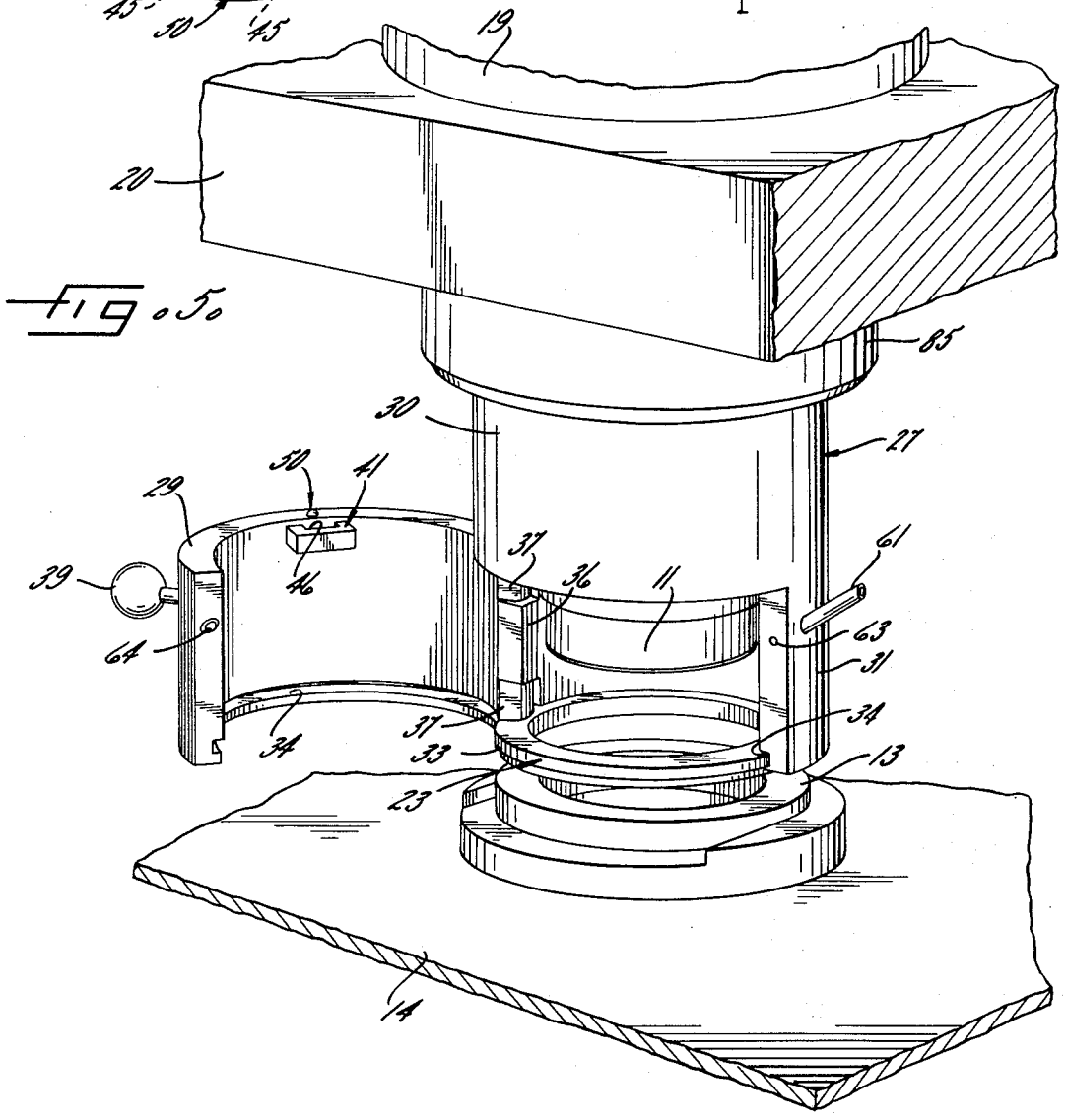

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PRESSURE SOURCE

FIG. 5


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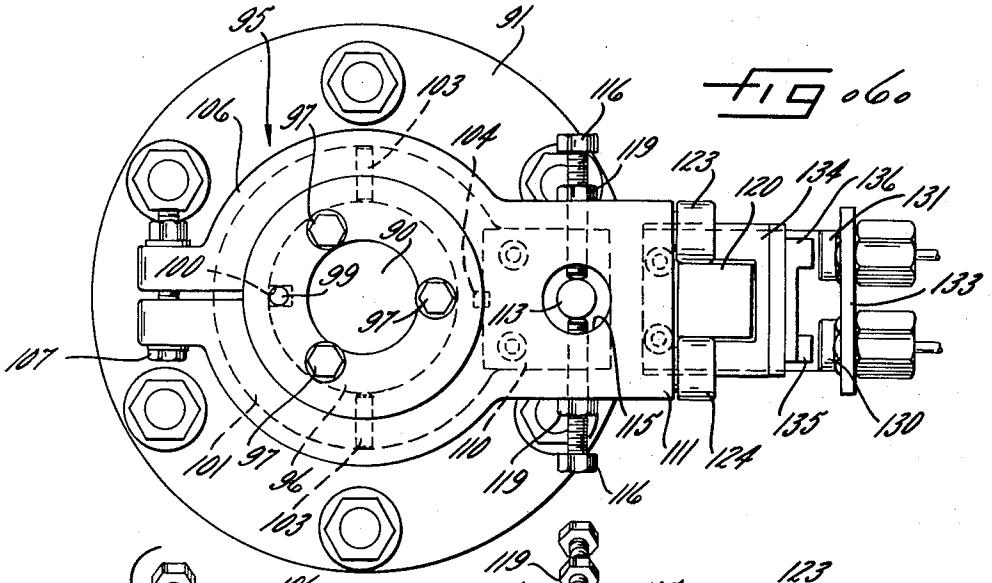

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Fig. 6

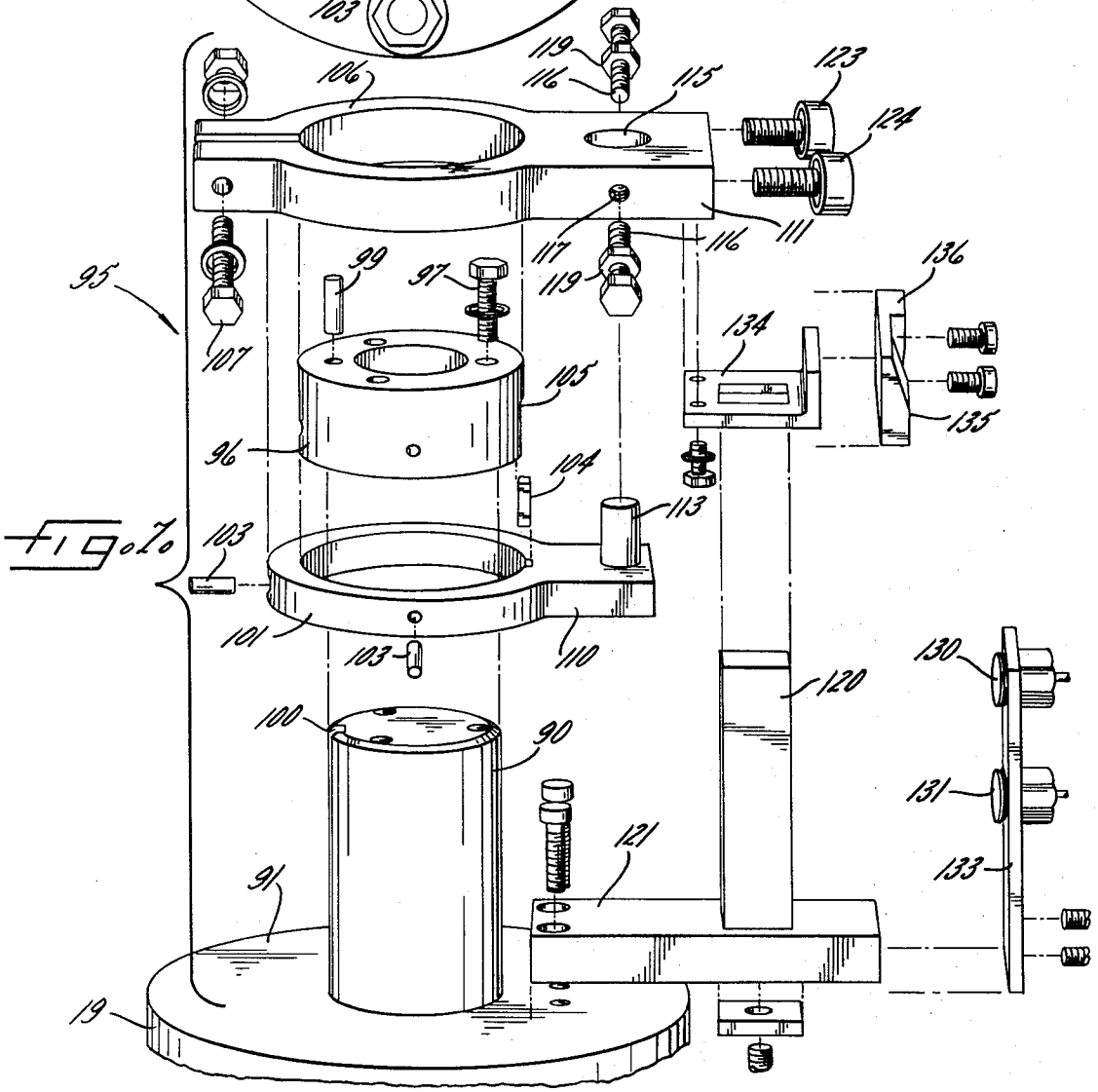

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Fig. 7

PUNCH PRESS WITH SAFETY DOOR

BACKGROUND OF THE INVENTION

This invention relates to a punch press with a reciprocable punch which coacts with an underlying die to punch holes in an intervening workpiece. More particularly, the invention relates to a punch press of the type in which the punch is carried on the end of a ram anchored to a piston which is adapted to be reciprocated back and forth within a cylinder in response to the admission of pressure fluid alternately into opposite ends of the cylinder.

A punch press of the same general type as the present press is disclosed in Scott, U.S. Pat. No. 3,720,125. In such a press, the punch reciprocates through a stripper plate which strips the workpiece from the punch as the latter is retracted out of the newly formed hole. The stripper plate is adjustable toward and away from the die to accommodate workpieces of different thicknesses and is carried on the end of a tubular housing which extends alongside and generally encloses the punch.

SUMMARY OF THE INVENTION

One of the aims of the present invention is to provide a punch press with a new and improved stripper housing which completely surrounds the punch and prevents the press operator from gaining access to the punch unless the press is disabled in such a manner as to make it safe for the operator to insert his hands into the housing and between the punch and the stripper plate.

A more detailed object is to achieve the foregoing through the provision of a stripper housing having an access door which is latched closed during the normal punching cycle of the press and which cannot be opened until the punching cycle has been terminated and the punch has been moved to a fully retracted position.

A further object is to provide a comparatively simple latch which reciprocates with the punch and latches the door closed during the normal punching cycle and then automatically unlatches the door when the cycle is completed and the punch is held in a safely retracted position. The invention also resides in the provision of a manually releasable detent which holds the door closed until the latter becomes held by the latch at the start of the punching cycle.

Still another object is to provide relatively simple means for preventing operation of the press unless the door is closed and for automatically and immediately stopping the punching cycle in the event the door should be forced open during such cycle.

These and other objects and advantages of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary front elevation of a new and improved punch press embodying the novel features of the present invention, parts of the press being broken away and shown in section and the hinged door being shown in an open position.

FIG. 2 is a fragmentary cross-section taken substantially along the line 2—2 of FIG. 1 and showing the hinged door in a closed position.

FIG. 2A is an enlarged view of parts shown in FIG. 2.

FIG. 3 is a fragmentary view similar to FIG. 2 but showing parts in moved positions.

FIG. 4 is a radial cross-section taken through the stripper housing and diagrammatically showing a pneumatic circuit which is associated with the door.

FIG. 5 is a fragmentary perspective view of the housing and the door, the latter being shown in an open position.

FIG. 6 is a fragmentary top plan view of the press as taken along the line 6—6 of FIG. 2.

FIG. 7 is an exploded perspective view of parts shown in FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in the drawings for purposes of illustration, the invention is embodied in a punch press 10 in which a vertically reciprocable punch 11 coacts with an underlying die 13 on the main support or bed 14 of the press to punch holes in an intervening workpiece 15. The specific press which has been illustrated is numerically controlled and is particularly suitable for performing high speed nibbling operations in which the punch nibbles away successive portions of the workpiece to form a contoured hole or to shape the edge of the workpiece.

In this instance, the punch 11 is carried in a suitable punch holder 15 attached to the lower end of a vertically reciprocable rod or ram 16 which forms part of a hydraulic actuator 17 having an upright cylinder 19 anchored to a horizontal support or mounting plate 20, the latter being rigid with the bed 14 and overhanging the die 13. The upper end of the ram 16 is connected to the lower end of a piston 21 which is reciprocated upwardly and downwardly in response to pressure fluid being alternately admitted into and dumped from opposite ends of the cylinder under the control of a suitable valve (not shown).

Overlying the die 13 and disposed just above the workpiece 15 is a circular stripper plate 23 formed with a central hole 24 through which the punch 11 reciprocates during a normal punching cycle. As the punch is retracted through its upstroke, the stationary stripper plate engages the workpiece and thus strips the workpiece from the punch.

In a typical numerically controlled cycle, the punch 11 is reciprocated through several successive working strokes and moves between advanced and retracted positions during each stroke. Thus, the punch advances sufficiently far into the die 13 to nibble off a portion of the workpiece 15 and then is retracted upwardly to the position shown in FIG. 3 in which the extreme lower end of the punch is disposed within the opening 24 in the stripper plate 23. After the workpiece has been repositioned, the punch is again advanced downwardly through the stripper plate and into the workpiece. Upon the completion of a given nibbling operation, it may be necessary to replace the punch, the die and the stripper plate with tooling of a different size or shape before proceeding to perform the next operation. When the tooling is to be changed at the end of an operation, the numerical control automatically termi-

nates the normal working stroke at the proper time and causes the ram **16** to retract the punch upwardly beyond its normal retracted position (FIG. **3**) and to stop the punch in an upper tool change position shown in FIGS. **1** and **2**. When raised to the latter position, the punch may be removed easily from the punch holder **15** by the press operator and the ram **16** cannot be reciprocated in an automatic cycle until the operator manually re-starts the numerical control.

In accordance with an important aspect of the present invention, the stripper plate **23** is mounted on the lower end of a tubular housing **27** which completely encloses the punch **11** and the ram **16** and which includes an access door **29** that cannot be opened until the punch is retracted to its upper tool change position and it is safe for the press operator to place his hands in the housing. As long as the punch is being reciprocated through its normal working stroke or is stopped out of its tool change position, the door is latched closed and cannot be opened either intentionally or inadvertently by the operator. When the punch is retracted to its tool change position, the door is automatically unlatched and may be opened for purposes of changing the punch and the stripper plate **23**. Accordingly, the housing **27** of the present invention protects the operator from injury and yet enables the operator to gain easy access to the punch when safe conditions prevail.

More particularly, the tubular housing **27** is of circular cross-section and is connected at its upper end to the lower end of the cylinder **19** in a manner to be described subsequently. In addition to the door section **29**, the housing includes a fixed section defined by an upper cylinder **30** (see FIG. **5**) and by a lower half cylinder **31** located directly beneath the cylinder and opening toward the front of the press **10**. The door **29** also is shaped as a half cylinder and is hinged to one edge portion of the half cylinder **31**. When the door is closed, its free edge mates with and engages the opposite edge of the half cylinder **31** and the housing thus defines a complete cylinder from its top to its bottom.

The stripper plate **23** projects just below the lower edge of the housing **27** and is formed on its upper side with a radially extending flange **33** (FIG. **5**) which fits snugly but releasably into a complementary groove **34** formed around the inner side of the door **29** and the half cylinder **31**. When opened, the door pulls away from the stripper plate and the latter then may be removed easily from the housing **27** simply by pulling the plate radially out of the half cylinder **31**.

To mount the door **29** for hinging on the half cylinder **31**, a large ear **36** (FIG. **5**) is formed along one edge portion of the half cylinder and fits between a pair of vertically spaced smaller ears **37** formed on the adjacent edge portion of the door. A vertical hinge pin **38** (FIG. **4**) extends through holes in the ears and is threaded at its upper end into the lower edge of the cylinder **30**. The door thus swings about the pin in moving between its open and closed positions. To facilitate opening and closing of the door, a handle **39** is secured to the edge portion of the door opposite the hinge.

In carrying out the invention, a latch **40** (FIGS. **2** and **3**) reciprocates with the punch **11** and coacts with a strike **41** on the inner side of the door **29** to latch the latter closed unless the punch is in its tool change position shown in FIG. **2**. Herein, the latch comprises an elongated finger secured to one side of the punch holder **15** by screws **43** and projecting downwardly alongside the punch holder, the finger **40** being spaced radially outwardly from the holder with its lower end located in the same plane as the lower surface of the holder. The strike **41** is located near the upper end of the door and midway between the side edges thereof and comprises a block **44** (FIG. **4**) fastened to the door by screws **45** and formed with an upwardly opening hole **46** for slidably receiving the latch finger **40**.

When the punch **11** is retracted upwardly to its tool change position, the latch finger **40** is spaced above the strike **41** as shown in FIG. **2** and thus the door **29** can be swung open about the hinge pin **38** to enable the operator to gain access to the punch and the stripper plate **23**. When the door is closed and the punch is advanced downwardly from its tool change position, the latch finger **40** telescopes into the hole **46** in the strike and prevents the door from being opened. The latch finger remains telescoped with the strike even when the punch is shifted upwardly to its normally retracted position (see FIG. **3**) during the working stroke and thus the operator cannot open the door while the punch is reciprocating or when the punch is in any position other than its tool change position. Accordingly, the danger of the operator being injured is substantially reduced since all of the reciprocating elements above the stripper plate **23** are enclosed and since access to the housing **27** cannot be gained until the punch is retracted to its tool change position to pull the latch finger **40** out of the strike **41**.

Advantageously, provision is made of a releasable detent **50** (FIGS. **2** and **2A**) for holding the door **29** in its closed position after the door has been shut and before the punch **11** is shifted downwardly to advance the latch finger **40** into latching engagement with the strike **41**. In this instance, the detent comprises a vertical plunger **51** (FIG. **2A**) which is fitted slidably into a chamber **53** formed in a screw **54** which is threaded into an upwardly opening hole **55** drilled in the upper edge of the door just outboard of the strike. A coil spring **56** is telescoped into the chamber **53** and urges the plunger **51** upwardly to a position in which the upper end of the plunger projects above the upper edge of the door. When the latter is in its closed position, the plunger seats releasably in a downwardly tapered hole **56** drilled in the lower edge of the cylinder **30** and serves to hold the door closed. After the latch finger **40** has been released and as the door is pulled opened by the operator, the plunger is automatically cammed out of the hole **56** and, when the door is re-closed, the plunger snaps into the hole to hold the door until the latch **40** subsequently telescopes into the strike **41**.

The invention also contemplates means for preventing automatic cycling of the punch **11** if the door **29** is not closed and also for causing the punch to stop immediately if the door should happen to swing open during a punching cycle. Herein, these means comprise a sensing system **60** (FIG. **4**.) for detecting if the door is open or closed and operable when the door is open to produce an electrical signal for disabling automatic cycling of the punch.

Specifically, the sensing system **60** includes an air conduit **61** (FIGS. **4** and **5**) extending into the side of the half-cylinder **31** and communicating with a drilled passage **63** which opens out of the free side edge of the half-cylinder **31**. When the door is closed, the end of the passage is blocked and sealed by a rubber pad **64**

located in a hole drilled in the corresponding side edge of the door **29.**

During the time the door **29** is closed, the passage **63** is pressurized to a predetermined pressure with air introduced into the conduit **61** from a compressed air source **65** (FIG. **4**), the air flowing through a pressure regulator **66** and an adjustable needle valve **67** before flowing into the passage. As long as the passage is blocked by the closed door **29,** there is virtually no flow of air through the needle valve and thus there is little if any pressure drop across the valve. When the door is opened, however, the air escapes rapidly from the portion of the conduit **61** downstream of the needle valve and causes a much faster flow of air through the needle valve from the upstream portion of the conduit so as to create a larger pressure drop across the valve. A differential pressure switch **69** is connected in parallel with the needle valve and triggers from the position shown in full in FIG. **4** to the position shown in phantom when the differential pressure across the valve increases to a predetermined level as a result of the increased flow of air through the conduit. Upon triggering, the switch de-energizes a relay **70** which is connected into the control circuit of the press **10** and which is effective when de-energized to prevent automatic cycling of the punch **11** from its tool change position. If the relay is de-energized while the press is in a working cycle, the punch is automatically stopped and the press is shut down.

Accordingly, the relay **70** is de-energized whenever the door **29** is open and thus prevents automatic cycling of the punch **11** until the door is closed to aline the strike **41** with the latch finger **40.** Should the strike break or pull loose from the door during the punching operation, the punch **11** will be immediately stopped if the door flies open and causes de-energization of the relay.

In addition to guarding the safety of the press operator, the latch **40** and the sensing system **60** help prevent damage to the press **10.** In most instances, the sheet metal workpiece **14** is bowed or buckled to some extent and, upon being re-positioned beneath the punch **11,** pushes upwardly and laterally against the stripper plate **23** and tends to force the door **29** open. The latch keeps the door tightly closed and thus holds the stripper plate in its proper position so that the plate will not be shifted laterally and struck by the punch when the latter is advanced downwardly. If the latch or the strike **41** should fail and the door forced open during re-positioning of the workpiece, the sensing system **60** will stop automatic cycling of the machine and prevent downward shifting of the punch. Thus, there is little danger of the punch striking and jamming against the stripper plate **23.**

Extremely vertically compact mechanism **70** (FIG. **1**) is provided beneath the cylinder mounting plate **20** for adjusting the stripper housing **27** upwardly and downwardly so as to enable vertical adjustment of the stripper plate **23** to accommodate workpieces of different thicknesses between the stripper plate and the die **13.** As shown in FIG. **1,** the adjusting mechanism **70** comprises an inner ring **71** which is telescoped over the lower end portion of a cylindrical, sleeve-like nose **73** formed integrally with and depending from the cylinder **19.** The nose projects downwardly through a hole **74** in the cylinder mounting plate **20** and slidably receives the ram **16** to help guide and rigidly support the latter during reciprocation of the punch **11.**

The inner ring **71** is internally threaded with threads of one hand and is externally threaded with threads of equal pitch but of the opposite hand, the ring being threaded onto the cylinder nose **73** so as to move upwardly and downwardly on the nose when rotated. Rotation of the ring in this particular instance is effected by a reversible rotary fluid motor **75** (FIG. **1**) which is advantageously supported above the cylinder mounting plate **20** and whose drive shaft **76** carries a pinion **77** positioned to mesh with a second pinion **79** on the upper end of an upright shaft **80** projecting downwardly through the cylinder mounting plate **20.** A gear **81** is fastened to the shaft **80** immediately below the cylinder mounting plate and meshes with gear teeth **83** formed around the outer periphery of the ring **71** just above the external threads thereon. Thus, when the motor **75** is energized, the shaft **80** is rotated to turn the ring **71** and cause the latter to thread upwardly and downwardly on the cylinder nose **73.**

Threaded onto the external threads of the inner ring **71** is a non-rotatable outer ring **85** (FIG. **1**) which is connected to the stripper housing **27** by means of angularly spaced shear pins **86** (FIG. **1**) extending radially between the stripper housing and the outer ring. If the punch **11** should happen to strike the stripper plate **23** during the downstroke of the punch, the shear pins **86** will fracture to allow the housing **27** to pull loose from the outer ring **85** and, as a result, the ram **16** can complete its downstroke and the housing **27** will not be damaged by the punch jamming against the stripper plate.

To prevent rotation of the stripper housing **27** and the outer ring **85,** a radially projecting bracket **87** is attached rigidly to the outer ring and is formed with a hole **88** which slidably and rotatably receives the lower end portion of the shaft **80.** Thus, the shaft is free to rotate within the bracket but prevents turning of the outer ring **85** and permits the latter to move upwardly and downwardly.

With the foregoing arrangement, lowering of the stripper plate **23** is effected by driving the motor **75** in one direction so as to turn the inner ring **71** and cause the latter to thread downwardly on the cylinder nose **73.** The outer ring **85** and the stripper housing **27** are carried downwardly with the inner ring and, being held against rotation, the outer ring also threads downwardly on the inner ring. Accordingly, the stripper housing **27** and the stripper plate **23** are shifted downwardly through a distance which is twice as great as the downward displacement of the inner ring **71.** Upward adjustment of the stripper plate is carried out in a similar manner by driving the motor in the opposite direction to cause the rings to thread upwardly.

As a result of the two threaded rings **71** and **85,** the stripper plate **23** may be lowered through small increments and over a relatively wide range by moving the inner ring only a short distance downwardly from the cylinder mounting plate **20.** Because the outer ring **85** is threaded onto the inner ring **71,** the two rings are nested radially not only with one another but also with the cylinder nose **73** and thus the adjusting mechanism **70** is very compact in a vertical direction. Such compactness enables a reduction in the vertical distance between the die **13** and the bottom of the cylinder mounting plate **20** to permit the use of a comparatively short

ram **16.** The short ram thus is less likely to deflect laterally under the lateral forces exerted on the ram as the punch **11** impacts against the workpiece **15** during the nibbling operation and, in addition, lateral forces of smaller magnitude are transmitted back to the cylinder **19** by the ram. Accordingly, the ram itself is comparatively rigid and remains rigidly supported in the cylinder.

The rigidity of the lateral support of the ram **16** is increased still further by means of an upwardly projecting rod **90** (FIGS. **1** and **7**) which is integral with the upper end of the piston **21.** As shown in FIG. **1,** the rod **90** extends upwardly out of the upper end of the cylinder **19** and is guided for up and down sliding by a cap **91** connected to the cylinder and closing off the upper end thereof. By virtue of the rod being guided within the cap **91,** additional radial support is provided to counteract the lateral forces imposed on the ram **16** during the nibbling operation and to resist cocking of the ram and the piston **21** in the cylinder **19.**

The ram **16** is oriented and locked in a precisely predetermined angular position in the cylinder **19** by rugged and comparatively trouble-free mechanism **95** (FIGS. **2, 6** and **7**) which acts on the upwardly projecting rod **90** to orient and lock the ram. Orientation of the ram in the cylinder enables proper angular orientation of the punch **11** and, with the orienting and locking mechansim **95** acting on the rod **90** and being located above the cylinder mounting plate **20,** the area below the plate is unencumbered by the mechanism to help maintain a comparatively short vertical dimension between the plate and the die **13** so that a short ram may be used.

In this instance, the orienting and locking mechanism **95** comprises a cup-shaped collar **96** (see FIG. **7**) which is telescoped onto the upper end portion of the rod **90** and is anchored thereto by angularly spaced screws **97.** A depending pin **99** is rigid with the collar and fits tightly into a keyway **100** in the upper end of the rod to locate the collar in a precise angular position on the rod.

Telescoped over the lower end portion of the collar **96** is a ring **101** (FIG. **7**) which is fastened to the collar by radially extending pins **103** and is held in an accurately established angular position on the collar by a square key **104** fitted into a keyway **105** in the side of the collar. A split ring **106** is telescoped over the upper end portion of the collar **96** immediately above the lower ring **101** and is adapted to be clamped securely to the collar by a bolt **107.** When the bolt is loosened, the collar **96** may be turned within the split ring **106** to enable angular orientation of the rod **90** and the ram **16.**

As shown in FIGS. **2** and **7,** the lower ring **101** is formed with a radially projecting arm **110** which is disposed immediately below an arm **111** projecting radially from and formed integrally with the split ring **106.** The arm **111** is held in an angularly fixed postion and, when the split ring **106** is unclamped from the collar **96,** the arm **110** may be adjusted angularly relative to the fixed arm **111.** To enable adjustment of the arm **110,** an upright dowel **113** is press-fitted into a hole **114** (FIG. **2**) in the arm **110** and projects upwardly into an enlarged hole **115** formed in the arm **111.** Two adjusting screws **116** are threaded into radially extending holes **117** in the arm **111** and are positioned with their free ends or tips in engagement with the dowel **113.**

When the split ring **106** is unclamped, one of the adjusting screws may be loosened and the other tightened to shift the dowel **113** within the hole **115** and thereby adjust the ring **101,** the collar **96** and the rod **90** angularly relatively to the angularly fixed split ring. In this way, the ram **16** may be adjustably oriented in a proper angular position within the cylinder **19.** After the ram has been oriented, both adjusting screws **116** are tightened against the dowel **113** and are clamped in place by lock nuts **119** located between the sides of the arm **111** and the heads of the screws. The split ring **106** then is tightened by means of the bolt **107** and clamps securely against the collar **96** to prevent turning of the rod **90** and the ram **16.**

To hold the arm **106** in an angularly fixed position, a hardened post **120** (FIGS. **6** and **7**) of square cross-section is anchored to a plate **121** connected to and extending outwardly from the cylinder cap **91.** The post projects upwardly from the plate, is disposed alongside the outer end of the arm **106** and coacts with two anti-friction rollers **123** and **124** to guide the arm for up and down reciprocation with the rod **90** while preventing turning of the arm. As shown in FIG. **6,** the anti-friction rollers are journaled on the free outer end of the arm **106** and are located on opposite sides of the post **120** to ride up and down on the latter when the arm is moved upwardly and downwardly as the rod **90** is reciprocated. The rollers fit snugly against the sides of the post and thus prevent the arm **106** from turning angularly relative to the post.

With the foregoing arrangement, the rollers **123** and **124** establish a rolling connection between the arm **106** and the post **120** to avoid the use of a sliding guide connection for the arm and hence virtually eliminate the creation of heat at the connection as the rod **90** is reciprocated at rapid rates ranging upwardly to **600** strokes per minute. Because the arm **106** remains angularly stationary when the rod **90** is adjusted by the screws **116,** the rollers always remain in face-to-face contact with the sides of the square post **120** and thus always roll smoothly along the post without cocking or binding and without being subjected to excessive wear as otherwise would occur in the case of line contact between the rollers and the post. The two adjusting screws **116** are capable of shifting the rod **90** angularly through small, precise increments and thus the angular position of the rod may be accurately established to insure proper angular orientation of the punch **11.**

As mentioned above, encumbrance between the die **13** and the cylinder mounting plate **20** is reduced by locating the orienting and locking mechanism **95** above the mounting plate and by arranging the mechanism to act on the upwardly projecting rod **90.** Such encumbrance is reduced still further using the rod to actuate means for signaling the vertical position of the punch **11.** Herein, these means comprise two proximity switches **130** and **131** (FIGS. **6** and **7**) supported in vertically and horizontally spaced relation on a bracket **133** upstanding from the plate **121.** A second bracket **134** is anchored to and projects outwardly from the arm **106** and carries a pair of horizontally spaced lugs **135** and **136** which move upwardly and downwardly past the switches as the punch **11** is reciprocated. When a tool changing operation is to be performed, the lug **135** triggers the switch **130** when the punch has been shifted upwardly to its tool changing position, and the switch produces an electrical signal to stop the ram

16 with the punch in that position. When the punch has shifted downwardly into the die 13 a predetermined distance during the normal working stroke of the punch, the lug 136 triggers the switch 131 to produce a signal causing the ram to reverse directions and shift the punch upwardly.

To effect reversal of the ram 16 when the punch 11 is shifted upwardly to its normally retracted position (FIG. 3), a proximity switch 140 is supported on the upper cylinder 30 of the stripper housing 27 and is adapted to be triggered by a lug 141 which is carried on the punch holder 15. While the proximity switch 140 is carried on and adjustable vertically with the stripper housing 27 for the advantageous purpose disclosed in the aforementioned application, the switches 130 and 131 of the present punch press 10 are removed from the housing and are located above the cylinder mounting plate 20 so that the area below the plate is not encumbered by such switches.

We claim:

1. A punch press having a support, a vertically reciprocable ram on said support and normally operable to shift a punch downwardly and upwardly through a working stroke between retracted and advanced positions, said ram being selectively operable to shift the punch upwardly beyond said retracted position to a tool change position, a tubular housing mounted on said support and surrounding said punch, a stripper plate supported on the lower end of said housing and formed with a hole within which said punch reciprocates during said working stroke, said housing comprising a fixed section and a door section hinged on said fixed section to swing outwardly and inwardly relative to the latter about an upright axis between closed and open positions, a strike mounted on said door section, and a latch movable with said ram and engageable with said strike during said working stroke to hold said door section in said closed position but automatically releasable from the strike to permit outward swinging of said door section to said open position when said ram shifts said punch upwardly to said tool change position.

2. A punch press as defined in claim 1 in which said latch comprises a downwardly projecting finger movable with said ram, said strike comprising a member secured to the inner side of said door section and formed with an upwardly opening hole for slidably receiving said finger.

3. A punch press as defined in claim 1 further including means operable independently of said latch for holding said door section in said closed position and selectively releasable to permit swinging of said door section to said open position when said punch is in said tool change position.

4. A punch press as defined in claim 3 in which said means comprise a detent mounted on one of said sections and movable into latching engagement with the other section automatically as an incident to swinging of said door section to said closed position.

5. A punch press as defined in claim 4 in which said detent comprises a plunger mounted for endwise movement in said one section, a spring biasing said plunger toward the other section, and a hole in said other section for receiving said plunger when said door section is in said closed position and shaped to automatically release said plunger as said door section is swung toward said open position.

6. A punch press as defined in claim 1 further including means responsive to the position of said door section and operable to produce a signal when the door section is out of said closed position, and means responsive to said signal for preventing movement of said ram through said working stroke.

7. A punch press as defined in claim 6 further including a passageway in one of said sections and having an open end which is blocked by the other of said sections when said door section is in said closed position and which is unblocked when said door section is in said open position, means for introducing pressurized air into said passageway and operable to pressurize the latter to a preselected pressure level when said door section is in said closed position, and said signal producing means being operable to produce an electrical signal in response to the pressure in the passageway dropping below said level when said door section is moved to said open position and the end of the passageway is unblocked.

8. A punch press comprising a support, a reciprocable ram on said support and normally operable to shift a punch through a working stroke between and retracted and advanced positions, said ram being selectively operable to retract the punch beyond said retracted position to a tool change position, a tubular housing mounted on said support and surrounding said punch, said housing comprising a fixed section and a door section movable between open and closed positions relative to said fixed section, and means for preventing movement of said door section from said closed position at all times during said working stroke and operable to permit movement of said door section to said open position when said ram retracts said punch to said tool change position.

9. A punch press as defined in claim 8 in which said means comprises a latch reciprocable with said ram, and a strike on the inner side of said door section and telescoping with said latch during said working stroke.

10. A punch press comprising a support, a reciprocable ram on said support and normally operable in an automatic cycle to shift a punch through a working stroke between retracted and advanced positions, a tubular housing mounted on said support and surrounding said punch, said housing comprising a fixed section and a door section movable between open and closed positions relative to said fixed section, means for releasably holding said door section in said closed position, a passageway in one of said sections and having an open end which is blocked by the other of said sections when said door section is in said closed position and which is unblocked when said door section is in said open position, means for introducing pressurized air into said passageway and operable to pressurize the latter to a preselected pressure level when said door section is in said closed position, signal producing means operable to produce an electrical signal in response to the pressure in the passageway dropping below said level when said door section is moved to said open position and the end of the passageway is unblocked, and means responsive to said signal for preventing automatic cycling of said ram through said working stroke.

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