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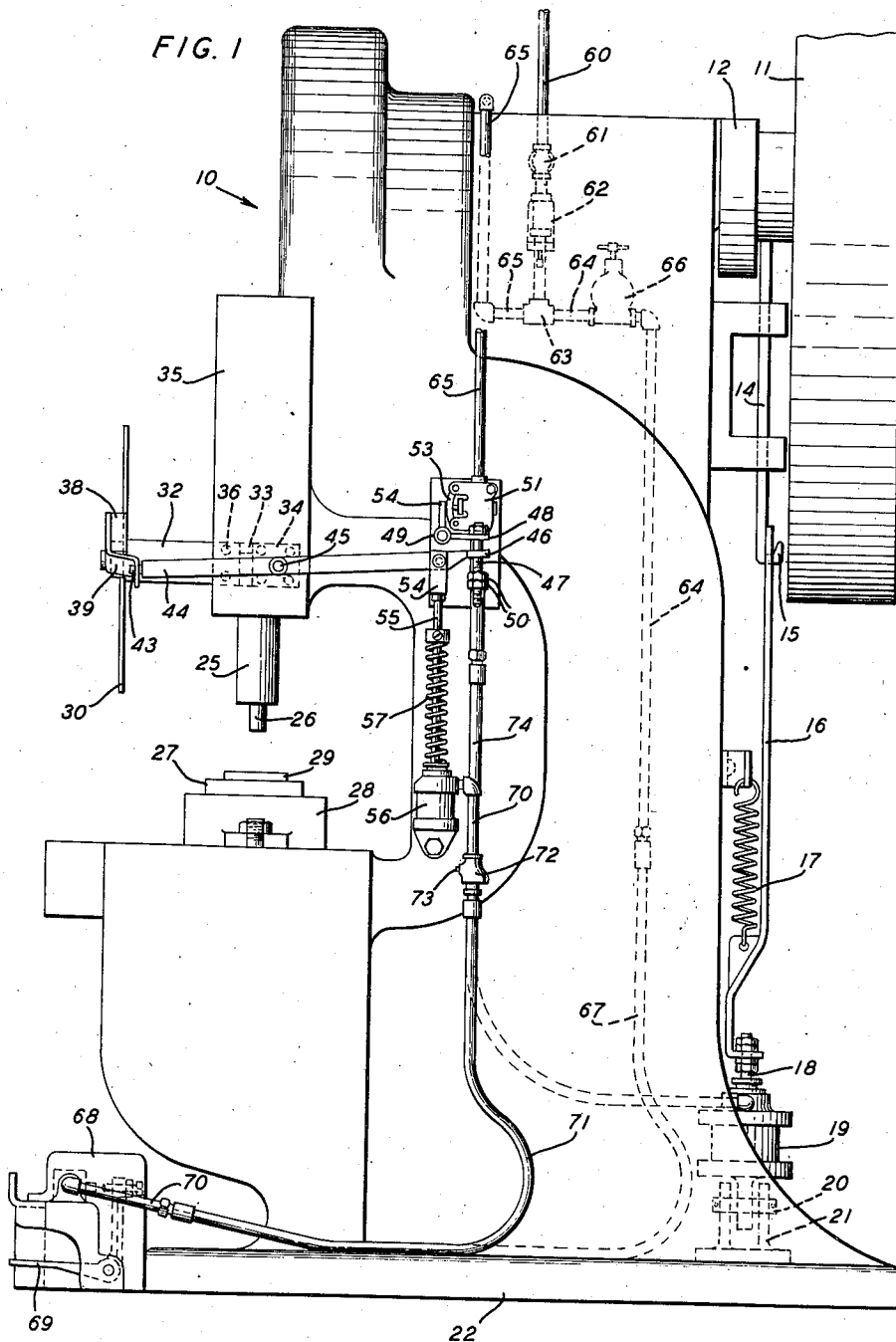
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AIR OPERATED CONTROLS FOR MACHINES

Filed Dec. 6, 1944

3 Sheets-Sheet 1



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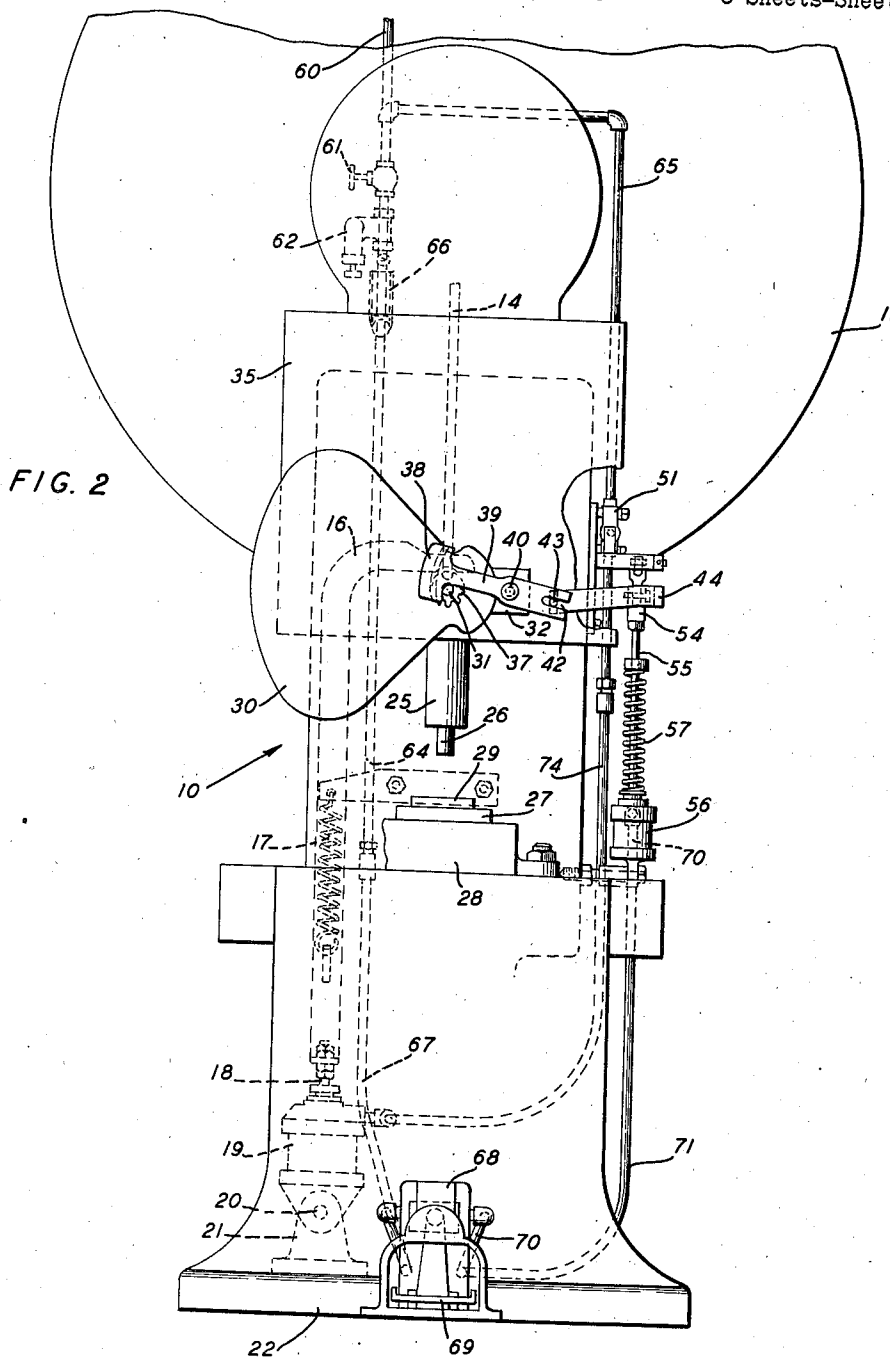
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3 Sheets-Sheet 2



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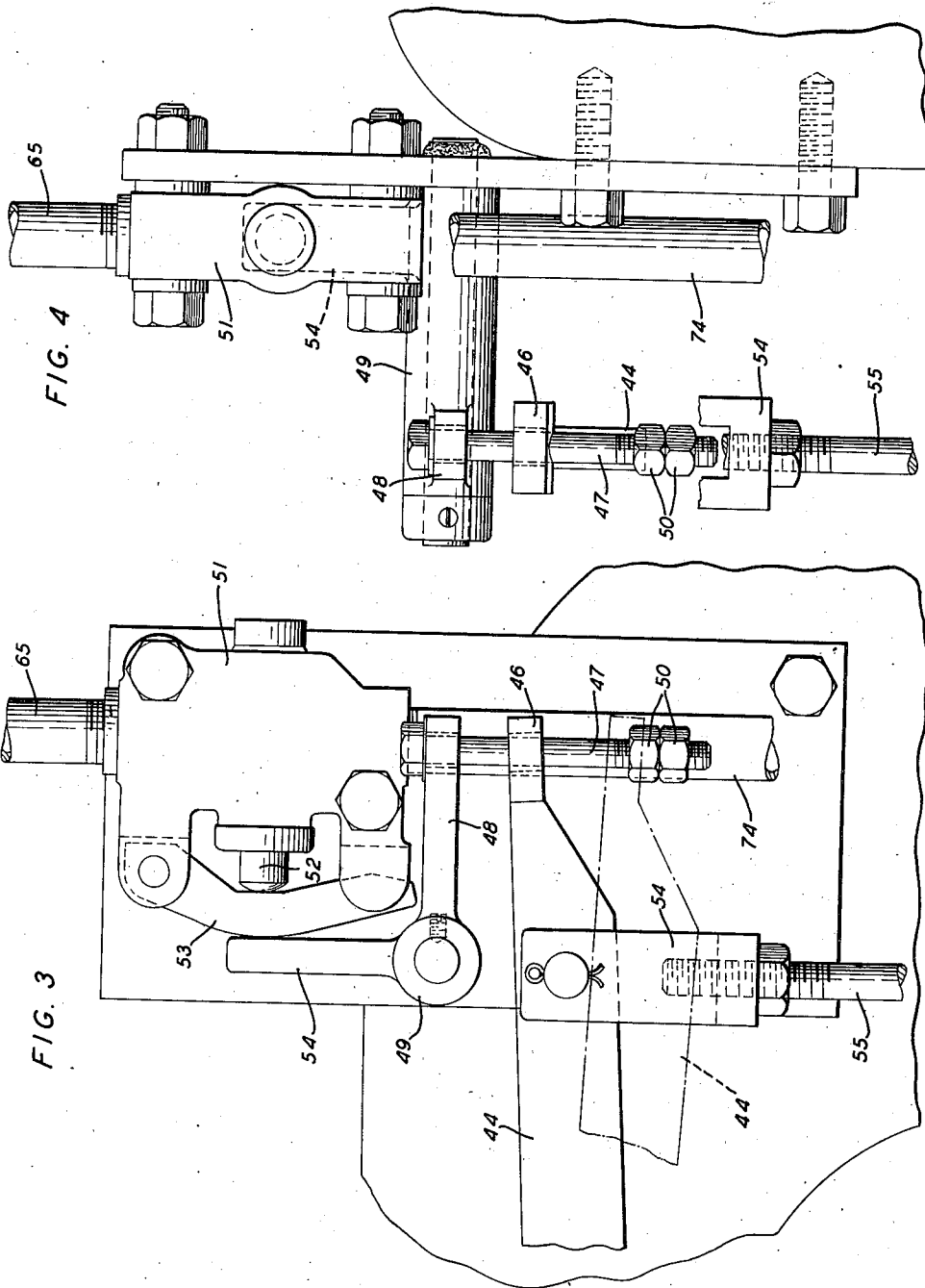
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3 Sheets-Sheet 3



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AIR OPERATED CONTROL FOR MACHINES

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8 Claims. (Cl. 192—133)

1

This invention relates to air operated controls for machines, and more particularly to air operated controls for punch presses and guards therefor.

Punch presses are frequently used for what are known as first and second operations, the first operation including the blanking of parts from a supply of material, while the second operation includes additional forming or perforating of the blanked parts. During the first operation, a guard is seldom used, particularly when a strip of material is fed automatically to the press, an operation which does not necessitate the positioning of the operator's hands close to the working area of the press. Second operations, however, make it necessary for one or both of the operator's hands to move into the working area of the press to position the blanked parts or articles for additional work thereon, and oftentimes to remove the articles from the press.

An object of the invention is to provide a control for a material working machine and a guard therefor which may be operated with a minimum of effort and which is accurate in the actuation of the guard to cover the working area of the machine prior to the operation of the machine.

With this and other objects in view, the invention comprises a control for a material working machine including a tool mounted for movement through an operating cycle into and out of a working position by a power means, a guard movable to shield the working position, a fluid control unit operable to render the power means effective, a normally closed valve in a fluid line with the unit to control the unit, an arm actuable to move the guard into the shielding location and mechanism movable by the arm to open the valve to the unit as the guard reaches approximately the shielding location.

Other objects and advantages will be apparent from the following detailed description when considered in conjunction with the accompanying drawings, wherein

Fig. 1 is a side elevational view of a material working machine and guard therefor illustrating the control mechanism;

Fig. 2 is a front elevational view of the structure shown in Fig. 1;

Fig. 3 is an enlarged fragmentary side elevational view of a portion of the control mechanism, and

Fig. 4 is a fragmentary side elevational view of the structure shown in Fig. 3.

Referring now to the drawings, it will be noted that the material working machine selected to

2

illustrate the invention is a punch press indicated generally at 10 and including the conventional driving means (not shown) for rotating its drive shaft upon which a flywheel 11 is mounted. The conventional clutch mechanism is indicated at 12 and is of the one revolution type, normally in its inoperative position. The clutch 12 is operated through the downward movement of a pull rod 14 operatively connected at its upper end in a suitable manner (not shown) to the operating portions of the clutch, its lower end being connected at 15 to an element 16. The element 16 is normally urged upwardly through the force of a spring 17 to normally cause the clutch 12 to be in its inoperative position. The lower end of the element 16 is adjustably secured to a piston rod 18 of an air cylinder unit 19, the latter being pivotally supported at 20 by a bracket 21, the latter being mounted upon a base 22 of the press.

It is not believed necessary to describe the inner workings of the press, it being understood that operation of the one revolution clutch 12 will connect the driving means, including the flywheel 11, with a tool support 25 to move the latter, with a selected tool 26 mounted therein, through a complete cycle of operation from its upper position, through the material working portion of its cycle and back to its normal or upper position. A die 27, carried by a die block 28, is positioned beneath the tool 26 to cooperate therewith when a material or article 29 is fed to the die. The area, where work is performed upon the material or article through the aid of the tool or punch 26 and the die 27, may be called the working position of the machine. It is this position that is to be guarded to assure the removal of the operator's hand prior to the beginning of the operating cycle of the machine.

The guard is of the type shown in Patent Number 1,043,876 to F. C. Spencer of November 12, 1912. In other words, the guard 30 is pivotally supported at 31 upon a bracket 32. The bracket 32 is in the form of a hinge with a pivotal joint 33 and includes a portion 34 fixed to the head 35 of the machine, the other portion conditioned to be fixed, through the aid of screws 36 or other suitable means, to the head 35 to hold the guard in position to guard the working area of the machine and to also condition the guard for movement away from the working area to condition the machine for the conventional first operation work, if so desired.

The pivotal support or spindle 31 for the guard, has a pinion 37 fixed thereto and to the guard so that they will all move in unison about the axis

of the spindle. A rack 38, carried by the lever 39, interengages the pinion 37 and serves to rotate the pinion to move the guard into and out of its shielding position when the lever 39 is rotated about its pivot 40. The pivot 40 is supported at a fixed position on the bracket 32. The end of the lever 39, opposite that of the rack 38, is forked as at 42 to straddle a pin-like portion 43 of a lever arm 44. This connection between the lever 39 and the lever arm 44 assures operation of the guard when the latter is in its operating position and conditions the guard so that it may be rearwardly moved into its inoperative position when the bracket 32 is conditioned to swing the guard to one side of the machine.

The lever arm 44 is pivotally supported at 45 and extends rearwardly to a position where its apertured end 46 receives an element 47. The element 47 is in the form of a bolt carried by an arm 48 of a bell crank lever 49, the lower threaded portion of the element 47 carrying threaded members or nuts 50 which are adjustable on the element to vary the interval of time in which a valve 51 is actuated after the guard 30 has moved toward its shielding position. The valve 51 is of the normally closed three-way type including a plunger 52 engaged by a cam lever 53, the latter being engaged by the other arm 54 of the bell crank lever 49. Through the aid of a yoke 54 pivotally connected to the lever arm 44 adjacent its rearmost end, a piston rod 55 of an air cylinder 56 is operatively connected to the lever arm. The force of a spring 57 normally urges the piston rod 55 upwardly and constitutes the means to return the guard 30 to its normal position, as shown in Figs. 1 and 2.

A main airline 60 supplies air under pressure for the control system. The air in this supply line passes through a shut-off valve 61 and a filter 62 to a point 63 where the supply line meets air lines 64 and 65. A pressure regulator valve 66 is disposed in the air line 64 for use in regulating the pressure of the air used in the control system. A flexible air hose 67, coupled with the air line 65, extends to a foot valve 68, the latter being normally closed three-way type operated into open position through the actuation of a treadle 69. An air line 70 leading from the valve 68 to the top of the air cylinder 56 includes a flexible hose or air line 71 and a speed control unit 72. The speed control unit is variable through the adjustment of a threaded element 73 to vary the speed of travel of the fluid and thus vary the speed of movement of the guard into its shielding position.

Returning now to the air line 65, it will be noted that this air line extends from one side of the machine, over the top thereof and down the other side of the machine to the valve 51. An air line 74 leads from the valve 51 to the air cylinder 19. It should be understood that both air cylinders 19 and 56 are provided with suitable exhaust ports, in their lower portions, so that their inner structures or pistons may be moved downwardly by the admission of air under pressure into the upper portions of the cylinders. It should also be understood that the pistons may be returned to their upper positions by their respective springs 17 and 57, through the provision of normally open exhausts in the valves 51 and 68 for the fluid lines 74 and 70 respectively.

Considering now the operation of the machine and the air operated control therefor, let it be assumed that the article 29 has been placed upon the die 27 to condition the machine for opera-

tion thereon. The operator may then actuate the valve 68 by applying downward pressure upon the treadle 69 to open the valve for the passage of air under pressure to the air cylinder 56 to cause downward movement of the piston rod 55 and clockwise rotation of the lever arm 44. This movement imparted to the lever arm 44 will cause counterclockwise rotation of the lever 39 (Fig. 2) causing the rack 38 to rotate the pinion 37 and with it the guard 30, from the normal position shown, to a position shielding the working area of the machine. If the operator's hand should be disposed across the path of the guard, either one of two things will happen; one, the movement of the operator's hand free of the working area, or two, the stopping of the guard prior to the actuation of the valve 51.

Just before the guard 30 reaches its lowermost position, through the actuation of the lever arm 44, the portion 46 of the latter will move into engagement with the threaded members 50, causing downward movement of the element 47, rocking the bell crank lever 49 about its pivot and opening of the valve 51 through movement of the cam lever 53 and the plunger 52. At this time, the exhaust of the valve is closed and air under pressure is admitted to the air line 74 and through it, to the air cylinder 19, to cause downward movement of the member 16 and the pull rod 14, to release the clutch 12 and thus start one operating cycle of the machine. During this operating cycle, the tool holder 25 with the tool 26, is moved downwardly to cooperate with the die 27 in performing work upon the article.

After the operating cycle has been completed, the guard will be returned to its normal position by the spring 57, it being assumed that the operator will release the pressure on the treadle 69 shortly after its actuation. The control mechanism resets itself through the constant forces in the springs 17 and 57. Through the variations in the positions of the threaded members 50 upon the element 47, the time interval for the actuation of the valve 51 during the downward swinging movement of the guard may be varied.

It will be observed that to condition the machine for what is commonly known as first operation work, wherein the guard is not needed, the guard may be moved into an inoperative position without affecting the control mechanism. With the guard in its inoperative position, brought about through the removal of the machine screws 36 and the swinging of the guard about the hinged portion of the bracket 32, the lever arm 44 will continue to cause actuation of the bell crank lever 49 to open the valve 51 after operation of the foot valve 68 to admit air to the air cylinder 56. Furthermore, during the time when the guard is in its inoperative position, there remains no mechanism which would obstruct the vision of the operator from viewing the performance of the machine during the blanking of articles from material. All that remains of the guard actuating mechanism which projects forwardly of the machine, is the lever arm 44 and this is positioned above the working area of the machine.

Although specific improvements of the invention have been shown and described, it will be understood that they are but illustrative and that various modifications may be made therein without departing from the scope and spirit of this invention as defined by the appended claims.

What is claimed is:

1. A control mechanism for a machine having a material working tool mounted for movement

5

through an operating cycle into and out of a working position, clutch controlled power means to move the tool through the operating cycle, and a guard supported by the machine and movable to shield an area adjacent the working position, a control mechanism comprising a lever arm to move the guard to shield the area, a fluid controlled unit operable to actuate the clutch to render the power means effective, a fluid line, a normally closed valve in the fluid line with the unit to control the flow of a fluid under pressure to the unit for actuating the unit when the valve is opened, means to actuate the lever arm, and a mechanism movable by the lever arm to open the valve, whereby the unit will render the power means effective as the guard reaches approximately the area to be shielded.

2. A control mechanism for a machine having a material working tool mounted for movement through an operating cycle into and out of a working position, clutch controlled power means to move the tool through the operating cycle, and a guard supported by the machine and movable to shield an area adjacent the working position, a control mechanism comprising a lever arm to move the guard to shield the area, a fluid controlled unit operable to actuate the clutch to render the power means effective, a fluid line, a normally closed valve in the fluid line with the unit to control the flow of a fluid under pressure to the unit for actuating the unit when the valve is opened, means to actuate the lever arm, an actuable element positioned to operate the valve, and a member carried by the element and positioned to be engaged by the lever arm, when the latter has moved the guard to approximately the shielding location, to actuate the element.

3. A control mechanism for a machine having a material working tool mounted for movement through an operating cycle into and out of a working position, clutch controlled power means to move the tool through the operating cycle, and a guard supported by the machine and movable to shield an area adjacent the working position, a control mechanism comprising a lever arm to move the guard to shield the area, a fluid controlled unit operable to actuate the clutch to render the power means effective, a fluid line, a normally closed valve in the fluid line with the unit to control the flow of a fluid under pressure to the unit for actuating the unit when the valve is opened, means to actuate the lever arm, an actuable element positioned to operate the valve, and variable means carried by the element and positioned to be engaged by the lever arm, when the latter has moved the guard to a selected one of various positions adjacent the shielding position, to actuate the element.

4. A control mechanism for a machine having a material working tool mounted for movement through an operating cycle into and out of a working position, clutch controlled power means to move the tool through the operating cycle, and a guard supported by the machine and movable to shield an area adjacent the working position, a control mechanism comprising a lever arm to move the guard to shield the area, a fluid controlled unit operable to actuate the clutch to render the power means effective, a fluid line, a normally closed valve in the fluid line with the unit to control the flow of a fluid under pressure to the unit for actuating the unit when the valve is opened, a fluid controlled unit to actuate the lever arm, a variable speed control in a fluid line

6

with the last mentioned unit to vary the speed of movement of the guard into its shielding location, and a mechanism movable by the lever arm to open the valve, whereby the first mentioned unit will render the power means effective as the guard reaches approximately the shielding location.

5. A control mechanism for a machine having a material working tool mounted for movement through an operating cycle into and out of a working position, clutch controlled power means to move the tool through the operating cycle, and a guard supported by the machine and movable to shield an area adjacent the working position, a control mechanism comprising a lever arm to move the guard to shield the area, a fluid controlled unit operable to actuate the clutch to render the power means effective, a fluid line, a normally closed valve in the fluid line with the unit to control the flow of a fluid under pressure to the unit for actuating the unit when the valve is opened, means to actuate the lever arm, a mechanism movable by the lever arm to open the valve, whereby the unit will render the power means effective as the guard reaches approximately the area to be shielded, and a pressure control valve disposed in the fluid line to vary the pressure of the fluid to the unit.

6. A control mechanism for a machine having a material working tool mounted for movement through an operating cycle into and out of a working position, clutch controlled power means to move the tool through the operating cycle, a guard mounted to be rocked about a pivot into and out of a location to shield an area adjacent the working position, and operable mechanism to rock the guard, the control mechanism comprising a lever arm actuable to operate the said guard rocking mechanism, a fluid controlled unit operable to actuate the clutch to render the power means effective, a fluid line, a normally closed valve in the fluid line with the unit to control the flow of a fluid under pressure to the unit for actuating the unit when the valve is opened, means to actuate the lever arm, and a mechanism movable by the lever arm to open the valve, whereby the unit will render the power means effective as the guard reaches approximately the area to be shielded.

7. A control mechanism for a machine having a material working tool mounted for movement through an operating cycle into and out of a working position, clutch controlled power means to move the tool through the operating cycle, a guard mounted to be rocked about a pivot into and out of a location to shield an area adjacent the working position, operable mechanism to rock the guard, a support for the guard and its operable mechanism, whereby the guard and its operable mechanism may be supported in an operative position in front of the machine or be moved to an inoperative position to one side thereof, the control mechanism comprising a lever arm formed for connection with the guard rocking mechanism when the latter is in its operative position to operate the said guard rocking mechanism, a fluid controlled unit operable to actuate the clutch to render the power means effective, a fluid line, a normally closed valve in the fluid line with the unit to control the flow of a fluid under pressure to the unit for actuating the unit when the valve is opened, means to actuate the lever arm, and a mechanism movable by the lever arm to open the valve, whereby the unit will render the power means effective

as the guard reaches approximately the area to be shielded.

8. A control mechanism for a machine having a material working tool mounted for movement through an operating cycle into and out of a working position, clutch controlled power means to move the tool through the operating cycle, a guard mounted to be rocked about a pivot into and out of a location to shield an area adjacent the working position, operable mechanism to rock the guard, a support for the guard and its operable mechanism, whereby the guard and its operable mechanism may be supported in an operative position in front of the machine or be moved to an inoperative position to one side thereof, the control mechanism comprising a lever arm formed for connection with the guard rocking mechanism when the latter is in its operative position to operate the said guard rocking mechanism, a fluid controlled unit operable to actuate the clutch to render the power means effective, a fluid line, a normally closed valve in the fluid line

with the unit to control the flow of a fluid under pressure to the unit for actuating the unit when the valve is opened, means to actuate the lever arm, and a mechanism movable by the lever arm to open the valve, whereby the unit will render the power means effective when the guard is in its inoperative position and will render the power means effective only when the guard nears the shielding location when the guard is in its operative position.

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