July 20, 1943. B. J. YANCHENKO 2,324,660

SAFETY CONTROL FOR RIVETING MACHINES AND THE LIKE

Filed Jan. 20, 1942 2 Sheets-Sheet 1

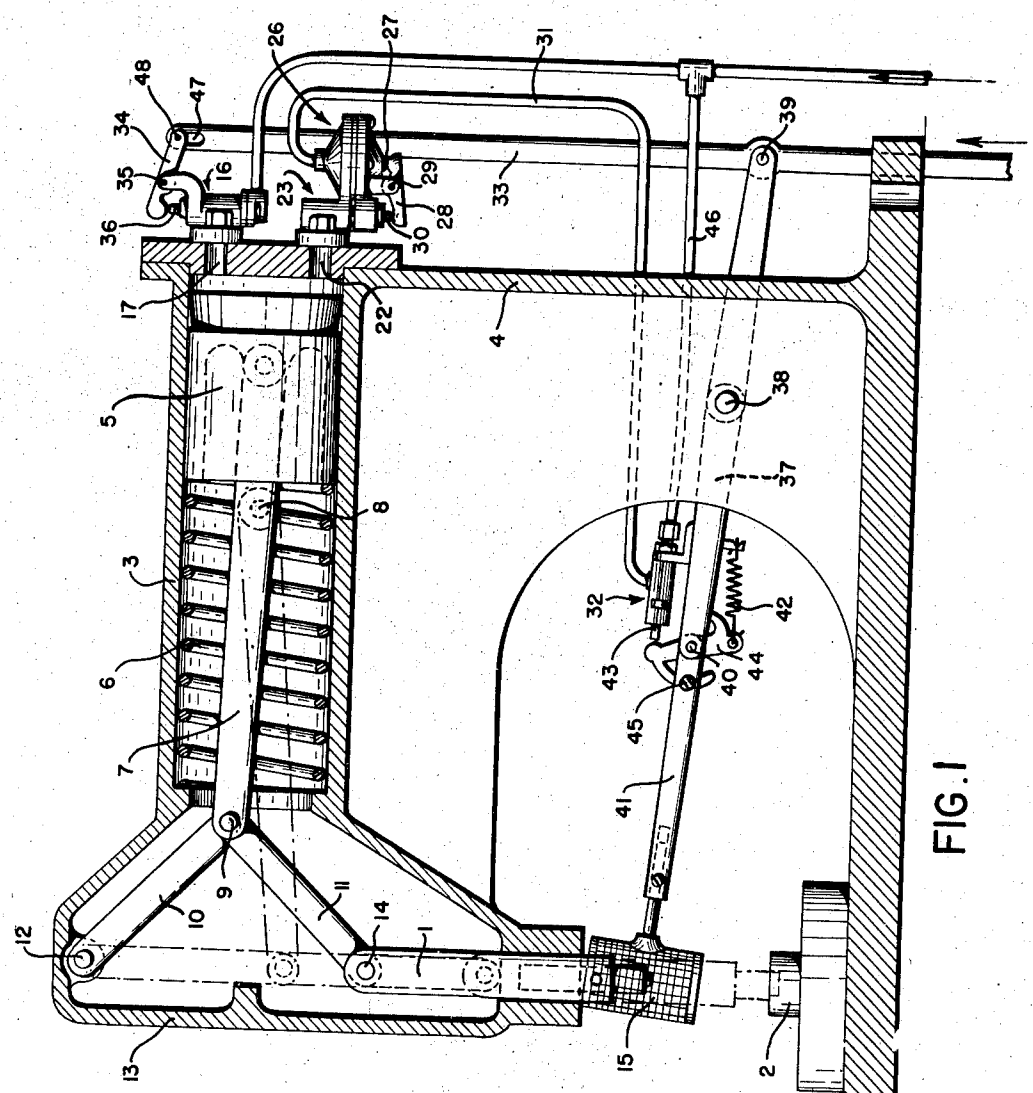

FIG. 1

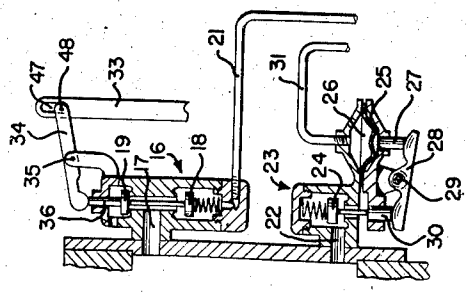

FIG. 4

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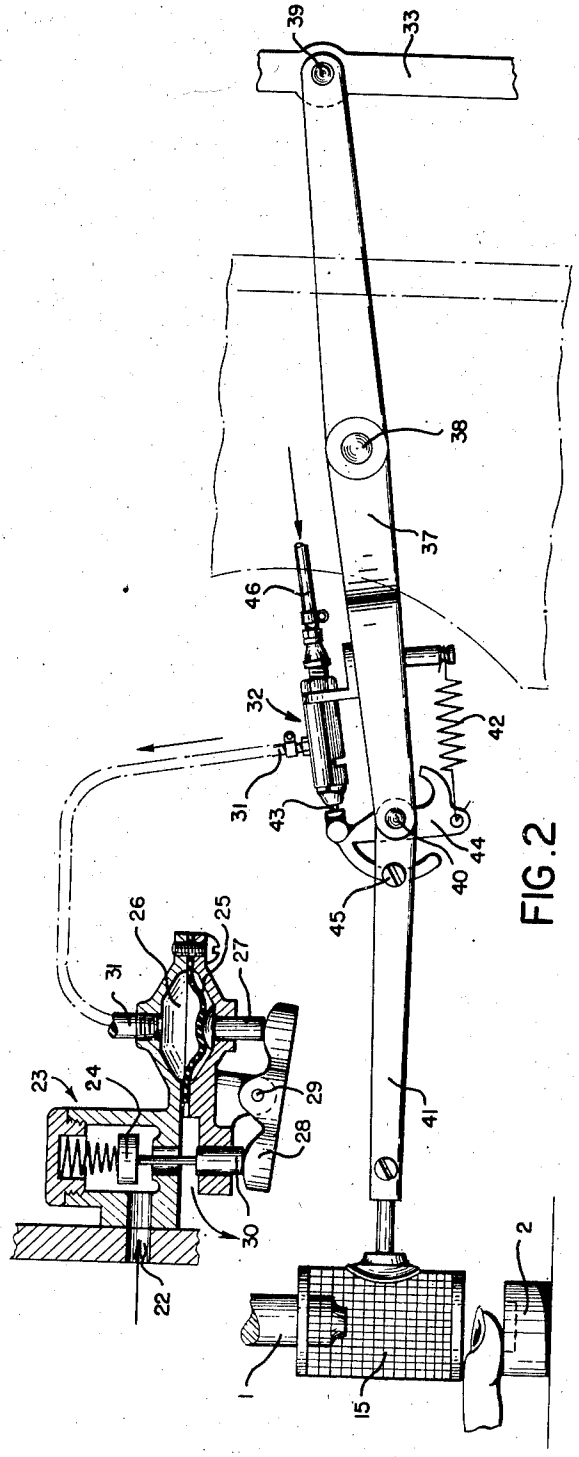

FIG. 2

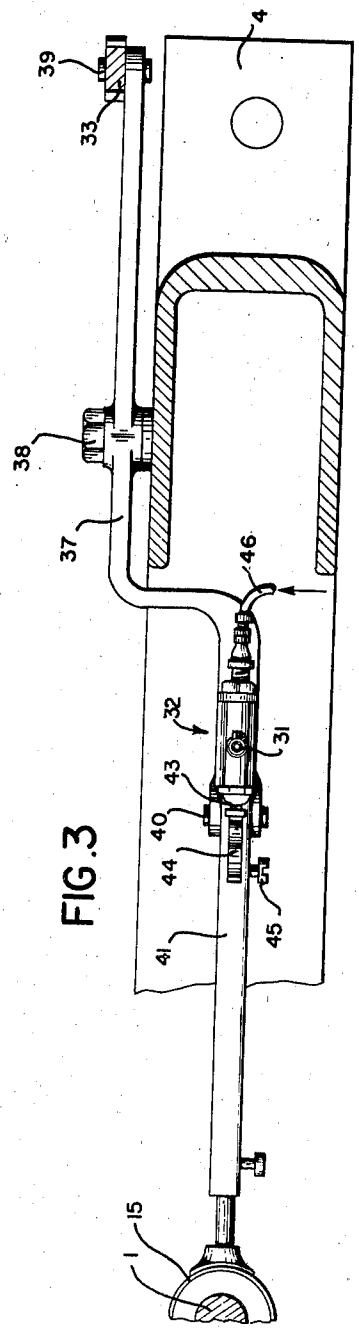

FIG. 3

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SAFETY CONTROL FOR RIVETING MACHINES AND THE LIKE

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9 Claims. (Cl. 192—133)

This invention relates to power operated machines, which have an opening and closing movement, and a guard around the operating zone of the machine operable to disable the operation of the machine, in the event the guard comes in contact with an obstruction, as the fingers of the operator. In machines of this general type embodying a guard, oftentimes the guard itself becomes a source of injury to the operator, because of the blow it imparts to the fingers of the operator.

The invention has for its object a guard mechanism in which any blow received by the operator from the guard is inconsequential but sufficient to disable the actuating mechanism of the machine.

In the illustrated embodiment of the invention, the invention is shown as applied to a pneumatic riveting machine for applying rivets, as hollow rivets and the like, to an article, as a piece of cloth, fabric, leather, etc., one rivet being applied in each operation. In such riveting operation, the operator is called upon to hold the work over the anvil of the riveting machine, and in so doing is liable to get his fingers in the range of movement of the guard.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

Figure 1 is a diagrammatic sectional view illustrative of a pnuematic riveting machine.

Figure 2 is an enlarged detail view of parts seen in Figure 1 illustrating the disabling operation, when the guard encounters an obstruction.

Figure 3 is a plan view of parts seen in Figure 2, parts being omitted.

Figure 4 (Sheet 1) is a detail view of the control valve and the pneumatically operated exhaust valve.

This invention consists of guard operated means for disabling the actuating mechanism of a machine having an opening and closing movement, as for instance, a riveting machine, operable by the movement of the guard out of normal position, when it encounters an obstruction for exhausting the air from a pneumatic motor of the actuating mechanism of the riveting machine. The machine here illustrated comprises a movable element, as the reciprocating head 1 movable toward and from a stationary element or anvil 2.

The mechanism for actuating the head 1 may be of any suitable construction, that here shown for the purpose of illustration comprises a pneumatic motor including a casing as a cylinder 3 suitably carried by the frame 4 of the machine, a single acting piston 5 movable in the cylinder against the action of a returning spring 6, the motion of the piston being transferred to the head 1 by a connecting rod 7 pivoted at one end at 8 to the piston and at its other end at 9 to the joint of a toggle consisting of links 10 and 11; the link 10 being pivoted at its outer end at 12 to a suitable head 13 of the frame and the link 11 being pivoted at its outer end at 14 to the head. The head 1 slides in the frame head 13. The cylinder 3 forms an overhanging bracket supporting the frame head 13. The links 10 and 11 are normally arranged in folded position, so that the head 1 is retracted. The links are movable to straightened position by the pneumatic pressure on the piston 5 moving the piston 5 to the left (Figure 1) against the action of the spring 6.

15 designates the guard, this guard surrounding the path of movement of the head 1 and normally being elevated far enough above the anvil 2 to permit the work to be placed on the anvil. The guard 15, during each operation of the control mechanism, moves toward the anvil 2 in advance of the head 1, and if during such movement it encounters an obstruction, as the finger of the operator, it operates to disable the cylinder and piston motor 3, 5 by exhausting any air in the cylinder out of the cylinder. As the power is air, the controls for the flow of air are valves. 16 designates a control valve for controlling the flow of air from a suitable source to the cylinder 3 through an intake port 17. The valve 16 here shown is of the combined intake and exhaust type including a casing having a normally closed intake valve head 18 therein and a normally open exhaust valve head 19, these being connected together, so that they act as a unit. The intake end of the casing of the valve 16 is connected by a pipe 21 to a suitable source of supply. The cylinder 3 is also provided with an exhaust port 22 in the head thereof, this being controlled by a normally closed exhaust valve 23 including a suitable casing having a spring-pressed valve head 24 therein. The exhaust valve is opened against its spring by pneumatically operated means, as a diaphragm 25 in a diaphragm chamber 26 acting on a plunger 27, which in turn acts on one end of the lever 28 pivoted at 29 between its ends, the other end of the lever thrusting against the stem 30 on the exhaust valve head 24.

The pressure side of the diaphragm chamber is connected by a pipe 31 to the casing of a valve 32 operated by the guard, which valve is connected to the source of supply, as through the pipe 21. The valve 32 is of the combined intake and exhaust type and includes normally open exhaust valve head and the normally closed intake valve head. The valve 32 is of the same general construction as the valve 16.

The control valve is operated by operator-operated mechanism, this usually being a pedal, not shown, and a rod 33 connected to a motion transmitting part, as a lever 34, pivoted at 35 to the casing of the valve 16 and coacting with the stem 36 of the movable valve member of the valve 16. The rod 33 is connected to the lever 34 by a lost motion connection for a purpose to be hereinafter explained.

The guard 15 is supported by a carrier, which includes relatively movable members, one of which is connected to the operator-operated means or the rod 33 to be operated thereby, and the other of which is connected to the guard and capable of having a movement relatively to the former member, when the guard encounters an obstruction. The relative movement of the members operates the valve 32. One of the members of the guard carrier, as here shown, includes a lever 37 pivoted between its ends at 38 to the frame, one arm of the lever being pivoted at 39 to the operating rod 33, and the other arm being pivoted at 40 to the other member of the carrier, this being an extension 41 of the lever 37. The relative movement of the members of the guard carrier, that is, the pivotal movement of the extension 41 is yieldingly resisted by a relatively light spring 42. The pivotal movement of the extension 41 operates the stem 43 of the valve 32 to close its exhaust valve head and open its intake valve head. The spring 42, as here shown, is connected to an adjustable bracket 44 mounted on the pivot 42 and adjusted to various angular positions relative to the extension 41, in order to adjust the timing of the operation of the valve 32. The arm 44 is held in its adjusted position relative to the extension 41 by a set screw 45. The intake end of the casing of the valve 32 is connected to the pipe 21 by a pipe or tube 46. The operating rod 33 is connected to the lever 34 by a pin-and-slot connection consisting of a lengthwise slot 47 in the rod for receiving the pin 48 on the lever. This connection constitutes means for operating the guard from its starting position down into its operative position in advance to the opening of the control valve 16.

In operation, after the operator has placed the work with the rivet thereon over the anvil 2, depresses the pedal, which causes the operating rod 33 to thrust upwardly, thus first rocking the guard carrier 37 about its pivot 38 to carry the guard down to entirely close the space between the riveting head 1 and the anvil 2. After so actuating the guard carrying lever, the lost motion is taken up between the rod 33 and the lever 34, so that the control valve 16 is operated to permit air to flow from the source through the pipe 21, valve 16, port 17 into the cylinder 3 to actuate the piston 5 therein to bring the riveting head 1 down into coaction with the rivet on the anvil 2. Upon release of the foot pedal, the air will exhaust back through the port 17 and valve 16 to the outer air. The valve 16 is shown in its operated position in Figure 4. If the guard 15 encounters an obstruction, as the finger of an operator, as shown in Figure 2, the guard is arrested in its movement, and the extension 41 moved about the pivot 40 into the position shown in Figure 2, this operating the valve 32 to close its exhaust and open its intake, so that the air passes from pipe 21 through pipe 46, valve 32 and pipe 31 to the diaphragm chamber 26, actuating the diaphragm into the position shown in Figure 4, to open the exhaust valve head 24, so that the exhaust port is open to the exhaust of air from the cylinder 5, when during the continued operation of the rod 33, the control valve 16 is opened to the intake of air, so that when the guard does encounter an obstruction, the actuating mechanism, that is, the cylinder and piston 3, 5 is disabled. As the force required to move the guard, which itself is relatively light, on its pivot is inconsequential, the blow received by the operator from the guard is also light or inconsequential.

What I claim is:

1. In a safety control for machines which include a stationary element and a head having an opening and closing movement toward and from the stationary element, and mechanism for actuating the head; the combination of a control for the actuating mechanism and operator-operated means for the control, a guard movable in advance of the head to close the space between the head and the stationary element, a carrier for the guard including relatively movable members, one connected to the operator-operated means to be operated thereby and the other to the guard, the latter being normally movable as a unit with the former and relatively thereto upon the guard encountering an obstruction, and means operated by the relative movement of the members of the carrier to disable the actuating mechanism.

2. In a safety control for machines which include a stationary element and a head having an opening and closing movement toward and from the stationary element, and mechanism for actuating the head; the combination of a control for the actuating mechanism and operator-operated means for the control, a guard movable in advance of the head to close the space between the head and the stationary element, a carrier for the guard including relatively movable members, one connected to the operator-operated means to be operated thereby, and the other being pivoted to the former and connected to the guard, the members being normally movable as a unit and the pivoted member movable on its pivot when the guard encounters an obstruction, and means operated by the pivotal movement of the guard carrying member to disable the actuating mechanism.

3. In a safety control for machines which include a stationary element and a head having an opening and closing movement toward and from the stationary element, and mechanism for actuating the head; the combination of a control for the actuating mechanism, and operator-operated means for the control, a guard movable in advance of the head to close the space between the head and the stationary element, a carrier for the guard including relatively movable members, one connected to the operator-operated means to be operated thereby and the other to the guard, the latter being normally movable as a unit with the former and relatively thereto upon the guard encountering an obstruction, means operated by the relative movement of the members of the carrier to disable the actuating mech-

anism, and a spring for yieldingly resisting the relative movement of said members.

4. In a safety control for machines which include a stationary element and a head having an opening and closing movement toward and from the stationary element, and mechanism for actuating the head; the combination of a control for the actuating mechanism, and operator-operated means for the control, a guard movable in advance of the head to close the space between the head and the stationary element, a carrier for the guard including relatively movable members, one connected to the operator-operated means to be operated thereby, and the other being pivoted to the former and connected to the guard, the members being normally movable as a unit and the pivoted member movable on its pivot when the guard encounters an obstruction, means operated by the pivotal movement of the guard carrying member to disable the actuating mechanism, and a spring for yieldingly resisting the pivotal movement of the member connected to the guard.

5. In a safety control for machines which include a suitable frame, a stationary element and a head having an opening and closing movement toward and from the stationary element, and mechanism for actuating the head; the combination of a control for the actuating mechanism, and operator-operated means for the control, a guard movable in advance of the head to close the space between the head and the stationary element, a carrier for the guard including relatively movable members, one being a lever pivoted to the frame between its ends and one arm thereof being connected to the operator-operated means to be operated thereby, the other member being an extension of the other arm of the lever and pivoted thereto and carrying the guard, the lever and extension being normally movable as a unit and the extension movable about its pivot when the guard encounters an obstruction, and means operated by the pivotal movement of the extension to disable the actuating means.

6. In a safety control for machines which include a stationary element and a head having an opening and closing movement toward and from the stationary element, and mechanism for actuating the head; the combination of a control for the actuating mechanism, and operator-operated means for the control, a guard movable in advance of the head to close the space between the head and the stationary element, a carrier for the guard including relatively movable members, one being a lever pivoted to the frame between its ends and one arm thereof being connected to the operator-operated means to be operated thereby, the other member being an extension of the other arm of the lever and pivoted thereto and carrying the guard, the lever and extension being normally movable as a unit and the extension movable about its pivot when the guard encounters an obstruction, means operated by the pivotal movement of the extension to disable the actuating means, and a spring for yieldingly resisting the pivotal movement of the extension.

7. In a safety control for machines which include a stationary element and a head having an opening and closing movement toward and from the stationary element, and mechanism for actuating the head; the combination of a control for the actuating mechanism, and operator-operated means for the control, a guard movable in advance of the head to close the space between the head and the stationary element, a carrier for the guard including relatively movable members, one connected to the operator-operated means to be operated thereby and the other to the guard, the latter being normally movable as a unit with the former and relatively thereto upon the guard encountering an obstruction, and means operated by the relative movement of the members of the carrier to disable the actuating mechanism, the operator-operated means including mechanism for operating the guard in advance of the control.

8. In a safety control for machines which include a frame, a stationary element and a head having an opening and closing movement toward and from the stationary element; the combination of a pneumatically operated actuating mechanism for the head including a casing and a movable member working therein, said casing having an intake port and an exhaust port, a combined intake and exhaust control valve for the intake port normally arranged with the exhaust open and the intake closed, a normally-closed exhaust valve for the exhaust port, and pneumatic means for operating it, a guard movable to close the space between the head and the stationary element preliminary to the closing movement of the head, operator-operated means for operating the control valve, a movable carrier for the guard operated by the operator-operated means, the carrier including relatively movable members, means for yieldingly holding the members from relative movement, one of said members carrying the guard, a combined intake and exhaust valve for controlling the flow of motive fluid to the pneumatically operated means normally arranged with its exhaust open and the intake closed and operable by the relative movement of the members of the carrier to open the intake and close the exhaust.

9. In a safety control for machines which include a frame, a stationary element and a head having an opening and closing movement toward and from the stationary element; the combination of a pneumatically operated actuating mechanism for the head including a casing and a movable member working therein, said casing having an intake port and an exhaust port, a combined intake and exhaust control valve for the intake port normally arranged with the exhaust open and the intake closed, a normally-closed exhaust valve for the exhaust port, and pneumatic means for operating it, a guard movable to close the space between the head and the stationary element preliminary to the closing movement of the head, operator-operated means for operating the control valve, a movable carrier for the guard operated by the operator-operated means, the carrier including relatively movable members, means for yieldingly holding the members from relative movement, one of said members carrying the guard, a combined intake and exhaust valve for controlling the flow of motive fluid to the pneumatically operated means normally arranged with its exhaust open and the intake closed and operable by the relative movement of the members of the carrier to open the intake and close the exhaust, the operator-operated means including mechanism for actuating the carrier to operate the guard in advance of the operation of the control valve.

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