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SAFETY DEVICE FOR FLUID OPERATED PRESS INCLUDING SAFETY
DEVICE COMPRISING CONTACT BAR AND MICROSWITCH APPARATUS
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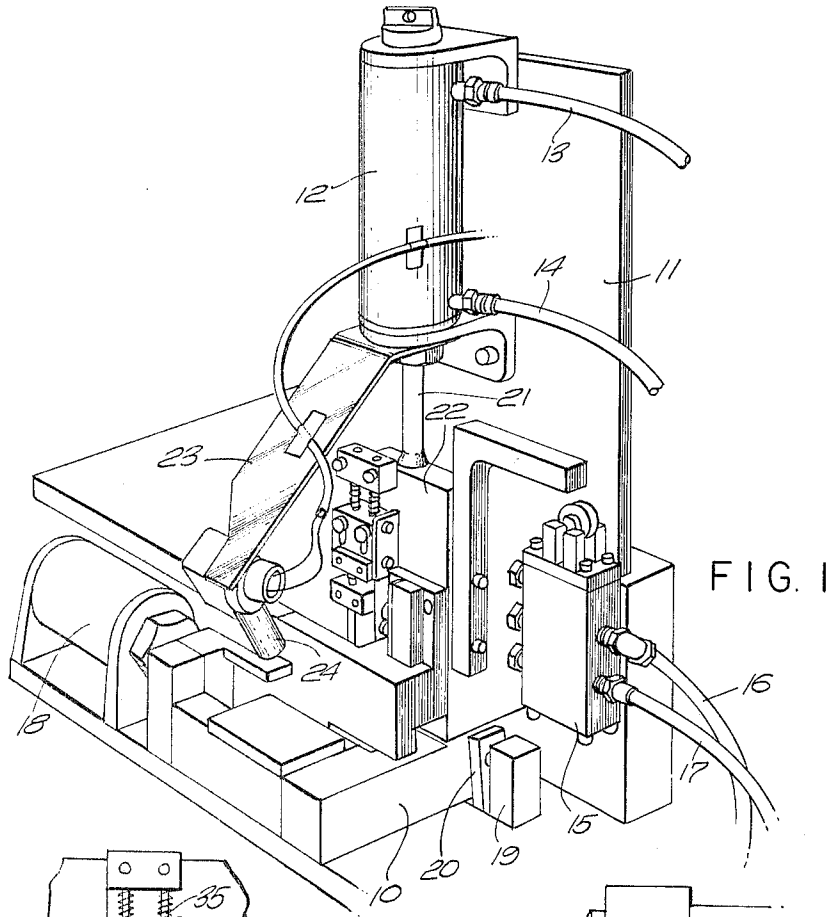


FIG. 1

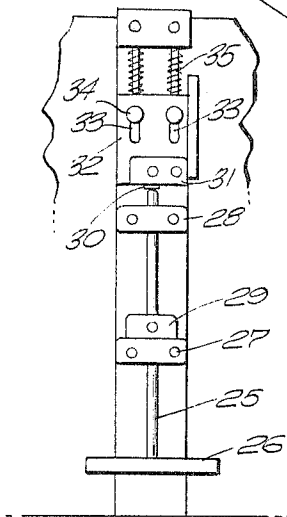


FIG. 2

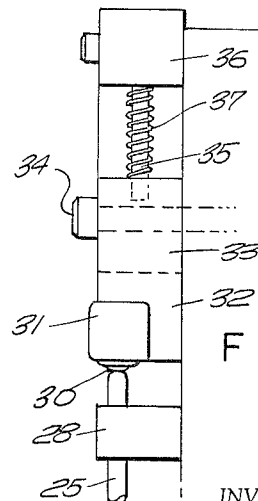


FIG. 3

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SAFETY DEVICE FOR FLUID OPERATED PRESS INCLUDING SAFETY DEVICE COMPRISING CONTACT BAR AND MICROSWITCH APPARATUS

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8 Claims. (Cl. 192—134)

My present invention relates to safety devices and more particularly to a safety device for a fluid operated press.

The principal object of the present invention is to provide a safety device which will reverse the operation of the press if the operator's hand or other object is accidentally left in the path of the reciprocating ram.

A further object of the present invention is to provide a safety device which compensates for the inertia of the press.

Another object of the present invention is to provide a safety device for a fluid operated press which is highly sensitive and responds instantly to protect the operator.

A further object of the present invention is to provide a safety device for a fluid operated press which is simple in construction and easy and economical to manufacture and assemble.

With the above and other objects and advantageous features in view my invention consists of a novel arrangement of parts more fully disclosed in the detailed description following, in conjunction with the accompanying drawings, and more particularly defined in the appended claims.

In the drawings,

FIG. 1 is a perspective view of a fluid operated press equipped with the safety device of the present invention.

FIG. 2 is a front elevation of the safety device.

FIG. 3 is a side elevation of the same.

Stamping operations in the manufacture of small parts are always dangerous when the operator is feeding successive parts to a bed to be acted upon by a reciprocating ram. Since speed is of the essence, the operator develops a certain carelessness and occasionally there are accidents when the operator catches his or her hand beneath the ram of the press. Insurance companies thus require that presses and similar pieces of machinery be equipped with various safety devices for preventing such accidents. Electric eyes have been utilized to stop the press when the operator's hand is within the beam of the electric eye. However, the very presence of the electric eye requires the operator to reach around it and more often than not the positioning of the part on the press is outside of the beam of the electric eye so that it is rendered inoperative insofar as any safety features are concerned. In some instances tripping devices are provided either with or without the electric eye which operate on contact. Such tripping devices invariably cause more damage than the press because there is an inherent inertia in the press which crushes the tripping device against the operator's hand. The present invention is designed to provide a tripping device which is sensitive to the slightest touch and which compensates for the inertia of the press so that even a sheet of paper interposed between the press and the bed will cause the device to operate instantly.

Referring to the drawings, FIG. 1 illustrates an assembly operation in which the tools are operated by a fluid operated vertically reciprocable press. In the illustrated form the table or bed 10 is provided with a vertical support 11 on which the fluid cylinder 12 is mounted. The fluid cylinder 12 is provided with the conventional upper and lower fluid connections 13 and 14 which carry the pressure to the cylinder and reciprocate the piston. The sequence of operation of the connections 13 and 14 are

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controlled by a valve 15 operating through the connections 16 and 17. In the illustrated press a complex tool is provided which also has a horizontal movement provided by a cylinder 18. Since this movement completes the assembly operation, at the end of its stroke a micro-switch 19 is tripped by the pivoted arm 20 to reverse the valve 15 and cylinder 12 and cause the press to move upwardly. Vertically reciprocable from the bottom of the cylinder 12 is the ram arm rod 21 carrying the block 22 at the lower end of which the tool for the operation is mounted. It should be noted that operation of the valve 15 by the microswitch 19 is through any conventional electromechanical transducer. The present invention uses a standard solenoid operated valve unit.

This type of press is normally used for light work at high speeds. The fluid cylinder 12 causing the press to move rapidly upwardly and downwardly. The press is also normally equipped with a foot pedal for initiating the downward stroke. The operator places a piece of metal or work to be stamped beneath the press manually. Then withdrawing his or her hand the operator presses the foot pedal and causes the cylinder 12 to move the rod 21 and block 22 downwardly. If nothing disturbs the operation the cycle continues until the press hits downwardly then the rod 18 moves over and completes the operation hitting the micro-switch 19 and its arm 20 and causing the valve 15 to reverse and pull the rod 21 upwardly ready for the next operation. For the sake of safety, the press is usually equipped with a plate 23 extending from the lower end of the cylinder bracket 12. Mounted at the end of the plate 23 an electric eye 24 pointed at the lower die bed where a smaller light beam is provided. When the operator places his hand into the light beam, the electric eye causes the valve 15 to reverse and lift the block 22. Also, if this is done before the pedal is pressed, it immobilizes the operation so that pressing the pedal will not result in the piston coming downwardly if the electric eye is broken. However, the electric eye beam is very narrow and works in a small area and if the operator reaches around the eye to position a piece of metal in the proper position beneath the ram, frequently the operator's hand will not break the electric eye and the ram can come downwardly and cause injury to the operator.

To prevent this, the applicant has provided the novel safety device illustrated in FIGS. 1, 2 and 3. Mounted on the front of the block 22 is an inverted T-shaped member 25 having a horizontal bar 26 at the bottom end and adapted to be positioned slightly below the level of the die reciprocating at the bottom of the block 22. The vertical rod 25 extends slidably through a supporting block 27 and a second supporting block 28 vertically spaced therefrom to keep it in proper alignment. Just above the block 27 a small stop member 29 is mounted on the vertical rod 25 to limit downward movement of the horizontal portion 26 but permit upward movement thereof. The upper end of the rod 25 extends through the supporting block 28 and bears against the tripping mechanism 30 of a micro-switch 31. The micro-switch 31 is connected to the valve 15 and is designed to reverse the position of the valve and cause upward movement of the block 22 when the micro-switch is tripped. It will be noted that in the position illustrated in FIGS. 2 and 3, that the vertical rod 25 is actually contacting the trigger mechanism 30 of the micro-switch. Therefore, as the press is operating and the assembly comes downwardly, the slightest touch of the horizontal bar 26 will trip the micro-switch and cause the press to reverse. This protects the hands of the operator. However, the downward speed of the press coupled with the fractional delay in the impulse of the micro-switch to the valve to the cylinder 12 would normally allow the block 22 to move a fraction of an inch

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further downwardly before reversing. This fraction of an inch could very well crush the hands of the operator. The bar 26 would be resting against operator's hands and further movement of even $\frac{1}{4}$ of an inch would cause serious injury to the fingers and hands of the operator. Thus the very safety device used for tripping a press could itself cause considerable damage where the press overrides. To prevent this, the construction illustrated in FIGS. 1, 2 and 3 is used.

The micro-switch 31 is mounted in a block 32 having a pair of spaced vertically elongated slots 33 extending therethrough. A pair of bolts 34 extend through the upper ends of the slots and into the carrying block 22. Thus the block 32 is supported on the bolts 34 but is loosely slidable thereon so that the block 32 can move upwardly in its slot 33 as seen in FIGS. 2 and 3. The upper end of the block 32 is provided with a pair of spaced rods 35 extending upwardly into a guide block 36 and slidable into openings therein. The rods 35 are surrounded by coil springs 37 which normally resiliently urge the block 32 downwardly into the position shown in FIGS. 2 and 3. Now when the bar 26 at the bottom end of the rod 25 encounters an operator's hand or other object, not only will the slight immediate upward movement trip the mechanism 30 of the micro-switch 31 to start the reversal, but further downward movement of the block 22 will cause the micro-switch and its block 32 to slide upwardly in the slots 33 against the action of the springs 35 to take up any possible squeezing action between the bar 26 and the operator's hand. This lost motion effect is a second safety feature which prevents the contacting safety device triggered by the bar 26 to do any damage caused by the inertia of the press on its downward stroke.

I have thus provided a fluid operated press with a positive contact safety device which in and of itself is also provided with a safety device so that contact with the initial safety device not only causes the press to reverse but the device itself can do no harm due to the inertia of the press. The device is fairly simple in construction and can readily be applied to other types of machines utilizing reciprocating members. Other advantages of the present invention will be readily apparent to a person skilled in the art.

I claim:

1. A fluid operated press having a vertically reciprocating ram and a solenoid operated valve for controlling said ram, a safety device comprising a rod mounted on said ram for vertical sliding movement, a contact bar mounted at the bottom end of said rod and positioned below the bottom of said ram, a micro-switch mounted on said ram and reversing said valve to raise said ram on operation of said switch, the upper end of said rod being in contact with the operating button of said switch, said micro-switch being mounted on said ram for limited vertical sliding movement to provide a yielding vertical movement of said switch.

2. A fluid operated press having a vertically reciprocating ram and a solenoid operated valve for controlling said ram, a safety device comprising a rod mounted on said ram for vertical sliding movement, a contact bar mounted at the bottom end of said rod and positioned below the bottom of said ram, a micro-switch mounted on said ram and reversing said valve to raise said ram on operation of said switch, the upper end of said rod being in contact with the operating button of said switch, said rod mounting comprising a pair of vertically spaced blocks mounted on said ram, said blocks having vertically aligned openings for receiving said rod, and a block fixed to said rod above the lower of said ram blocks for limiting downward movement of said rod, said micro-switch being mounted on said ram for limited vertical sliding movement to provide a yielding vertical movement of said switch.

3. A fluid operated press having a vertically reciprocating ram and a solenoid operated valve for controlling

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said ram, a safety device comprising a rod mounted on said ram for vertical sliding movement, a contact bar mounted at the bottom end of said rod and positioned below the bottom of said ram, a micro-switch mounted on said ram and reversing said valve to raise said ram on operation of said switch, the upper end of said rod being in contact with the operating button of said switch, said micro-switch mounting comprising a block, said block having spaced slots, and a bolt extending through each slot to permit limited vertical movement of said block carrying said micro-switch.

4. A fluid operated press having a vertically reciprocating ram and a solenoid operated valve for controlling said ram, a safety device comprising a rod mounted on said ram for vertical sliding movement, a contact bar mounted at the bottom end of said rod and positioned below the bottom of said ram, a micro-switch mounted on said ram and reversing said valve to raise said ram on operation of said switch, the upper end of said rod being in contact with the operating button of said switch, said rod mounting comprising a pair of vertically spaced blocks mounted on said ram, said blocks having vertically aligned openings for receiving said rod, and a block fixed to said rod above the lower of said ram blocks for limiting downward movement of said rod, said micro-switch mounting comprising a block, said block having spaced vertical slots, and a bolt extending through each slot to permit limited vertical movement of said block carrying said micro-switch.

5. A fluid operated press having a vertically reciprocating ram and a solenoid operated valve for controlling said ram, a safety device comprising a rod mounted on said ram for vertical sliding movement, a contact bar mounted at the bottom end of said rod and positioned below the bottom of said ram, a micro-switch mounted on said ram and reversing said valve to raise said ram on operation of said switch, the upper end of said rod being in contact with the operating button of said switch, said micro-switch being mounted on said ram for limited vertical sliding movement to provide a yielding vertical movement of said switch, and spring means for yieldingly retaining said micro-switch in downward position in contact with said rod.

6. A fluid operated press having a vertically reciprocating ram and a solenoid operated valve for controlling said ram, a safety device comprising a rod mounted on said ram for vertical sliding movement, a contact bar mounted at the bottom end of said rod and positioned below the bottom of said ram, a micro-switch mounted on said ram and reversing said valve to raise said ram on operation of said switch, the upper end of said rod being in contact with the operating button of said switch, said rod mounting comprising a pair of vertically spaced blocks mounted on said ram, said blocks having vertically aligned openings for receiving said rod, and a block fixed to said rod above the lower of said ram blocks for limiting downward movement of said rod, said micro-switch being mounted on said ram for limited vertical sliding movement to provide a yielding vertical movement of said switch, and spring means for yieldingly retaining said micro-switch in downward position in contact with said rod.

7. A fluid operated press having a vertically reciprocating ram and a solenoid operated valve for controlling said ram, a safety device comprising a rod mounted on said ram for vertical sliding movement, a contact bar mounted at the bottom end of said rod and positioned below the bottom of said ram, a micro-switch mounted on said ram and reversing said valve to raise said ram on operation of said switch, the upper end of said rod being in contact with the operating button of said switch, said micro-switch mounting comprising a block, said block having spaced slots, and a bolt extending through each slot to permit limited vertical movement of said block carrying said micro-switch, and a spring for yieldingly re-

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taining said block and micro-switch in lowermost position in contact with said rod.

8. A fluid operated press having a vertically reciprocating ram and a solenoid operated valve for controlling said ram, a safety device comprising a rod mounted on said ram for vertical sliding movement, a contact bar mounted at the bottom end of said rod and positioned below the bottom of said ram, a micro-switch mounted on said ram and reversing said valve to raise said ram on operation of said switch, the upper end of said rod being in contact with the operating button of said switch, said rod mounting comprising a pair of vertically spaced blocks mounted on said ram, said blocks having vertically aligned openings for receiving said rod, and a block fixed to said rod above the lower of said ram blocks for limiting downward movement of said rod, said micro-switch mounting comprising a block, said block having spaced vertical slots, and a bolt extending through each slot to

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permit limited vertical movement of said block carrying said micro-switch, and a spring for yieldingly retaining said block and micro-switch in lowermost position in contact with said rod.

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