May 23, 1967 R. J. PERSIA ET AL 3,321,589

SAFETY LOCK SWITCH

Filed Sept. 19, 1963 2 Sheets-Sheet 1

Fig. 1.

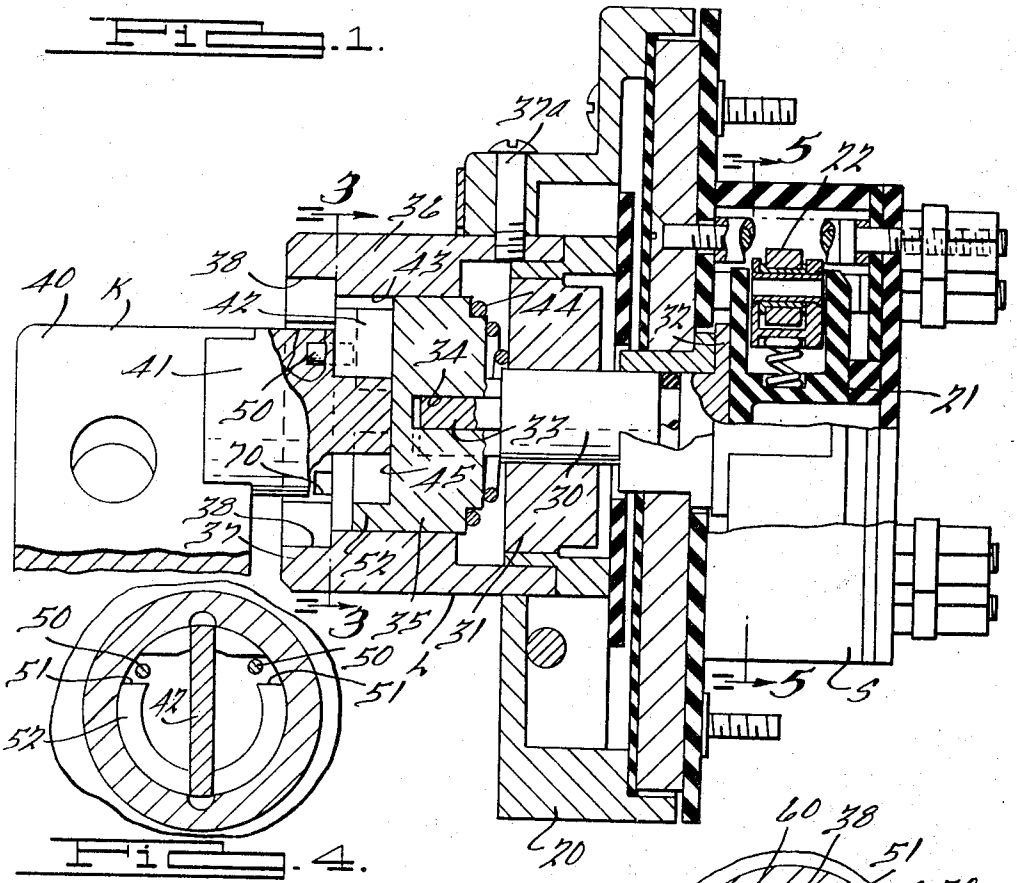


Fig. 4.

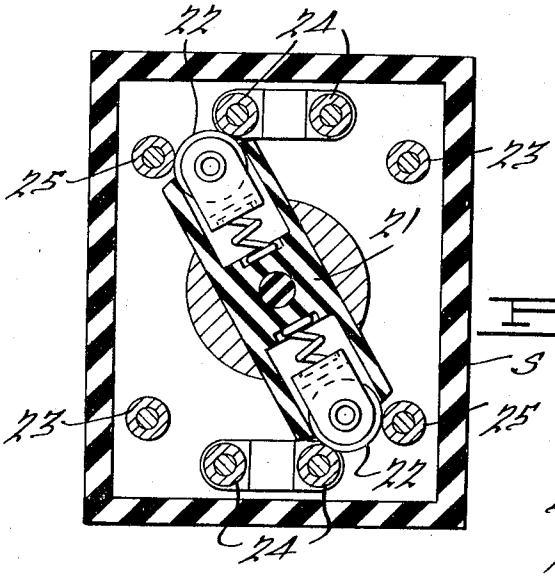


Fig. 5.

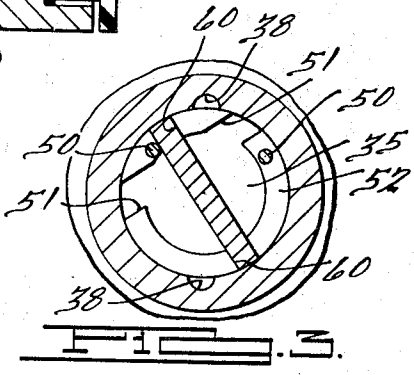


Fig. 3.

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SAFETY LOCK SWITCH

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Fig. 1.

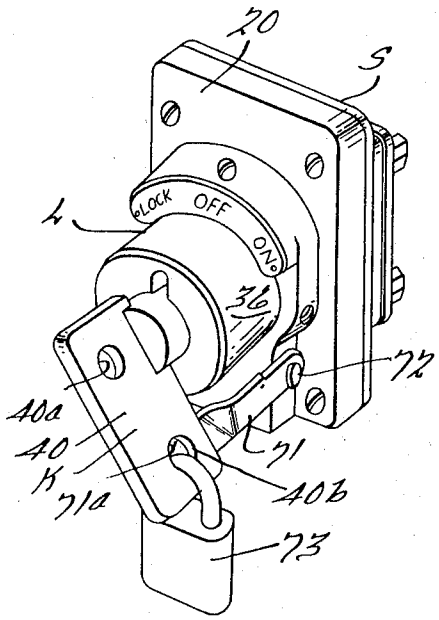


Fig. 2.

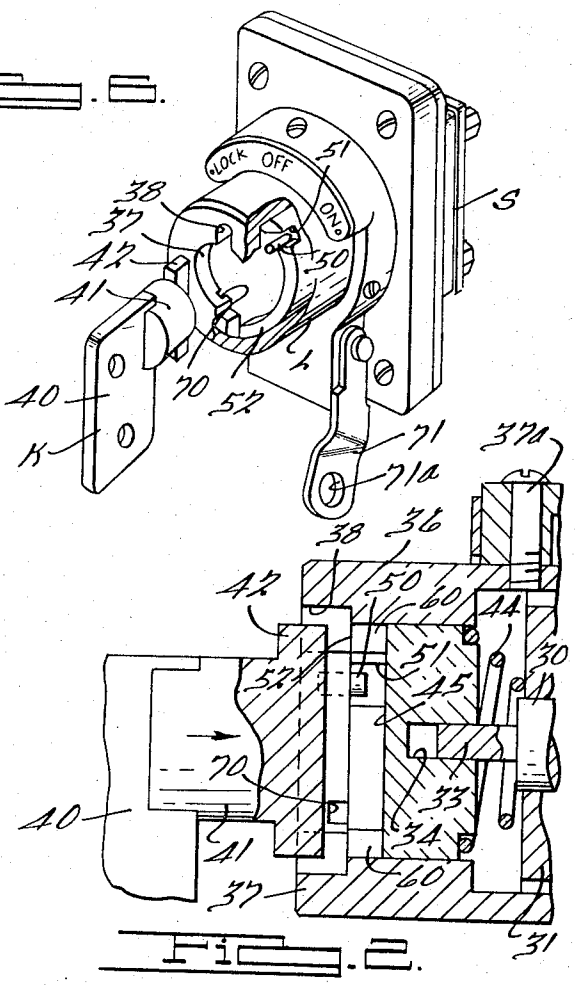
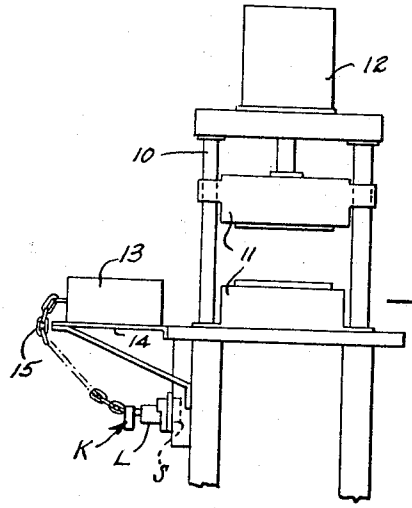


Fig. 3.



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3,321,589

SAFETY LOCK SWITCH

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This invention relates to safety lock switches and, more especially, to a switch of this type adapted particularly for use with punch presses and the like.

The switch of this invention has three positions to which the switch may be turned by a special key. With this key, the switch may be turned to "On" position for normal operation of the press and to "Off" and "Lock" positions in which the circuit to the press operating mechanism is open.

One of the objects is to provide a safety lock switch of the class described in which the key can be removed from the lock only in the "Off" position of the switch. With such a construction, the invention contemplates attaching the key, by a chain or other flexible element, to the safety block usually provided in presses to be placed between the dies to limit closing movement thereof. In accordance with the present invention, it is proposed to make the chain so short that the key must be removed from the lock in order to position the safety block between the dies of the press. Therefore, when the safety block is between the dies of the press, the key is of necessity removed from the lock, and the switch is in "Off" position. This assures anyone performing mechanical work on the press that the switch will not be inadvertently turned to "On" position.

Another object of the invention is to provide a switch of this type in which the switch may be secured in "Lock" position to prevent unauthorized operation of the press. When, for instance, the electrical circuits of the press are being serviced, it may not be feasible to place the safety block between the dies of the press, and thus remove the key from the lock, because the ram may be in its lowered position or stalled in some other position where the safety block could not be used. In such an event, the serviceman moves the key to "Lock" position wherein it may be fastened by a padlock to a bracket on the switch. In this position of the switch, the circuit to the press operating mechanism is open so that the press cannot be operated and the key is locked in this position to prevent unauthorized or accidental closing of the switch.

Another object of the invention is to provide safety means in the lock whereby the lock can be actuated only by purposeful intent and not by accident. To this end, the spring pressed connecting link or disk which is actuated by the key is provided with a slot or recess which is engaged by a locking pin on the housing so that the key can rotate the connecting link only after the connecting link has been pressed inwardly by the key against the action of said spring to disengage the locking pin from the slot or recess in the connecting link. This safety feature is considered to be of considerable importance.

Another feature of this invention resides in the ruggedness of the key and lock. The key is attached to the safety block which may weigh in the neighborhood of 20 pounds and which is normally stored on a rack on or beside the press. In accordance with this invention, the key and lock are rugged enough to hold the weight of the safety block in the event it is dropped or knocked off its supporting rack, which sometimes happens. In accordance with this invention, the key and lock are constructed to stand up under this type of treatment.

Another important feature of the invention resides in the means provided for holding the key in "On" position. This consists of a slot or recess in the cap which receives the back edge of the bit or web of the key when the switch is in "On" position. When the key is in this position, it is urged into locking engagement with the slot or recess by the spring pressed connecting link. The bit or web of the key is disengaged from this slot or recess during the initial inward pressure on the key after the key is inserted. When the key is in this locked position, it cannot be turned inadvertently to interfere with the operation of the press when the latter is running. Such interference could occur by somebody or something moving past the press and brushing against the key so as to turn it. Also, the safety block could fall off its supporting rack and the weight of the falling block could turn the key and interrupt the operation of the press.

The various objects and advantages, and the novel details of construction of a commercially practical embodiment of the invention, will become more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, in which:

FIGURE 1 is a vertical sectional elevational view through a safety lock switch constructed in accordance with this invention, with the key shown fully inserted;

FIGURE 2 is a sectional elevational view of the lock portion shown in FIGURE 1 with the key partially inserted;

FIGURE 3 is a sectional view taken substantially on the plane indicated by line 3—3 in FIGURE 1;

FIGURE 4 is a similar view with the lock switch in "Off" position;

FIGURE 5 is a sectional view taken substantially on the plane indicated by line 5—5 in FIGURE 1;

FIGURE 6 is a broken away perspective view of the lock showing certain parts thereof;

FIGURE 7 is a perspective view of the lock switch; and

FIGURE 8 is a semidiametric view showing a press and the environment in which the invention is used.

The safety lock switch of this invention, as shown in FIGURES 1, 6 and 7, comprises a locking mechanism L, a switch mechanism S and a key K.

One environment in which the invention of this application may be used to advantage is shown diagrammatically in FIGURE 8. In this figure, there is illustrated a punch press or the like **10** having relatively movable dies **11** one of which is adapted to be reciprocated by means of a piston and cylinder or like mechanism **12**. Presses of this general type are usually provided with a safety block **13** adapted to be placed between the dies to prevent the closing thereof during inoperative periods of the press. The safety block is usually lodged on a supporting rack or the like **14** secured to or arranged adjacent the press **10**. The safety block **13** is attached to the key K by means of a chain or other flexible element **15**. In accordance with this invention, it is proposed to make the chain **15** so short that the key K must be removed from the lock in order to position the safety block between the dies of the press. This assures anyone performing mechanical work on the press that the switch will not be inadvertently turned to "On" position.

The device comprises a cover **20** to the rear side of which the switch mechanism S is attached. The switch mechanism is of conventional construction and will only be briefly referred to. It consists of a movable contact arm **21** provided with roller contacts **22** at the opposite ends thereof. When the contacts **22** are in engagement with the contact terminals **23**, the switch is in "On" position. When the contact rollers **22** are located between the spaced contacts **24**, the switch is in "Off" position, and when the contact rollers **22** engage the contact members

25, the switch is in "Lock" position. The circuit to the operating mechanism of the press is closed when the contact arm 21 is swung to the position opposite to that shown in FIGURE 5 wherein the contact rollers 22 engage the contacts 23. In the two other positions; that is, the "Off" position and the "Lock" position, the circuit to the press operating mechanism is open.

As stated, the switch mechanism is of conventional construction and hence may be varied as found necessary or expedient.

The movable contact arm 21 is actuated by a rotatable yolk member 30 rotatably mounted in a sleeve guide 31 secured within the cover 20. The yolk member 30 is provided with a portion 32 engaging the contact arm 21 to actuate the same. The opposite end of the yolk member 30 is provided with a tongue 33 adapted to enter a recess 34 to nonrotatably but slidably connect the yolk member 30 to a connecting link or disk 35 slidably mounted in a housing member 36 secured, as, for instance, by fasteners 37*a* to the cover 20.

The housing member 36 is provided with an annular flange 37 at the forward or front face thereof which flange is provided with a pair of opposed keyhole slots 38. The key K is provided with a handle portion 40, a stem portion 41, and a head, or bit, or web 42. In inserting the key K into the lock, the ends of the head or web 42 enter the keyhole slots 38 when the key is in a vertical position, such as shown in FIGURE 6, which is the "Off" position of the switch.

The link or disk member 35 is slidably mounted in a bore 43 formed in the housing 36 annd is urged towards the left and towards the annular flange 37 by means of a spring 44 which bears on the one hand against the connecting link or disk 35 and on the other hand against the sleeve guide 31. Thus, the connecting link or disk 35 is normally urged to the left, as viewed in FIGURES 1 and 2 and normally reposes in the position illustrated in FIGURE 2 in which it engages the annular flange 37. The connecting link or disk 35 is moved to the right, as viewed in these figures, when the key is inserted and pressed inwardly against the forward flat face 45 of the disk or connecting link 35. This is the position of the parts illustrated in FIGURE 1.

When the head 42 of the key clears the keyhole slots 38, it is within the annular flange 37 and engages the face 45 of the connecting link 35 to move the same axially of the housing 36 to compress the spring 44.

Means is provided so that the lock can be actuated only by purposeful intent, and to this end, the annular flange 37 is provided with one or more, here shown as two, locking pins 50 projecting inwardly from the annular flange 37 and engaging recesses 51 formed in a flange 52 formed in the disk member 35. Thus, the disk member 35 must be forcefully moved to the right against the action of the spring 44 by the head 42 of the key K before the disk member 35 can be rotated. This prevents the lock from being accidentally operated by any unintended pressure on the key K. It will be obvious that when the connecting link or disk 35 is rotated by the key, the connection 33–34 with the yolk 30 permits the yolk 30 to be rotated and the contact arm 21 to be actuated.

In order that the key K may engage the connecting link or disk 35 to rotate the same, the flange 52 of the connecting link or disk 35 is provided with a pair of opposed slots 60 adapted to be engaged by the head 42 of the key when the same is inserted in the keyhole slots 38.

Thus, when the key is inserted into the lock through the keyhole slots 38, it will engage the opposed slots or recesses 60 in the flange 52 of the connecting link 35 and upon continued inward pressure of the key, the connecting link 35 will be pressed inwardly against the action of the spring 44 to move the slots 51 clear of the locking pins 50. Thereupon, by turning the key, the connecting link 35 may be rotated and through the connection 33–34 will rotate the yolk member 30 and actuate the contact arm 21.

In order to lock the key in "On" position, the annular flange 37 on the housing 36 is provided with a pair of opposed recesses 70 in which the back edges of the head 42 on the key may engage in the "On" position of the lock. The head 42 of the key is held in engagement with the recesses 70 by the connecting link or disk 35 pressing thereagainst, which connecting link 35 is urged to the left by the spring 44. Thus, when the key is locked in this "On" position, it cannot be turned inadvertently to "Off" or "Lock" positions to interfere with the operation of the press when the latter is running. Such interference could occur by somebody or something moving past the press and brushing against the key so as to turn it. Also, the safety block 13 could fall off its supporting rack and the weight of the falling block could turn the key and interrupt the operation of the press. As stated, this is prevented by the engagement of the head 42 with the recesses 70 in the flange 37 of the housing 36.

The handle 40 of the key K is shown as provided with an opening 40*a* with which the end of the flexible arm or chain 15 is connected which connects the key to the safety block 13.

Another feature of the present invention resides in the means for positively securing the lock in the "Lock" position to prevent unauthorized operation of the press as, for instance, when the electrical circuits of the press are being serviced. Under such circumstances, it may not be feasible to place the safety block between the dies of the press and thus remove the key from the lock, because the ram of the press may be in its lowered position or the dies may be stalled in some intermediate position where the safety block 13 could not be used. Under such circumstances, the operator moves the key to "Lock" position wherein an aperture 40*b* in the handle 40 of the key K is brought adjacent a bracket 71 attached as at 72 to the cover 20. The bracket 71 is provided with an aperture 71*a* adapted to register with the aperture 40*b* whereupon a padlock 73 may be employed to lock the key to the bracket to prevent the unauthorized or accidental operation of the lock and switch.

It should be pointed out that, as shown in the drawings, the key and lock are rugged enough to support the weight of the safety block 13 in the event it is dropped or knocked off its supporting rack, which sometimes happens. Moreover, such a catastrophe would not interfere with the lock and, hence, the switch in the "On" or "Lock" positions of the lock switch.

From the foregoing description, it will be apparent that when the key is first inserted into the lock, the head 42 passes through the keyhole slots 38, whereupon the head of the key is inside the annular flange 37 of the housing 36. The key head first engages the face 45 and the slots 60 of the connecting link or disk and upon continued pressure on the key, the connecting link 35 is moved to the right from the position illustrated in FIGURE 2 to that illustrated in FIGURE 1. This moves the recesses 51 from engagement with the lock pins 50 so that the connecting link 35 may be rotated to rotate the yolk member 30 and actuate the contact arm 21. When the lock is in "On" position and the key is released, the rear faces of the ends of the head 42 engage in the receses 70 in the flange 37 to lock the switch in its "On" position. As also described, when the switch is moved to the "Lock" position, the key may be padlocked in this position to the bracket 71.

Also as described, the safety block 13 may be placed between the dies of the press only when the key K is removed from the lock and this can occur only when the lock switch is in "Off" position. Thus, it will be seen that there is provided a simple, rugged lock switch particularly adapted for use with punch presses and the like and providing all of the safety factors desirable in an installation of this type.

While one commercially practical embodiment of the invention has been described and illustrated herein some-

what in detail, it will be understood that various changes may be made as may come within the purview of the accompanying claims.

What is claimed is:

1. In a lock switch of the class described, a movable contact, a second contact matable with said movable contact, a yolk member coupled with said movable contact for moving said movable contact, a key, a housing having a keyhole therein for receiving said key, a connecting link coupled to said yolk member and rotatably and axially movable in said housing for axially moving said connecting link in response to the insertion of the key, and a locking pin carried by one of said housing and said connecting link for engaging a recess in the other of said housing and said connecting link to prevent rotation of said connecting link until said connecting link has been moved axially by said key, means engaging said connecting link supporting said connecting link for axial movement of said connecting link relative to said yoke member, and resilient means disposed between portions of said yoke member and said connecting link for resiliently urging said connecting link in an axial direction away from said yoke member.

2. In a lock switch of the class described, a first contact, a movable contact engageable with said first contact, a yolk member coupled with said movable contact for moving said movable contact, a key, a housing having a keyhole therein, a connecting link coupled to said yolk member and rotatably and axially movable in said housing, said connecting link being axially movable by the insertion of the key in said keyhole, a locking pin projecting from a portion of said housing in a direction toward said connecting link, and a recess in a portion of said connecting link adjacent said portion of said housing for engaging said pin and normally preventing rotation of said connecting link until said connecting link has been moved axially by said key sufficiently to cause said recess to clear said pin, means engaging said connecting link supporting said connecting link for axial movement of said connecting link relative to said yoke member, and resilient means disposed between portions of said yoke member and said connecting link for resiliently urging said connecting link in an axial direction away from said yoke member.

3. In a lock switch of the class described, a first contact, a movable contact, a yolk member coupled with said movable contact for moving said movable contact, a key, a housing having a keyhole therein, a connecting link coupled to said yolk member and rotatably and axially movable in said housing, said connecting link being axially movable by the insertion of the key in said keyhole, one or more locking pins projecting from a portion of said housing in a direction toward said connecting link, corresponding recesses formed in a portion of said connecting link adjacent said portion of said housing, said pins engaging said recesses to normally prevent rotation of said connecting link, said connecting link being moved axially inwardly by the insertion of said key to disengage said pins from said recesses to permit said rotation of said connecting link by said key, means engaging said connecting link supporting said connecting link for

axial movement of said connecting link relative to said yoke member, and resilient means disposed between portions of said yoke member and said connecting link for resiliently urging said connecting link in an axial direction away from said yoke member.

4. In a lock switch of the class described, a first contact, a movable contact, a yolk member coupled to said movable contact for moving said movable contact, a key, a housing having a keyhole therein, a connecting link coupled to said yolk member and rotatably and axially movable in said housing, a spring normally urging said connecting link toward said keyhole, said connecting link being axially movable against the action of said spring by the insertion of the key in said keyhole, a recess in the front end of said housing securing, in at least one portion of said key, the back edge of the bit of the key to prevent rotation of the key, said key being held in said recess by the spring influenced connecting link to lock said key in said recess in one position of the switch, means engaging said connecting link supporting said connecting link for axial movement of said connecting link relative to said yoke member, and means including said spring disposed between portions of said yoke member and said connecting link for resiliently urging said connecting link in an axial direction away from said yoke member.

5. In a lock switch of the class described, a first contact, a movable contact, a yolk member coupled to said movable contact for moving said movable contact, a key, a housing having a keyhole therein, a connecting link coupled to said yolk member and rotatably and axially movable in said housing, a spring normally urging said connecting link toward said keyhole, said connecting link being axialy movable against the action of said spring by the insertion of the key in said keyhole, a pair of diametrically opposed recesses in the front end of said housing being engageable with the back edge of the bit or web of the key to prevent rotation of the key, said key being held in said recesses by the pressure thereon exerted by said connecting link whereby to hold said key in said recesses in one position of the switch, means engaging said connecting link supporting said connecting link for axial movement of said connecting link relative to said yoke member, and means including said spring disposed between portions of said yoke member and said connecting link in an axial direction away from said yoke member.

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