May 16, 1944. W. MORGAN 2,349,104

WIRE DRAWING MACHINE

Filed Aug. 29, 1941

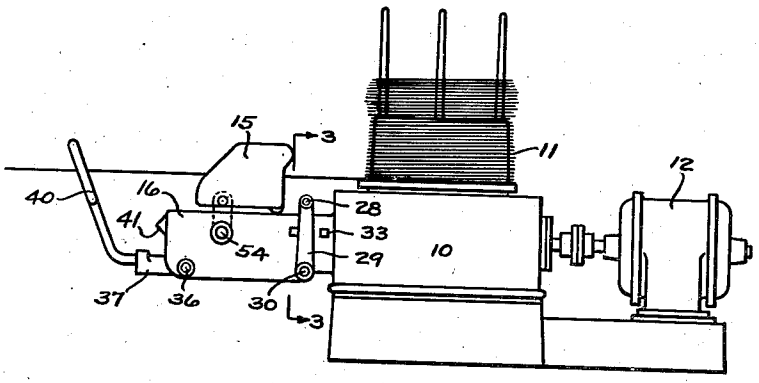


Fig. 1

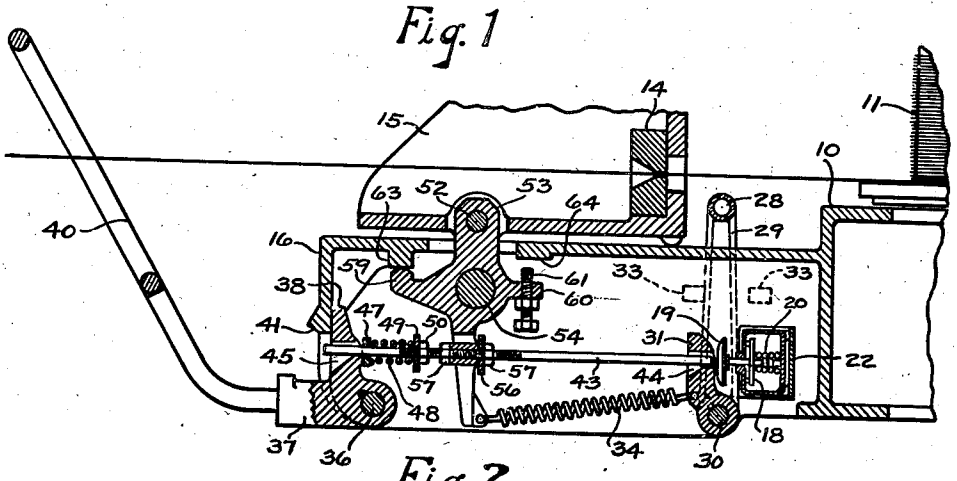


Fig. 2

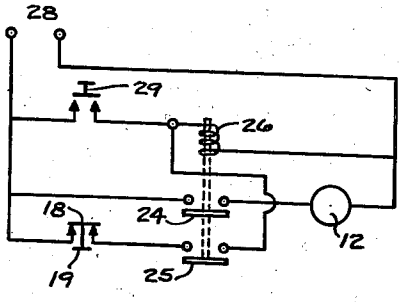


Fig. 4

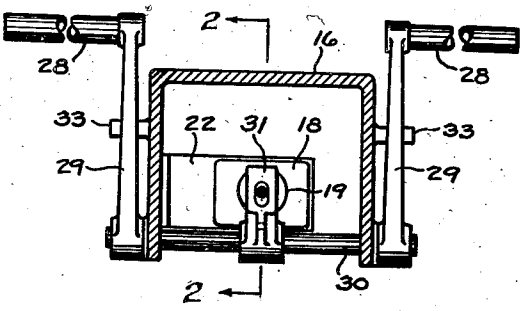


Fig. 3

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WIRE-DRAWING MACHINE

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13 Claims. (Cl. 205—16)

This invention relates to wire drawing machines, and more particularly to the construction and arrangement of safety mechanisms for stopping such machines under certain circumstances.

For example, it is important to stop the machine if the operator becomes caught by any of the moving parts, or if a snarl forms in the wire approaching the die, or if the wire breaks. Various mechanisms have been proposed heretofore for the purpose, but these prior constructions have been complicated and expensive, and they have required considerable electrical apparatus in the form of switches and the like.

It is accordingly one object of the invention to provide a wire drawing machine having a comparatively simple and inexpensive safety stop mechanism.

It is a further object of the invention to provide a wire drawing machine having a single safety stop switch which will be actuated automatically if the operator becomes caught in the machine, or if a snarl approaches the die, or if the wire breaks.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawing illustrating one embodiment of the invention and in which like reference numerals indicate like parts,

Fig. 1 is a side elevation of a wire drawing machine;

Fig. 2 is an enlarged sectional view of a portion of the machine, the section being taken on the line 2—2 of Fig. 3;

Fig. 3 is a section on the line 3—3 of Fig. 1; and

Fig. 4 is an electrical wiring diagram.

The embodiment illustrated comprises a hollow frame or casing 10 which serves to support a vertical rotatable block 11 of well known construction. This block is driven by an electric motor 12 which is connected to the block by suitable gearing (not shown) within the casing 10. The block 11 serves to draw wire through a die 14 mounted in a die box or holder 15. Directly beneath the die box there is provided a bracket 16 shaped as an inverted U in vertical cross-section and projecting outwardly from one side of the casing 10. Within the inner end portion of the bracket 16 there is mounted a safety stop device in the form of a push button switch 18 with its operating button 19 located on the outer side of the switch. This switch 18 is normally held closed by a light compression spring 20. The switch is secured to a flanged member 22 carried by one side wall of the bracket 16.

Referring now to Fig. 4, it will be seen that in order to control the motor 12 a line contactor is provided having two normally open switches 24 and 25, and a coil 26. The switch 24 controls the energization of the motor 12 from a suitable electrical source 28. The switch 25 is connected in series with the safety switch 18 and the coil 26. This coil 26 is also connected in series with a normally open push button 29. To start the motor it is merely necessary to close the push button 29 momentarily, thus energizing the coil 26 and closing the switches 24 and 25. Thereupon the push button 29 may be released, and the coil 26 will remain energized through the safety switch 18 and the switch 25. Whenever the safety switch is opened, the coil 26 will be de-energized, the switches 24 and 25 will open, and the motor 12 will stop.

Provision is made to open the safety switch 18 in the event the operator should become caught by the wire or by the rotating block. For this purpose two horizontal safety bars 28 are mounted on the upper ends of upright arms 29 at opposite sides of the bracket 16. The lower ends of the arms 29 are secured to the opposite ends of a horizontal shaft 30 journaled in the side walls of the bracket 16 and extending across the same beneath the switch 18. A short arm 31 is secured to the central portion of the shaft 30 and extends upwardly adjacent the outer surface of the push button 19. Suitable stops 33 are provided on the bracket 16 to limit the movements of the arms 29, and a coiled tension spring 34 is connected at its inner end to the arm 31 to bias the same outwardly away from the button 19. It will be apparent that if the safety bars 28 are moved inwardly toward the casing 10, the shaft 30 will be rocked, and the arm 31 will swing inwardly to engage the button 19 and open the switch 18.

Means is also provided to open the safety switch in the event a snarl of wire approaches the die box 15. For this purpose a transverse horizontal shaft 36 is suitably journaled in the side walls of the bracket 16 in the lower outer portion thereof, and on the central part of this shaft there is mounted a hub 37 having an arm 38 extending upwardly therefrom within the bracket. A snarl loop 40 extends outwardly and upwardly from the hub 37 into the path of the

wire as it approaches the die box 15. The weight of the snarl loop normally holds the arm 38 outwardly against the wall of the bracket 16, as shown in Fig. 2. Inward movement of the snarl loop is limited by engagement of the hub 37 with a shoulder 41 on the bracket. In order to connect the snarl loop with the safety switch, a horizontal rod 43 is provided. The inner end of this rod extends through an opening or recess 44 in the arm 31 into proximity with the push button 19, while the outer end extends through an opening 45 in the arm 38. A washer 47 is slidably mounted on the rod 43 adjacent the inner side of the arm 38, and a coiled compression spring 48 surrounds the rod inwardly of the washer. The inner end of this spring engages a washer 49 supported by a nut 50 threaded on the rod. The spring 48 is normally fully extended, and it is so proportioned that with a comparatively small deflection it will provide sufficient force to overcome the spring 20 in the safety switch. With this construction, a snarl in the wire approaching the die box will engage the loop 40 and move it inwardly, causing the arm 38 to compress the spring 48 and slide the rod 43 inwardly against the push button 19, thus opening the switch 18 and stopping the motor 12. During the brief interval required for the motor to come to a complete stop, the snarl loop will continue to move inwardly, such movement being permitted by the spring 48.

It is also important to open the safety switch in the event the wire breaks or the supply thereof becomes exhausted. For this purpose the die box 15 is pivotally connected by a transverse pin 52 to the upper arm of an upright lever 53 which is supported on a transverse fulcrum pin 54 in the bracket 16. The inner end portion of the die box rests slidably upon the upper surface of the bracket. The lower arm of the lever 53 is bifurcated and straddles the rod 43 inwardly of the nut 50. The lower end of the lever is connected to the outer end of the tension spring 34. The bifurcated portion of the lever is arranged to engage a shoulder or abutment in the form of a washer 56 adjustably secured to the rod 43 by means of nuts 57, this washer being located at the inner side of the lever. In order to limit the movements of the lever 53 about its fulcrum pin 54, the lever is provided with an outwardly projecting lug 59 and an inwardly projecting lug 60, the latter having an adjustable upright screw 61 mounted therein. The lug 59 serves to limit clockwise movement of the lever by engaging a boss 63 on the bracket, while the screw 61 limits counterclockwise movement by engaging a boss 64 on the bracket. The spring 34 has sufficient strength to swing the lever 53 in a counterclockwise direction when no wire is being drawn and thereby slide the rod 43 inwardly and open the safety switch 18, but not sufficient strength to swing the lever against the pull of the wire when wire is being drawn.

The operation of the invention will now be apparent from the above disclosure. So long as wire is being drawn through the die 14 by the rotating block 11, there will be sufficient pull on the die box 15 to swing the lever 53 in opposition to the force of the spring 34 and hold the lug 59 in contact with the boss 63. If the wire breaks or the supply becomes exhausted, the pull on the die box will immediately cease, and the spring 34 will swing the lever 53 to bring the screw 61 against the boss 64. At the same time the lever 53 will slide the rod 43 inwardly against the push button 19 and open the switch 18, thereby stopping the motor 12. If the wire approaching the die box becomes snarled, the loop 40 will be swung inwardly, swinging the arm 38 inwardly against the washer 47. This will slide the rod 43 inwardly and open the switch 18 to stop the motor 12. During the brief interval required for the motor to come to rest, the spring 48 will be compressed to allow still further inward movement of the loop 40 under the influence of the snarled wire, so that no breakage of the parts will occur. If the operator becomes caught in the machine, he need merely push either of the safety bars 28 inwardly to swing the arm 31 against the push button 19 and thus stop the motor 12.

The entire safety stop mechanism is simple, compact and relatively inexpensive. Only one safety switch is required, and this is of a simple type readily obtainable in the market.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A wire drawing machine comprising a die, a rotatable block arranged to draw wire through the die, means supporting the die for a limited movement in the general direction of the wire travel therethrough, biasing means yieldably urging the die in a direction opposite to the direction of wire travel therethrough but with a force insufficient to overcome the pull of the wire leaving the die, a safety stop switch for the block, means to actuate the switch when the die is moved by the biasing means, a movable snarl loop in a position to be engaged by snarls in the wire approaching the die, a substantially horizontal safety bar located adjacent the die and movable transversely in a direction toward the block, and connections whereby both the snarl loop and the safety bar may actuate the stop switch independently of die movement.

2. A wire drawing machine comprising a die, a rotatable block arranged to draw wire substantially horizontally through the die, means supporting the die for a limited movement in the general direction of the wire travel therethrough, biasing means yieldably urging the die in a direction opposite to the direction of wire travel therethrough but with a force insufficient to overcome the pull of the wire leaving the die, a substantially horizontal slidable rod mounted beneath the die and extending substantially parallel with the wire traveling therethrough, a safety stop switch for the block located adjacent one end of the rod in position to be actuated thereby, means to slide the rod and actuate the switch when the die is moved by the biasing means, a movable safety member, and connections whereby the safety member may actuate the stop switch independently of die movement.

3. A wire drawing machine comprising a die holder, a die carried thereby, a rotatable block arranged to draw wire substantially horizontally through the die, a pivotally mounted lever connected to the die holder and so arranged that the die holder may move for a limited distance in the general direction of the wire travel through the die, a spring connected to the lever and arranged to bias the die holder in a direction opposite the direction of wire travel through the die but with a force insufficient to overcome the pull of the wire leaving the die, a substantially horizontal slidable rod mounted beneath the die holder and extending substantially parallel with the wire traveling through the die, a safety stop switch for the block located adjacent one end of the rod in position to be actuated thereby, the le-

ver engaging the rod to slide the same into switch-actuating position when moved by the spring, a movable safety member, and connections whereby the safety member may actuate the stop switch independently of the lever.

4. A wire drawing machine comprising a frame, a bracket extending outwardly from the frame, a die holder mounted above the bracket, a die carried by the die holder, a rotatable block above the frame and supported thereby, a safety stop switch for the block mounted beneath the bracket and provided with an operating button, an upright lever mounted in the bracket and connected at its upper end to the die holder in such a manner that the latter may move for a limited distance in the general direction of the wire travel through the die, a spring connected to the lever to bias the die holder in a direction opposite the direction of wire travel through the die but with a force insufficient to overcome the pull of the wire leaving the die, a substantially horizontal slidable rod aligned with the switch button to actuate the same, the lever being arranged to slide the rod and actuate the switch upon movement of the lever under the influence of the spring, a snarl loop pivotally supported on the outer portion of the bracket, and connections whereby the snarl loop may slide the rod and actuate the switch independently of the lever.

5. A wire drawing machine comprising a frame, a bracket extending outwardly from the frame, a die holder mounted above the bracket, a die carried by the die holder, a rotatable block above the frame and supported thereby, a safety stop switch for the block mounted beneath the bracket and provided with an outwardly facing operating button, an upright lever mounted in the bracket and connected at its upper end to the die holder in such a manner that the latter may move for a limited distance in the general direction of the wire travel through the die, a spring connected to the lever to bias the die holder in a direction opposite the direction of wire travel through the die but with a force insufficient to overcome the pull of the wire leaving the die, a substantially horizontal slidable rod aligned with the switch button to actuate the same, the lower end of the lever being arranged to slide the rod inwardly and actuate the switch upon movement of the lever under the influence of the spring, a snarl loop pivotally supported on the outer portion of the bracket, and connections whereby the snarl loop may slide the rod inwardly and actuate the switch independently of the lever.

6. A wire drawing machine comprising a frame, a bracket extending outwardly from the frame, a die holder mounted above the bracket, a die carried by the die holder, a rotatable block above the frame and supported thereby, a safety stop switch for the block mounted beneath the inner portion of the bracket and provided with an outwardly facing operating button, an upright lever mounted in the bracket and connected at its upper end to the die holder in such a manner that the latter may move for a limited distance in the general direction of the wire travel through the die, a spring connected to the lever to bias the die holder in a direction opposite the direction of wire travel through the die but with a force insufficient to overcome the pull of the wire leaving the die, a substantially horizontal slidable rod aligned with the switch button to actuate the same, the lower end of the lever being arranged to slide the rod inwardly and actuate the switch upon movement of the lever under the influence of the spring, a snarl loop pivotally supported on the outer portion of the bracket, connections whereby the snarl loop may slide the rod inwardly and actuate the switch independently of the lever, a substantially horizontal safety bar pivotally supported on the inner portion of the bracket, and connections whereby the safety bar may actuate the switch independently of the lever.

7. A wire drawing machine comprising a die holder, a die carried thereby, a rotatable block arranged to draw wire through the die, a pivotally mounted lever connected to the die holder and so arranged that the die holder may move for a limited distance in the general direction of the wire travel through the die, a spring connected to the lever and arranged to bias the die holder in a direction opposite the direction of wire travel through the die but with a force insufficient to overcome the pull of the wire leaving the die, a safety stop switch for the block, a slidable rod to actuate the stop switch and provided with a shoulder, the lever being arranged to engage the shoulder and slide the rod in the switch actuating direction when moved by the spring, a movable snarl loop in a position to be engaged by snarls in the wire approaching the die, and a spring through which the snarl loop may transmit force to the rod to slide the same in the switch actuating direction.

8. A wire drawing machine comprising a die holder, a die carried thereby, a rotatable block arranged to draw wire through the die, a pivotally mounted lever connected to the die holder and so arranged that the die holder may move for a limited distance in the general direction of the wire travel through the die, a spring connected to the lever and arranged to bias the die holder in a direction opposite the direction of wire travel through the die but with a force insufficient to overcome the pull of the wire leaving the die, a safety stop switch for the block, the stop switch being of the push-button type, a slidable rod arranged with its inner end adjacent the switch to actuate the same, the rod having two outwardly facing shoulders and the lever being arranged to engage one of said shoulders and slide the rod inwardly when moved by the spring, a coiled compression spring surrounding the rod and engaging the other shoulder, a movable snarl loop in a position to be engaged by snarls in the wire approaching the die, and an arm movable with the snarl loop to engage the outer end of the said compression spring and slide the rod to switch actuating position while allowing over-travel of the snarl loop.

9. A wire drawing machine comprising a frame, a bracket extending outwardly from the frame, a die mounted above the bracket, a rotatable block above the frame and supported thereby, a safety stop switch for the block supported by the bracket, a transverse horizontal shaft rotatably mounted in the bracket, two arms secured to the opposite ends of the shaft and extending upwardly therefrom, a horizontal safety bar mounted on the upper end of each arm, and an arm secured to the central portion of the shaft and extending upwardly therefrom in a position to actuate the stop switch when the shaft is turned by movement of the safety bars toward the frame.

10. A wire drawing machine comprising a frame, a bracket of inverted U-shaped cross-section extending outwardly from the frame, a

die mounted above the bracket, a rotatable block above the frame and supported thereby, a safety stop switch for the block mounted within the interior of the bracket, a transverse horizontal shaft journaled in the side walls of the bracket, two arms extending upwardly from the opposite ends of the shaft, a horizontal safety bar mounted on the upper end of each arm, and means mounted on the shaft within the bracket to actuate the stop switch when the safety bars are moved toward the frame.

11. A wire drawing machine comprising a frame, a bracket of inverted U-shaped cross-section extending outwardly from the frame, a die holder above the bracket, a die mounted in the die holder, a rotatable block above the frame and supported thereby, a safety stop switch for the block mounted within the inner end portion of the bracket and provided with an outwardly facing operating button, an upright lever mounted in the bracket and connected at its upper end to the die holder in such a manner that the latter may move for a limited distance in the general direction of the wire travel through the die, a spring connected to the lever and tending to swing the lower portion thereof inwardly but with a force insufficient to overcome the pull of the wire leaving the die, a slidable rod aligned with the switch button to actuate the same and provided with an outwardly facing shoulder in position to be engaged by the lower portion of the lever, a snarl loop pivotally supported by a transverse shaft mounted in the outer portion of the bracket, an abutment on the rod outwardly of the lever, a coiled compression spring surrounding the rod at the outer side of the abutment, and an arm movable with the snarl loop and arranged to apply pressure to the outer end of the compression spring and thereby slide the rod to switch-actuating position as the snarl loop swings inwardly.

12. A wire drawing machine comprising a frame, a bracket of inverted U-shaped cross-section extending outwardly from the frame, a die holder above the bracket, a die mounted in the die holder, a rotatable block above the frame and supported thereby, a safety stop switch for the block mounted within the inner end portion of the bracket and provided with an outwardly facing operating button, a transverse horizontal shaft journaled in the side walls of the bracket below the switch, two arms extending upwardly from the opposite ends of the shaft, a horizontal safety bar mounted on the upper end of each arm, an arm mounted on the shaft within the bracket and arranged to actuate the switch button when the safety bars are moved inwardly toward the frame, the last-mentioned arm having a recess, a horizontal slidable rod arranged with its inner end in the recess in position to engage the switch button, a snarl loop pivotally mounted on the outer end portion of the bracket, and a yieldable connection between the snarl loop and the rod so arranged that as the snarl loop swings inwardly it will slide the rod inwardly and actuate the switch button.

13. A wire drawing machine comprising a frame, a bracket of inverted U-shaped cross-section extending outwardly from the frame, a die holder above the bracket, a die mounted in the die holder, a rotatable block above the frame and supported thereby, a safety stop switch for the block mounted within the inner end portion of the bracket and provided with an outwardly facing operating button, an upright lever mounted in the bracket and connected at its upper end to the die holder in such a manner that the latter may move for a limited distance in the general direction of the wire travel through the die, a spring connected to the lever and tending to swing the lower portion thereof inwardly but with a force insufficient to overcome the pull of the wire leaving the die, a transverse horizontal shaft journaled in the side walls of the bracket below the switch, two arms extending upwardly from the opposite ends of the shaft, a horizontal safety bar mounted on the upper end of each arm, an arm mounted on the shaft within the bracket and arranged to actuate the switch button when the safety bars are moved inwardly toward the frame, the last mentioned arm having a recess, a horizontal slidable rod arranged with its inner end in the recess in position to engage the switch button, the rod being provided with an outwardly facing shoulder in position to be engaged by the lower portion of the lever, a snarl loop pivotally supported by a transverse shaft mounted in the outer portion of the bracket, an abutment on the rod outwardly of the lever, a coiled compression spring surrounding the rod at the outer side of the abutment, and an arm movable with the snarl loop and arranged to apply pressure to the outer end of the compression spring and thereby slide the rod to switch-actuating position as the snarl loop swings inwardly.

WELD MORGAN.