SAFETY STOP FOR WIRE DRAWING MACHINE
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3 Claims

ABSTRACT OF THE DISCLOSURE

In a wire drawing apparatus where rod is payed from an overhead guide and an operator who became entangled in the rod might be dropped and injured if the rod were cut by a safety mechanism, the wire is cut only after passing through two or more dies, so that it cannot pull back.

In the operation of wire drawing machines it is customary to supply heavy wire or rod from horizontally disposed coils, up through an overhead guide, and down again into the machine where it is pulled through a plurality of drawing dies of increasingly smaller diameters. As the turns of coil rise to the overhead guide they sometimes tangle or the loops of the coil do not unwind but tend to form tight turns or kinks. It sometimes happens that when a machine operator attempts to straighten out these kinks he is caught in a tightening turn of the coil and lifted up bodily so that he strikes the overhead guide, and may have a limb torn off by the continually tightening loop of the coil turn. It is known to have safety switches that will cut off the power to the wire drawing machines when such an accident occurs, but the inertia of such mechanisms prevents them from stopping instantly, and much injury can occur even after the power has been shut off.

Our invention has the advantage that the advance of the wire or rod is stopped instantly when a human body is lifted by a wire coil.

It has the further advantage that the lifted person is not suddenly dropped again when the wire stops advancing.

Our apparatus comprises means supplying wire of indefinite length, drawing means comprising at least one drawing die for the wire, and means advancing the wire downstream of the die, and sensing means, between the supplying means and the drawing means, responsive to the presence of a human body. Our apparatus further comprises cutting means for the wire downstream of the die, and means for actuating the cutting means in response to the sensing means. In an important embodiment of our invention an overhead wire guide is positioned above the coils, and the sensing means is between a supporting means for the coils and the overhead guide. We prefer our sensing means to comprise photo-electric elements and our cutting means to comprise at least one blade pivoted so as to have its cutting edge urged through the wire essentially by the advancing of the wire itself.

A more thorough understanding of our invention may be gained from the appended drawing.

In the drawing:

FIGURE 1 shows a diagrammatic representation of the apparatus of our invention.

FIGURE 2 shows a pictorial view of an element of our invention.

Referring first to FIGURE 1 our apparatus is indicated generally by the numeral 10. Coils 11 of wire 12 are supported horizontally on a pallet 13. The gage of the wire 12 is heavy and it will be drawn down to smaller sizes in our apparatus. In many cases the wire 12 may be heavy enough to be called "rod" in the wire trade but it will be understood that the term "wire" as used in this application includes gages commonly known as rod.

We have shown the coils 11 horizontal. It is also known, however, to pay wire from coils supported vertically, as from a ram, and such means of coil supply are included within the scope of our invention. The wire 12 is payed upwardly over a trapeze guide 14, back down under a guide roll 16, around a wire drawing machine roll 17, through a first drawing die 18, onto a capstan 19, back to a roll 21, and in like manner through dies 22, 23, 24 and around capstans 26, 27, 28 and rolls 29, 31. The capstans 19, 26, 27, 28 are driven by means not shown of which many types are known. These capstans 19, 26, 27, 28 are driven in a known manner and serve to urge the advancing of the wire through the dies. Between the die 24 and the capstan 28 there is mounted a chopper 32 with two blades 33, 34 (see FIGURE 2) pivotally mounted to rotate around vertical pins 36, 37. The pins 36, 37 are rotatably supported by blocks 38, 39 and a horizontal mounting plate 41. The pins 36, 37 project through the plate 41, and are rigidly connected on the underside of the plate to lever arms 42, 43 which are urged by tension springs 44, 45 so as to close the blades together. The lever arms 42, 43 are prevented from moving in response to the springs 44, 45 by a solenoid plunger 46 urged forward by an energized solenoid coil 47. The blades 33, 34 have respective cutting edges 48, 49 between which a length 51 of wire must pass to advance from the die 24 to the capstan 28. The wire 51 is smaller in diameter than the wire 12 due to the drawing effect of the dies 18, 22, 23, 24. It would be cut off from the wire 51 by the blades 33, 34 due merely to the action of the springs 44, 45 upon the retraction of the solenoid plunger in the absence of any forward motion of the strand 51 itself, since the tension of the springs is not great enough. In operation, however, the length of wire 51 is advanced by the capstan 28 and serves to wedge the edges 48, 49 into cutting action once the blades are released against the wire. This has the advantage that if the wire is not actually advancing it will not be cut by the chopper 32. If the solenoid plunger 46 is retracted because the light beam is interrupted while the wire is stationary no harm is done, since the wire is not cut and no rethreading of the apparatus is required.

The solenoid coil 47 is electrically connected to a photocell 52 mounted somewhat upstream of and below the trapeze 14. The cell 52 is energized by a light source 53 mounted so that the beam of light will be interrupted by a body 54 carried upward toward the trapeze 14 by the wire 12. However, the aperture of the cell is great enough that the mere passage of a loop of the wire itself across the light beam will not interrupt the current flow from the cell 52. The photocell 52 is wired in a known manner to keep the solenoid plunger 46 forward against the lever arms 42, 43 so long as light energy from the source 53 reaches the cell 52. When the light beam is interrupted, however, the advancing wire 51 is immediately severed.

The actions of the capstans 19, 26, 27, 28 are such that they urge the wire only when they are wrapped under some back tension. Consequently, when the wire 51 is cut the capstans are no longer effective to advance the wire 12 even though the capstans continue to turn. Since, however, the chopper 32 is mounted downstream of the die 24, the body 54 is not immediately dropped when the wire stops moving since the friction engages the wire by the dies 18, 22, 23, 24 is sufficient to keep it from being pulled back by the weight of a human body.

In practice, we find it preferable to automatically shut off the machine power when the chopper is activated and this is readily done by wireing the apparatus in a known
manner. It will also be understood that although we have
used a photoelectric means for sensing the presence of a
body lifted by the wire 12, mechanical means such as a
lever arm connected to a limit switch may be used with
in the scope of our invention and, indeed, we prefer to
include such an additional sensing means as a precaution.

We have invented a new and useful apparatus for
which we desire an award of Letters Patent.

We claim:

1. In a wire drawing apparatus comprising means sup-
porting coils of wire for drawing, overhead guide means
for said wire positioned above said coils at an elevation
sufficient to cause injury to a person dropped therefrom,
a plurality of drawing dies for said wire, and means ad-
vanclng said wire downstream through said dies, the im-
provement comprising:

(A) sensing means between said supporting means and
said guide means responsive to the presence of a
human body above said supporting means,

(B) cutting means for said wire downstream of a
plurality of said dies,

(C) means actuating said cutting means in response to
said sensing means,

the dies upstream of said cutting means retaining said
wire against the weight of said body after the actuation
of said cutting means.

2. The apparatus of claim 1 wherein said sensing
means comprises a photocell.

3. The apparatus of claim 1 wherein said cutting means
comprises at least one blade pivoted so as to have its
cutting edge urged through said wire essentially by the
advancing of said wire.

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