

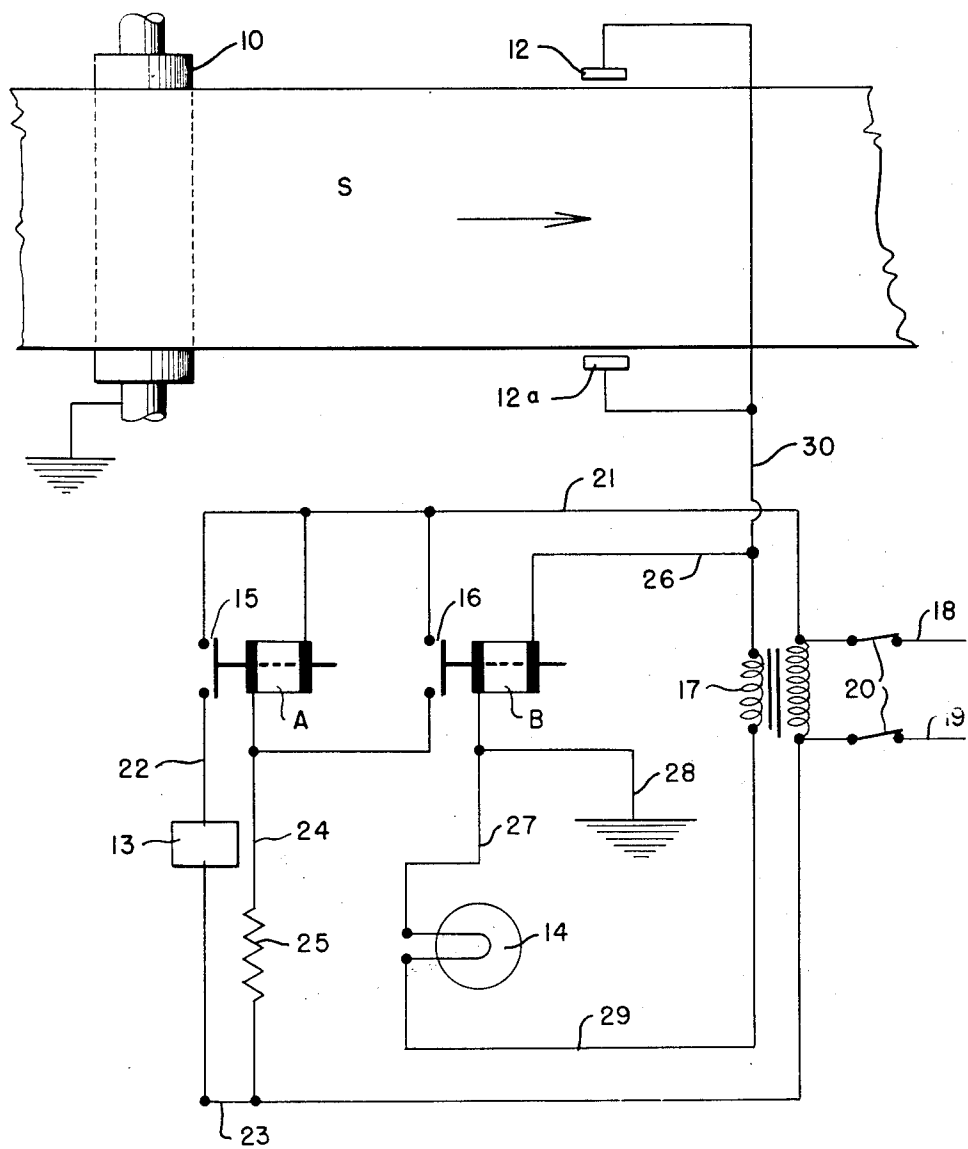
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STRIP TRACKING ALARM

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STRIP TRACKING ALARM

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This invention relates to an improved device for warning when a metal strip moving in a processing line is tracking improperly.

An object of the invention is to provide an improved device which warns of improper tracking of obscured portions of a strip, such as portions passing through a continuous annealing furnace.

A further object is to provide an improved warning device which is electrically operated and furnishes both a visual and an audible signal when a strip tracks improperly to either side.

In accomplishing these and other objects of the invention, I have provided improved details of structure, a single form of which is shown in the accompanying drawing, in which:

The single figure is a schematic plan view and a circuit diagram of a warning device which embodies features of the present invention.

The drawing shows in plan a portion of a continuous strip S traveling in a processing line. Somewhere in its length the strip passes over an electrically grounded roll 10. In accordance with the present invention, contact plates 12 and 12a are fixed at opposite sides of the strip in positions where the strip clears them as long as it tracks properly, but contacts one of them whenever it commences to track improperly. In practice such contact plates are situated wherever visibility of the strip is obscured, such as in an annealing furnace.

The warning device comprises an electrically operated audible signal 13, such as a siren or bell, and an electrically operated visual signal 14, such as a lamp. The operating means for the signals 13 and 14 includes a relay A, which has a set of contacts 15, a second relay B, which has a set of contacts 16, and a step-down transformer 17. The contacts 15 and 16 both are normally closed; that is, when their relays are not energized, they are closed and the relays must be energized to open them. However, when the strip is tracking properly, both relays are energized and these contacts are open.

The electric operating circuit includes power lines 18 and 19 connected to a suitable A. C. source and to the primary coil of the transformer 17. Preferably these lines contain a master switch 20. A conductor 21 connects line 18 to one contact of each of the sets 15 and 16 and to one end of the coil of relay A. A conductor 22 connects the other contact of set 15 with one side of the audible signal 13. A conductor 23 connects the other side of signal 13 with the line 19. A conductor 24, containing a resistance 25,

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connects both the other contact of set 16 and the other end of the coil of relay A with conductor 23 and thus with line 19. It is seen that contacts 15 are in series with the audible signal 13 so that, when they are closed, this signal is actuated. It is also seen that contacts 16 are in parallel with the coil of relay A. As already mentioned, when the strip is tracking properly, relay B is energized and its contacts 16 are open. Consequently current flows through the coil of relay A, energizes this relay and holds its contacts 15 open. When contacts 16 are closed by improper tracking of the strip, as hereinafter explained, they short-circuit the coil of relay A, which then does not receive enough current to remain energized and hence its contacts 15 close and actuate signal 13.

A conductor 26 connects one end of the secondary coil of the transformer with one end of the coil of relay B. A conductor 27 connects the other end of this coil with one side of the visual signal 14 and is grounded at 28. A conductor 29 connects the other side of signal 14 with the other end of the secondary coil of the transformer. When the strip is tracking properly, the coil of relay B thus receives current from the secondary coil of the transformer. The electrical resistance of the coil of relay B is sufficiently great that not enough current flows to actuate the visual signal 14. A conductor 30 connects both of the plates 12 and 12a with conductor 26.

Assume now that strip S contacts one of the plates 12 or 12a. A low resistance current path is thereby established from the secondary coil of the transformer 17 via conductor 30, the plate 12 or 12a, the strip S, the grounded roll 10, the grounded conductor 28, conductor 27, the visual signal 14, and conductor 29, back to the secondary coil. The current which now flows is sufficient to actuate the visual signal 14. The ground also short-circuits the coil of relay B, which no longer receives sufficient current to remain energized; consequently its contacts 16 close and short-circuit the coil of relay A to actuate the audible signal 13, as already explained. Both the visual and the audible signals remain actuated as long as the strip contacts one of the plates and thus give a continuous warning of improper tracking until that condition is corrected.

The device is particularly suited for use in a continuous annealing furnace, where view of the strip is obscured by the furnace enclosure. In such furnaces improper tracking of the strip can damage not only the strip, but also the furnace.

In electrically heated furnaces, if the strip tracks improperly, it can cut into the heating elements and short-circuit the entire furnace.

While I have shown and described only a single embodiment of the invention, it is apparent that modifications may arise. Therefore, I do not wish to be limited to the disclosure set forth but only by the scope of the appended claims.

I claim:

1. A device for warning when a metal strip tracks improperly comprising a ground connected to the strip, a contact plate which the strip normally clears but is adapted to contact when tracking improperly, a visual signal, an audible signal, and an electric circuit including a pair of relays and a step-down transformer having power lines connected to its primary coil, the contacts of one of said relays and one of said signals being connected in series across said lines, the coil of this relay also being connected across these lines, the contacts of the second relay being connected in parallel with the coil of the first relay, the coil of the second relay and the other signal being connected in series across the secondary coil of said transformer, said contact plate being connected between the secondary coil of said transformer and the coil of the second relay, the connection between the coil of the second relay and said second signal being grounded, both relays being energized when the strip is tracking properly and holding their contacts open, contact by the strip with said contact plate short-circuiting the coil of the second relay through the ground and thereby de-energizing this relay, actuating said second signal, short-circuiting the coil of the first relay, de-energizing this relay, and actuating said first signal.

2. A device for warning when a metal strip tracks improperly comprising a ground connected to the strip, a pair of contact plates on opposite sides of the strip which the strip normally clears but is adapted to contact when tracking improperly, a visual signal, an audible signal, and an electric circuit including a pair of relays and a step-down transformer having power lines connected to its primary coil, the contacts of one of said relays and said audible signal being connected in series across said lines, the coil of this relay also being connected across these lines, the contacts of the second relay being connected in parallel with the coil of the first relay, the coil

of the second relay and said visual signal being connected in series across the secondary coil of said transformer, said contact plates being connected between the secondary coil of said transformer and the coil of the second relay, the connection between the coil of the second relay and said visual signal being grounded, both relays being energized when the strip is tracking properly and holding their contacts open, contact by the strip with one of said contact plates short-circuiting the coil of the second relay through the ground and thereby de-energizing this relay, actuating said visual signal, short-circuiting the coil of the first relay, de-energizing this relay and actuating said audible signal.

3. A device for warning when a metal strip tracks improperly comprising a ground connected to the strip, a plate which the strip normally clears, the space between said plate and the strip being unobstructed to enable the strip to engage the plate as it shifts sidewise when tracking improperly, first and second relays each of which includes a coil and a set of normally closed contacts, a first signal connected in series with the contacts of said first relay, a second signal connected in series with the coil of said second relay with a ground connected therebetween, the contacts of said second relay being connected in parallel with the coil of said first relay, said plate being connected to the coil of said second relay on the opposite side from said second named ground, and an electric circuit normally energizing said relays and holding their contacts open to prevent energization of said signals, engagement of said plate by the strip short-circuiting said second relay to deenergize the relays and enable said circuit to energize said signals.

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