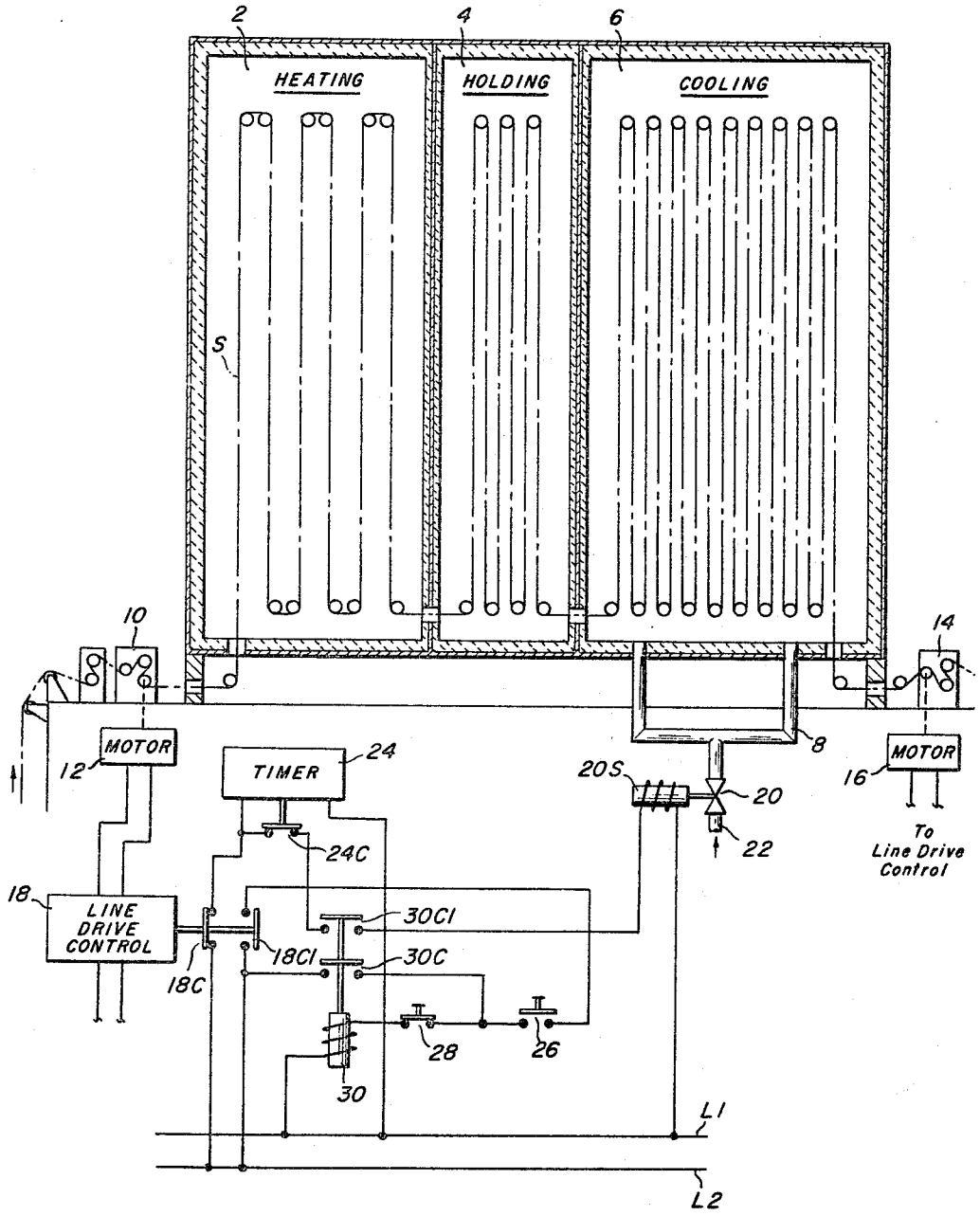
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CONTINUOUS HEAT TREATING APPARATUS

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CONTINUOUS HEAT TREATING APPARATUS

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This invention relates to apparatus for continuously heat treating a moving elongated object such as steel strip. Apparatus of this type is shown in Ferm Patent No. 2,292,511, dated August 11, 1942 and Lorig Patent No. 2,706,625, dated April 19, 1955. The strip moves continuously through a heating zone into a cooling zone which is provided with a protective atmosphere to prevent oxidation of the steel. This atmosphere is at a positive pressure so as to prevent air leakage into the furnace. When the strip stops moving for any reason the temperature in the cooling zone drops rapidly and hence the pressure of the gas also drops which can result in a negative pressure in the furnace. When this occurs air will leak into the furnace and oxidize the material being treated. As a result, the strip is not suitable for its intended purpose. Also because of contamination of the atmosphere by the air it is necessary to purge the furnace and recharge it with protective atmosphere before starting up the line. This is expensive and time consuming. In an attempt to solve this problem it has been suggested that the pressure of the protective atmosphere be increased. While this may prevent collapse of the atmosphere when the line is stopped for a short time it does not insure that the atmosphere will always remain at a positive pressure. In addition there is more tendency for the protective atmosphere to leak from the cooling chamber and it is necessary to use a substantially greater amount of the expensive atmosphere gas.

It is therefore an object of my invention to provide apparatus which will eliminate or greatly reduce the above described disadvantages.

This and other objects will be more apparent after referring to the following specification and attached drawings, in which:

The single figure is a schematic view of a continuous strip annealing furnace and the control of my invention.

Referring more particularly to the drawings, reference numeral **2** indicates the heating zone of a continuous strip annealing furnace through which the strip S passes into a holding zone **4** and hence into a cooling chamber **6**. Protective atmosphere is introduced into the cooling chamber through a manifold **8**. The protective atmosphere may be any of those commonly used. Bridle rolls **10** at the entry end of the heating zone **2** are driven by a motor **12** and bridle rolls **14** at the exit end of the cooling chamber **6** are driven by a motor **16**. A line drive control **18** is provided for controlling the movement of the strip through the line and includes an emergency stop. Additional drive motors may be provided and also controlled by the control **18**. Strip accumulators are provided before and after the bridles **10** and **14** and other standard equipment is provided. The parts so far described are conventional.

According to my invention I provide contacts **18C** and **18C1** which are connected to be operated by the emergency stop of the control **18**. The contact **18C** is closed when the line is stopped and open when the line is running. The contact **18C1** is open when the line is stopped and closed when the line is running. A solenoid operated valve **20** is inserted in conduit **22** leading from a high pressure source of protective atmosphere, not shown, to the manifold **8**. The power for operating solenoid **20S** is provided from a 110 volt alternating current source L1, L2. A timer **24** is connected in series with contact **18C** and is provided with a normally closed contact **24C**. The timer **24** may be of any conventional type that will open its contact **24C** after it has been energized for a predetermined time. Contact **18C1** is connected in series with push button switches **26** and **28** and relay coil **30** which has normally open contacts **30C** and **30C1**. Contacts **24C**, **30C1** and solenoid **20S** are connected in parallel with timer **24**. Contact **30C** is connected in parallel with contact **18C1** and switch **26**.

In operation, the strip S will pass continuously through the heating zone **2**, holding zone **4** and cooling chamber **6** with the valve **20** being closed, but with a protective atmosphere at a low pressure in the cooling chamber **6**. While the line is running switch **26** is closed. This will energize coil **30** through switch **28** and closed contact **18C1**. Energization of coil **30** closes its contacts **30C** and **30C1**. Closing of contact **30C** seals in coil **30** and push button switch **26** can be opened. Since contact **18C** is open, closing of contact **30C1** will have no effect. When the line stops, contact **18C** will close and contact **18C1** will open. Closing of contact **18C** starts timer **24** in operation and also energizes solenoid **20S** through contacts **24C** and **30C1**. Thus valve **20** will open immediately upon the signal for stoppage of the line and permits sufficient atmosphere to pass into the cooling chamber **6** to maintain it at a positive pressure. After a preset time the timer **24** will cause its contact **24C** to open, thus deenergizing solenoid **20S** and closing valve **20**. The solenoid **20S** may be deenergized at any time while the timer **24** is operating by opening switch **28**. After the line is started up again switch **26** is again closed to place the control on automatic.

While one embodiment of my invention has been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. Apparatus for continuously heat treating a moving elongated object which comprises a heating zone for said strip, a cooling chamber for said strip, means including a conduit for delivering a protective atmosphere to said cooling chamber, a normally closed valve in said conduit for controlling flow of protective atmosphere to said cooling chamber, means for moving said object successively through said heating zone and said cooling chamber, and means for automatically opening said valve when movement of said object through said cooling chamber begins to stop to admit protective atmosphere.

2. Apparatus for continuously heat treating a moving elongated object which comprises a heating zone, a cooling chamber, means including a conduit for delivering a protective atmosphere to said cooling chamber, a normally closed valve in said conduit for controlling flow of protective atmosphere to said cooling chamber, means for moving said object successively through said heating zone and said cooling chamber, a solenoid for operating said valve, a circuit including said solenoid, a timer, said timer having a contact in series with said solenoid, and means operable when said object begins to stop moving through said cooling chamber to complete said circuit whereby said solenoid will open said valve for a predetermined time, said timer contact opening after a predetermined time interval to cause said valve to close.

3. Apparatus for continuously heat treating a moving elongated object which comprises a heating zone for said strip, a cooling chamber for said strip, means including a conduit for delivering a protective atmosphere to said cooling chamber, a normally closed valve in said conduit for controlling flow of protective atmosphere to said cooling chamber, means for moving said object successively through said heating zone and said cooling chamber, control means for stopping and starting movement of said object moving means, and means operable by said

control means when movement of said object begins to stop and open said valve to admit protective atmosphere.

4. Apparatus for continuously heat treating a moving elongated object which comprises a heating zone, a cooling chamber, means including a conduit for delivering a protective atmosphere to said cooling chamber, a normally closed valve in said conduit for controlling flow of protective atmosphere to said cooling chamber, means for moving said object successively through said heating zone and said cooling chamber, control means for stopping and starting movement of said object moving means, a solenoid for operating said valve, a circuit including said solenoid, a timer, and means operable by said control means for actuating said timer and completing said circuit when said object begins to stop moving through said cooling chamber whereby said solenoid will open said valve for a predetermined time.

5. Apparatus for continuously heat treating a moving elongated object which comprises a heating zone, a cooling chamber, means including a conduit for delivering a protective atmosphere to said cooling chamber, a normally closed valve in said conduit for controlling flow

of protective atmosphere to said cooling chamber, means for moving said object successively through said heating zone and said cooling chamber, control means for stopping and starting movement of said object, a solenoid for operating said valve, a circuit including said solenoid, a timer having a contact in series with said solenoid, and means operable by said control means for actuating said timer and completing said circuit when said object begins to stop moving through said cooling chamber whereby said solenoid will open said valve for a predetermined time, said timer opening its contact after a predetermined time interval to deenergize said circuit and cause said valve to close.

References Cited by the Examiner

UNITED STATES PATENTS

2,009,856	7/1935	Otis et al.	263—3
2,534,973	12/1950	Ipsen et al.	266—3
2,838,296	6/1958	White	263—3

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