April 23, 1963 R. J. RUFF ETAL 3,086,763

RETRACTABLE INFRA-RED HEATER

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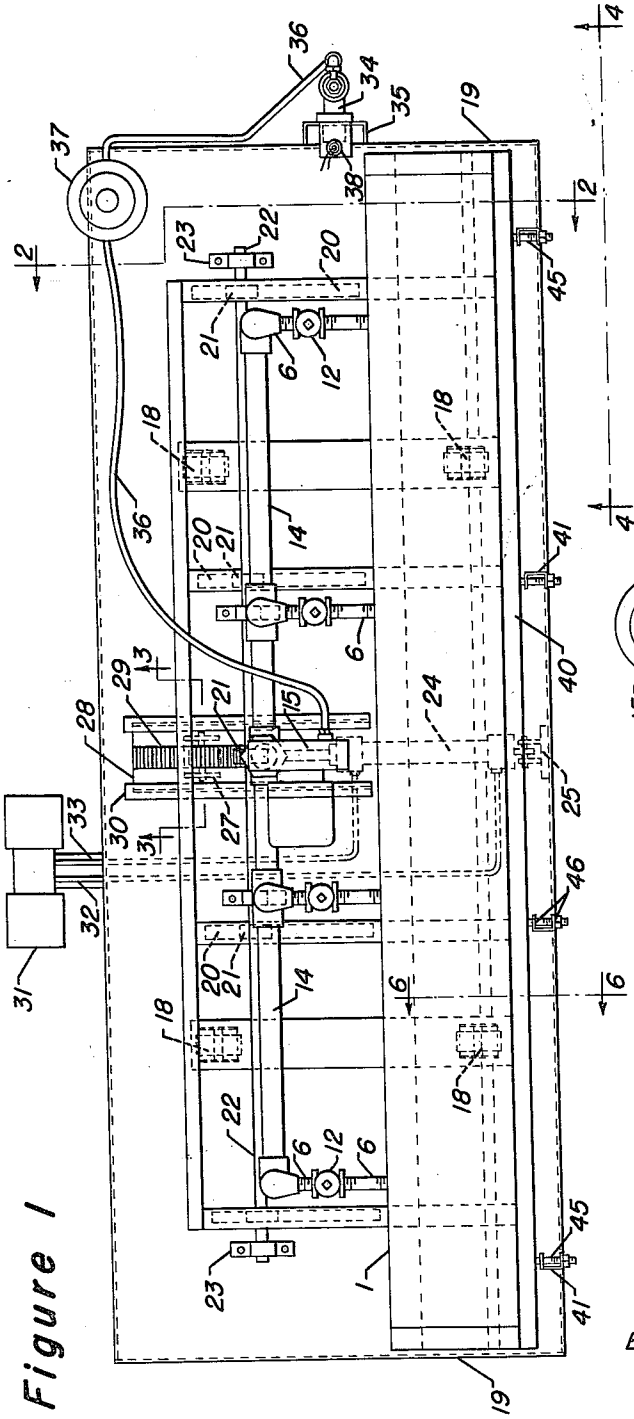


Figure 1

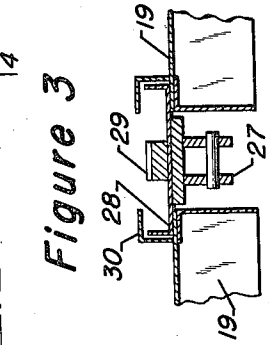


Figure 3

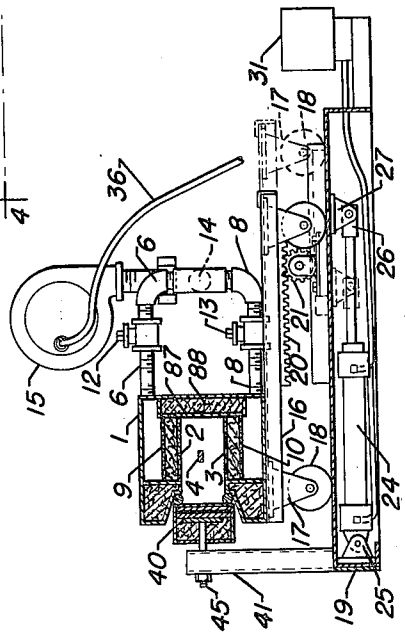


Figure 2

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Figure 4

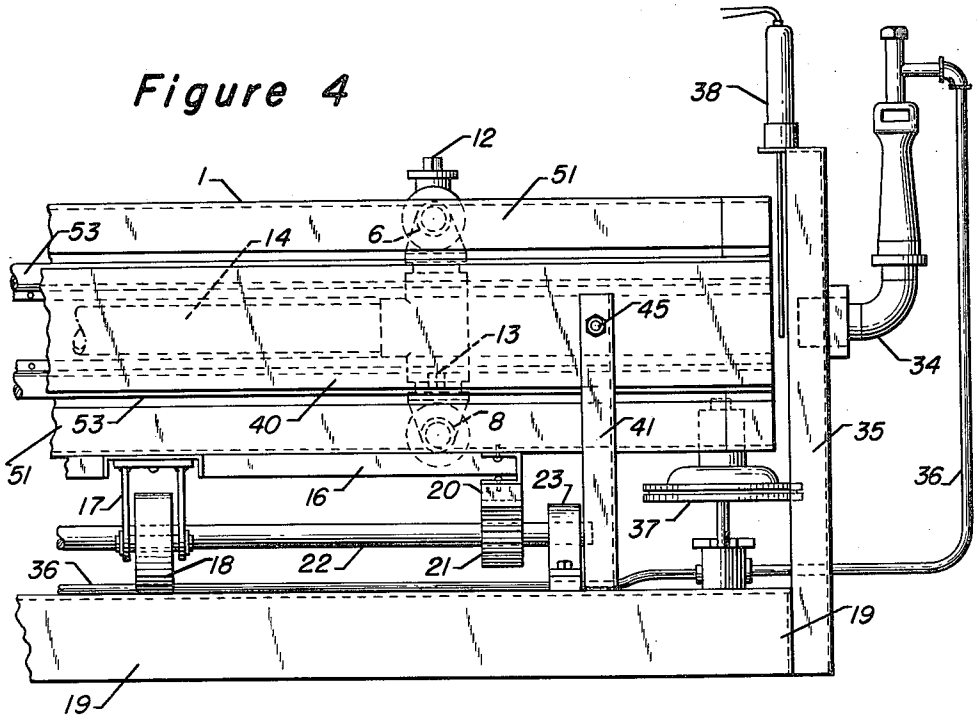
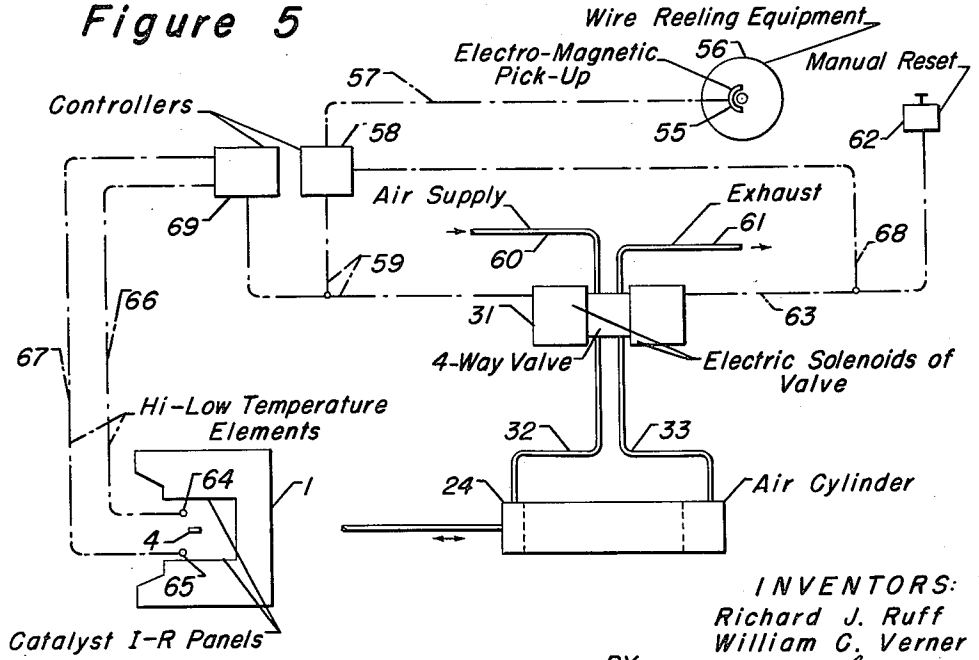


Figure 5



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RETRACTABLE INFRA-RED HEATER

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Figure 6

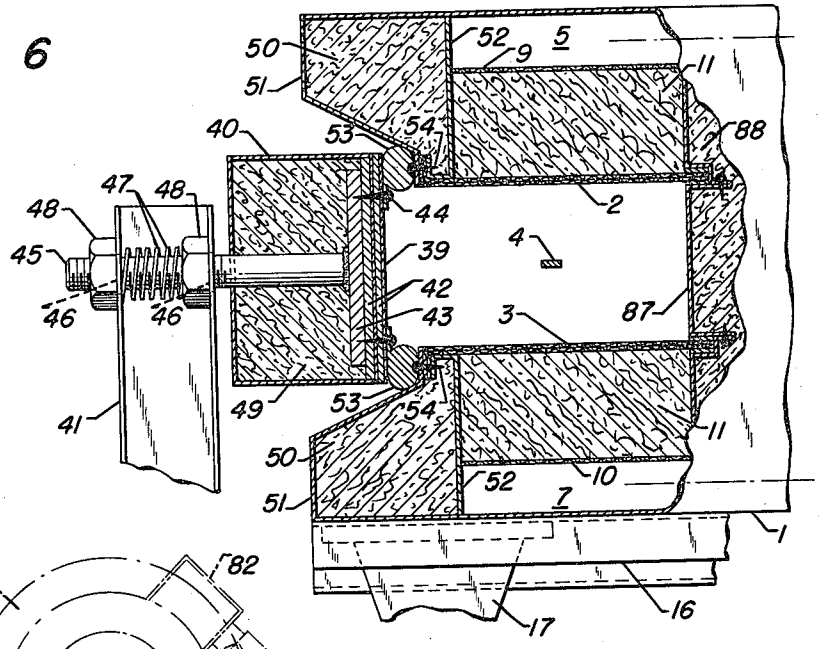
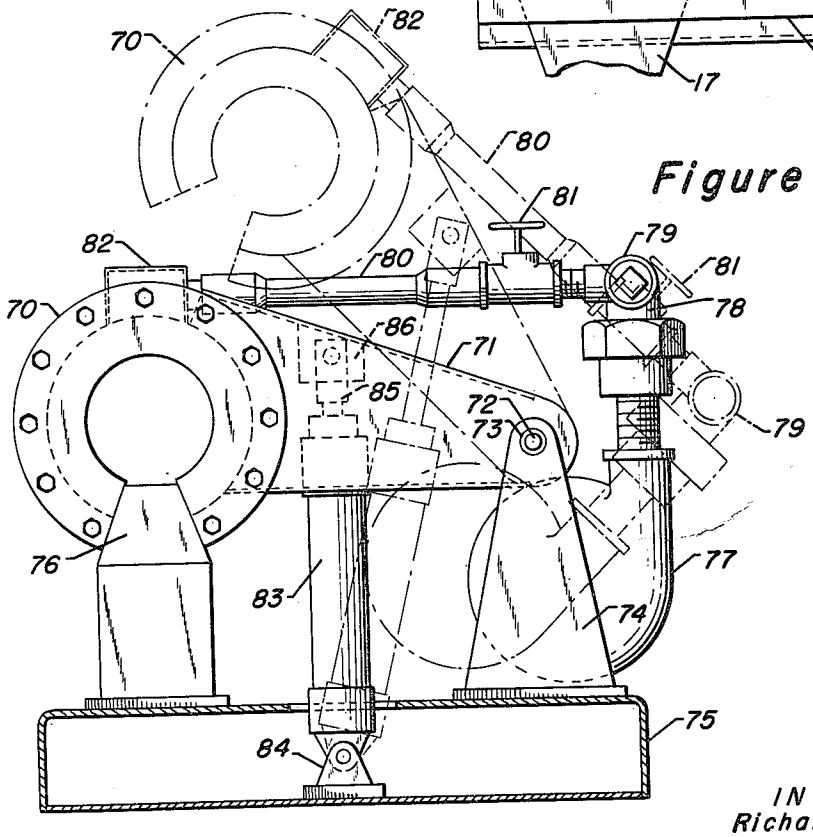


Figure 7



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RETRACTABLE INFRA-RED HEATER

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10 Claims. (Cl. 263—3)

This invention relates to a novel elongated tubular infra-red heating apparatus and more particularly to an apparatus arrangement providing for a rapid retractable movement of the heating section when there is a slow-down or stoppage of the material being heat treated in the unit.

Usual types of radiant heating units are not readily adjusted or controlled to give optimum heating, and are generally mounted in fixed positions such that it is difficult or impossible to utilize them for certain types of heating operations. For example, in effecting the heat treatment of certain types of materials or coatings, it is necessary that the heating operation be carried out while the material is in motion, or for only short periods of time, such that there is no melting or other damage caused to the material by reason of over-exposure or excess heating.

It is an object of the present invention to provide a movable infra-red heating unit which may be automatically moved away from the line of action of the material being heat treated.

It is another object of the present invention to provide a movable infra-red heating unit which may be retracted away from a moving line of material or work responsive to a stoppage, or slow-down, in the movement of such material through the heating section.

It is a still further object of the present invention to provide a novel construction and arrangement for an infra-red heating apparatus that utilizes opposing infra-red heating elements in a manner forming an open-ended tubular heating section, which section can in turn be moved rapidly away from material being heat treated when the flow of the material is stopped.

In a broad embodiment, the present invention provides a retractable heating apparatus adapted to heat treating normally moving material, which comprises in combination, an open-sided radiant heating section, a movable supporting frame attached to the heating section, air and fuel supply conduit means connecting with the heating section, guided movement means for the supporting frame providing reciprocatory movement of the frame through a short defined path, motive powered means connecting with the supporting frame that is operative to move the latter and the heating section back and forth along said defined path, at least one movement sensing element positioned adjacent to and in association with the moving material passing through the heating section, with said sensing element connecting with a control means which in turn connects with said motive powered means whereby the latter is operated responsive to a signal from said sensing element indicating a change in the rate of movement, and whereby the frame and heating section are retracted along said defined path away from the material being heat treated.

For example in effecting the heat treatment of a continuous strand of a coated or wrapped wire, or of a plurality of separate coated elements being carried by conveyor means through heating apparatus, it is, in many instances, necessary that the high temperature radiant heat be rapidly stopped or discontinued when there is a slow-down or stoppage of such material being heat treated, such that there is no overheating and resulting damage. Infra-red heating means is highly useful in many operations to provide a desired high temperature uniform heat for the rapid fusing of a material, or rapid drying, annealing, baking, etc.; however, temperatures of 1000° F. or more, will obviously effect the melting of a copper wire or the scorching of a particular type of coating if there is over-exposure, such that it is highly desirable to have means to effect a rapid lowering of temperature upon a stoppage of the work stream. The present invention is of a particular advantage in that it provides means for rapidly moving the actual heating section of the apparatus away from the material or work that is being heat treated. The present construction and arrangement utilizes an elongated open-sided heating section that can encompass the material being heat treated and at the same time, when properly triggered into action, move away from the material substantially instantaneously upon the stoppage of the work stream or upon the slow-down of the working material. For example, when heat treating a continuous strand of a material, such as coated wire, an electromagnetic pick-up, or a mechanical tachometer may be mounted in connection with the reeling equipment, or rollers, or conveyors, or the like, which are utilized to assist in the movement of the material. Such pick-up means or tachometer means may be connected with an amplification means and/or other control means, which in turn will operate a motor or air cylinder means that is connected to the heating unit of the apparatus such that the latter moves responsive to a signal from the pick-up or sensing means. The sensing means is adjusted to operate the control means upon noting a slow-down or stoppage of the work stream.

In a more specific embodiment of the present invention, there is provided a retractable radiant heating apparatus adapted for use in heating normally moving material, which comprises in combination, opposing and spaced elongated radiant heating sections, a wall section connecting one opposing set or pair of edges of the spaced heating sections and forming thereby an open-sided elongated heating unit having a U-shaped cross section, framing means supporting the heating unit, air and fuel supply conduit means to the spaced heating sections, a base member and movable guide means connective between the base member and the frame providing reciprocating movement of the latter in a defined path with respect to said base, motive powered means connecting to said frame that is operative to move the heating unit back and forth along said defined path to alternative positions, an elongated substantially fixed wall section supported from the base member in a position opposing the open side of the U-shaped heating unit and forming thereby a closure when the heating unit is in a position to heat the material passing therethrough, with said fixed wall section further forming thereby an open-ended tubular heating unit for the moving material to be passed therethrough, at least one movement sensing element positioned adjacent to and associated with the material moving through the heating unit, and control means connecting between said sensing element and said motive powered means whereby the latter is operated responsive to a signal from the sensing element and whereby the frame and heating unit are retracted along said path away from the material being heat treated when there is sensed a predetermined decreased movement thereof.

The present invention may be more easily described and advantageous features thereof set forth by reference to the accompanying drawings and the following description thereof.

FIGURE 1 of the drawing is a diagrammatic plan view of one embodiment of the present invention, as may be advantageously used in the heat treating of a continuous strand of wire-like material.

FIGURE 2 is a sectional elevation view through one end of the apparatus, as indicated by the line 2—2 shown in FIGURE 1.

FIGURE 3 is a partial sectional view, showing means for the connection of one end of an air cylinder with a toothed-racked driving means, as indicated by line 3—3 in FIGURE 1 of the drawing.

FIGURE 4 is a partial elevational view showing one end portion of the apparatus, as indicated by line 4—4 in FIGURE 1.

FIGURE 5 is a diagrammatic drawing showing one control means for having a movement sensing element and temperature sensitive elements connecting with the power means for effecting movement of the heating unit.

FIGURE 6 is a partial sectional elevational view through the heating elements and the closure wall section for the U-shaped heating section.

FIGURE 7 of the drawing is a diagrammatic elevational view showing a modified form for the heating section and an alternative type of movement for retracting or otherwise moving the heating section away from the line of material being heated.

Referring now specifically to the drawings, there is shown a heating chamber **1** which is divided into two radiant heat sections providing upper catalytic screens **2** and lower catalytic screens **3**. In the present embodiment the screens are arranged to oppose one another in providing high temperature radiant heating surfaces which in turn are adapted to transmit radiant heat to a moving strand of material, such as a coated wire **4**. It is also a feature of the present heating unit to have an adjustable temperature, being designed to receive fuel and air into an upper distributing chamber **5** from a plurality of spaced piping or conduit means **6**, and into a lower distributing chamber **7** that receives fuel and air by the way of the plurality of spaced piping means **8**. The fuel and air mixture is further diffused by means of screens **9** and **10**, in the upper and lower sections respectively, and by a packing material **11**, which may comprise steel wool and other similar types of flame proof wool-like material suitable for effecting a slight pressure drop and uniform distribution of the gaseous stream into the outer screen members **2** and **3**. As is more clearly shown in FIGURE 6 of the drawing, the outer screens **2** and **3** may actually comprise two or more screens or gauze-like members. Such screens are catalytically activated to provide for the oxidation of the fuel and air mixture at a temperature below the flame point, whereby there is a resulting radiant h eating surface providing adjustable infra-red heating to the interior of the heating unit and to material passing therethrough, such as the "bus-bar" **4** illustrated in the drawing. The coating of the catalytic screens may be in accordance with that shown and described in U.S. Patent No. 2,658,742, issued November 10, 1953, to H. R. Suter, et al., and reference is made to this patent for further description of the catalytically activated members. By proper adjustment of the fuel and air supply to the distributing chambers **5** and **7** and thence to the catalytically impregnated screens **2** and **3** at a slow velocity, there may be varying degrees of infra-red heat radiated from the heating elements in a flameless manner. Suitable control valves **12** and **13**, in the respective lines **6** and **8**, provide means for adjusting the fuel supply to the various portions of the elongated chamber **5** and **7**. The plurality of lines **6** and **8** receive fuel from the distributing conduit **14** and the latter in turn receives a fuel and air mixture from the premixing fuel and air blower **15**. The latter, of course, effects the mixing of air with a gaseous or vaporized fuel, such as propane or other bottled gas, or with natural gas, from a suitable supply source not shown. The interior end portions of the spaced screens **2** and **3** are connected to an interior wall section **87**. The latter is preferably of a polished alloy such that it is heat resistant and heat reflective. An insulating mineral wool **88** is mounted behind the plate **87** to protect the exterior wall of chamber **1**.

The heating chamber **1** is supported on a frame **16** which in turn is supported by a plurality of bearings **17** and rollers **18**, so that it may move back and forth in a suitably guided manner on top of a base member **19**. The lower side of frame **16** is provided with spaced toothed racked members **20** which in turn engage with and are aligned with a plurality of spaced spur gear members **21**. The latter are mounted on and attached to a shaft **22** which extends longitudinally and parallel with chamber **1** below the frame and below the plurality of racks **20**. Shaft **22** is in turn supported from spaced pillow-block bearings **23** that in turn rest upon the base member **19**. The racks **20**, as shown in the drawing, are at right angles with respect to the shaft member **22** and the heating chamber **1** such that the rotation of shaft **22** and the spur gears **21** will cause the toothed racks to move and in turn move the supporting frame **16** and the elongated heating chamber **1**.

In the construction and arrangement of the present embodiment, the turning of the shaft **22** and the movement of the frame **16** is effected by an air cylinder which is operative to move its connecting rod end **26** in a reciprocating motion. As best shown in FIGURES 2 and 3 of the drawing, there is indicated an air cylinder **24** having a non-movable end thereof connecting with a bearing member **25** which in turn is fixed to the base member **19**, while the movable piston end **26** of the air cylinder **24** connects with a bearing member **27** that in turn connects with a rack plate **28**. A toothed-rack **29** is welded or otherwise attached to the supporting plate **28** such that they both move back and forth responsive to the reciprocating movement of the air cylinder **24**. The travel of the toothed-rack **29** as well as the opposing movement of the frame **16** is controlled by the adjustment of the travel of the air cylinder piston and the resulting movement of the piston end **26**. The rack plate **28** is indicated as being guided and maintained in alignment on top of the base member **19** by means of guide member **30** which in turn are welded or otherwise attached to the top of base member **19**. One spur gear **21** on shaft **22** is maintained in engagement with the lower rack member **29** such that when the latter moves it will cause the shaft to rotate the other spaced spur gears **21**, which are maintained in alignment and in engagement with the plurality of spaced toothed-racks **20**, to effect a resulting movement of the frame **16** and the heating chamber **1**. Of course, by virtue of the rack and gear alignment which is utilized, the movement of the lower rack **29** in one direction will cause the opposite (180°) movement of the upper rack members **20** and frame **16**.

Where an air cylinder is used as the motive power to effect the movement of the frame and heating chamber, a suitable solenoid operated four-way valve, such as valve **31** having the connecting air lines **32** and **33**, will effect the desired reciprocatory action to the air cylinder **24** to in turn provide the desired movement of the frame. It is not intended, however, to limit the present invention and movement of the heat unit to the use of an air cylinder, in as much as electric motor means with a chain or gear drive, or combination thereof, may well be utilized to effect the reciprocating motion of the heating chamber and supporting frame. One means for effecting the automatic movement of the heating chamber by the action of the air cylinder or other motive powered means, responsive to one or more sensing elements will be more fully set forth in connection with the subsequent description of FIGURE 5 of the drawing.

Ignition means for the infra-red heating section of the apparatus may be provided by the use of a pilot burner **34**, such as is mounted at the end of the apparatus, in the present embodiment, on supporting post **35** extending upwardly from the base member **19**. Fuel is supplied to the burner **34** by means of a line **36** having control valve **37** that is in turn connective with the fuel and air mixing

blower 15. As is best noted in FIGURE 1, the pilot burner 34 is positioned such that it is in alignment with the open end of the tubular heating chamber 1 when the latter is in a retracted position, shown in dashed lines. When in operation, the heating section remains ignited and receives fuel by way of the header 14 and distributing lines 6 and 8 with fuel entering the heating elements when either in an operating position or a retracted position. However, when the unit has once been shut down for a period of time and has to be lighted again, such preheating and igniting can only take place in the retracted position. A glow plug 38 is also mounted on the supporting post 35 and aligned in front of the burner 34 such that by manual operation of a starting button the glow plug 38 can be caused to glow and ignite a fuel and air mixture passing from the end of burner 34 as valve 37 permits flow of fuel through line 36 to burner 34. Resulting hot flames and gases from the end of burner 34 will pass into the open end of the retracted heating chamber 1 and contact the face of the catalytic grids 2 and 3 such that as fuel is permitted to pass through each of the plurality of valves 12 and 13 in the respective fuel distributing lines 6 and 8, there is an ignition of the gas at the face of the screen or gauze members 2 and 3. The velocity of the fuel supply stream is maintained low so that there is a resulting flameless infra-red radiant heat emitted from the heating elements. After the latter have been ignited and are ready for operation to effect the heat treatment of the material passing through the unit, the heating chamber 1 is also ready for moving into operation by the movable supporting frame and the air cylinder 24, or other motive powered means. After the infra-red heating elements have been ignited, the pilot burner 34 may have its fuel supply discontinued and the glow plug turned off, not again being used until such subsequent time as a relighting of the elements is necessary.

The present embodiment of the retractable heating apparatus, as is best shown in FIGURE 6 of the drawings, utilizes a substantially fixed position wall or closure member 40 which in turn is supported from the base member 19 by means of supporting posts 41. The closure member 40 is maintained in alignment with the open side of the U-shaped heating section as provided by the chamber 1 and the spaced opposing heating surfaces 2 and 3, such that as the latter moves back and forth in a reciprocating manner the chamber will either be spaced away from the wall 40, or in contact therewith providing a resulting tubular heating chamber open only at its ends in order to accommodate the introduction thereto of a moving strand of wire, as bar 4, or other work which it is desired to have passed through the unit.

The present closure element 40 comprises one or more layers of heat resistant material such as asbestos members 42 and an external polished reflective covering 39, all of which are in turn attached to a base member 43 by rivets or cap screws 44, or other suitable means, whereby there is a resulting heat reflective and heat resistant face on the closure member 40 to provide a desirable form of interior surface for the heating unit when it is in an operating position. The base plate 43 is attached to a plurality of rod or bolt like members 45 that in turn pass through opposing openings 46 in posts 41 as a means for supporting the entire elongated closure member 40. A resilient action is provided by means of springs 47 mounted within each of the posts 41, between threaded nuts 48, which in turn are positioned on the end portions of rods 45. The present embodiment also utilizes soft resilient "tad-pole" members 53 along the longitudinal edges of the closure wall such that there is additional means to provide a tight closure with the end sections 51 of the U-shaped heating chamber 1. The tad-poles 53 may be bolted or otherwise attached to the wall section 40 by screws or bolts 44. The spring mounting arrangement at the supporting posts 41 for each of the support members 45, together with tad-poles 53, thus provide means throughout the length of the closure member 40 to absorb some of the shock of the closure as the heating section is brought back into operation each time after a retraction. Mineral wool or other insulation 49 is indicated as being placed between the back of the supporting plate 43 and the casing portion of the closure member 40. Similarly heat resistant wool 50 is placed longitudinally in the upper and lower end sections of the heating chamber 1 as provided by the casing sections 51 that extend beyond the steel wool distributing material 11 and partition walls 52.

Referring now to the diagrammatic drawing in FIGURE 5, there is indicated means for controlling the action of air cylinder 24 such that it may in turn retract the heating chamber 1 responsive to certain sensing elements. As previously set forth, it is a desirable and advantageous feature of the present invention to have automatic means for retracting the heating chamber and infra-red elements away from the moving line of material being heat treated when there is a slow-down or stoppage of the movement of such material. There is indicated in one embodiment an electro-magnetic pick-up 55 as being placed in conjunction with a magnet on a shaft or bearing of the reeling equipment 56 which is in turn utilized in effecting the movement of the wire or other material passing through the heat treating apparatus. The resulting voltage generated by the pick-up 55 may be passed by way of line 57 to amplification and control means, indicated as controller 58, such that the latter may provide energy through line 49 to activate the electric solenoids of the four-way air valve 31 that in turn connects, through air lines 32 and 33, to the air cylinder 24. Thus, where there is a slow-down or stoppage of the reeling equipment 56, the signal from the pick-up 55 will be modified to actuate controller 58 to in turn throw the air supply through line 60 and valve 31 to line 33 such that the internal piston of air cylinder 24 will move away from the heating position causing heating chamber 1 to inturn move away from the moving strand of work indicated as 4, in which case air is exhausted from air cylinder 24 through air line 32 and exhaust line 61. Conversely, when the reeling equipment starts up and it is desired to move the heating section 1 back into an operating position to heat the work passing therethrough, then the pick-up 55 and controller 58 will energize the solenoids of valve 31, through lines 68 and 63, to move the heating chamber. Also, manual reset means 62 can be used to energize the solenoids through line 63 to reverse the movement. The solenoids of valve 31 move the four-way valve portion to have air supplied through line 60 to the line 32 whereby the piston of air cylinder 24 moves in the opposite manner and moves the heating chamber 1, back into the desired operating position, with air being exhausted through line 33 and line 61.

It is not intended to limit the present invention to the use of any one type of movement sensing means, such as the electro-magnetic pick-up 55 operating in conjunction with an imbedded magnetic element, inasmuch as mechanical tachometer means may also be utilized to transmit a signal to a suitable controller, or alternatively, an air operated mechanism may be utilized to transmit a desired signal. Still another movement sensing means may comprise an electric circuit involving an electric-eye which will give a signal to a controller where there is a stoppage of a moving stream or a moving part passing a given fixed position sensing eye. The voltage amplification means at controller 58 may be of a standard type and need not be explained in detail in connection herewith. Over-ride means may also be incorporated in the system to either continue the movement of the work, or delay the movement of the heating chamber, as may be desired to suit the heat treating operation being effected.

A preferred embodiment of the present apparatus also incorporates in conjunction therewith suitable temperature sensitive elements, such as elements 64 and 65 positioned to be exposed to the heat from the infra-red elements within the heating chamber 1. The temperature

sensitive elements 64 and 65 may comprise thermocouple means for transmitting a signal by way of the respective lines 66 and 67 to amplifier-controller 69 which will in turn energize the solenoid of valve 31 to cause the air cylinder 24 to retract chamber 1 responsive to a temperature condition within the heating chamber that is either above or below a predetermined or preset temperature limit at controller 69. Thermocouples or electric resistant sensing elements may be used as the temperature sensing elements 64 and 65 and it is not intended to limit the present invention to any one type of sensing means nor to any one type of control means, inasmuch as various standard forms of control circuits and control means may be used in conjunction with thermal sensing elements to provide a resulting actuating of a solenoid, such as used with four-way valve 31 for the air cylinder 24.

The construction and arrangement which is shown in the drawing and which has been described hereinbefore indicates that the heating section is positioned in a horizontal manner such that the material or work is passed in a horizontal line or plane transversely through the tubular heating zone; however, the present apparatus may well be utilized in a vertical position such that the material may pass in a rising or descending path through the tubular heating zone.

It may also be pointed out that the movement of the heating section in a straight line reciprocating path of movement need not be adhered to inasmuch as other reciprocatory means may well be utilized. For example, in FIGURE 7 of the drawing there is indicated a modified embodiment of the apparatus which effects a movement of the heating section by use of a supporting frame which is attached to a fixed shaft member, such that the heating section actually moves through a short arc of a circle. An open-ended tubular heating section 70 is supported by suitable framing members 71 from a shaft 72 which in turn is supported by suitable bearing means 73 and bearing supports 74 that rest on a base member 75. An insulated closure member 76 is designed and constructed to have a wedge-like shape and is positioned to coincide with an open portion of the tubular heating section 70 whereby the latter is entirely enclosed in its operating position to provide an open-ended heating section adapted to handle a moving strand or stream of material therethrough. The closure member 76 is not shown in detail, but may be constructed in a manner similar to closure 40 of the previously described embodiment, such that it has an insulated heat reflective face opposing the heating elements of the heating section 70. The construction of the radiant heating surface of heating section 70 may also be similar to that previously described and may comprise one or more elements formed in a U-like shape, or as shown, in the form of a portion of a circle such that material passing through the unit will be subjected to substantially uniform heating from opposing sides of the interior portion of the heating section. The heating section receives a fuel and air supply from blower 77 that discharges fuel through piping means 78 to header line 79, which in turn distributes fuel and air through a plurality of spaced lines 80 and valves 81 to an inlet section 82. The latter uniformly effects the low velocity distribution of the fuel to the catalytic radiant heating surface on the interior of the heating section 70. Such heating surface may comprise one or more layers of catalytically treated gauze or screening, or other refractory material, such that it may provide a high temperature radiant heating surface upon the flameless catalytic oxidation of the fuel supply as it passes through the screen.

The modified embodiment also indicates the use of an air cylinder 83 as the motive power means for moving the frame 71 and the attached heating section 70 such that the latter is either in the lower position indicated in the full lines of the drawing or in a retracted elevated position shown by the dashed lines, whereby the material being heat treated can be rapidly removed from the high temperature zone of treatment upon activation of the air cylinder 83. The air cylinder 83 is shown connected to base member 75 by bearing means 84 while the movable piston rod end 85 connects to bearing means 86 that in turn connects with the frame 71. A valve and control means operating in conjunction with air cylinder 83 may be of the type previously described in connection with FIGURE 5 of the drawing. It may also be pointed out in connection with the modified embodiment of the apparatus that other types of movement means may be utilized, as for example, an electric motor operating gearing or chain drive means that will cause the rapid movement of the heating section responsive to a signal from movement sensing means or to temperature sensitive means operating through suitable control units. The modification of FIGURE 7 may also be utilized in accommodating either a horizontally moving material or vertically moving material and there is no intention to limit its use to any one fixed arrangement or amount of movement.

We claim as our invention:

1. A retractable heating apparatus adapted to heat treat normally moving material, which comprises in combination an elongated open-sided infra-red heating unit having opposing spaced catalytically activated metal screens, an elongated fixed wall section positioned to be in closable contact with the open side portion of said heating unit, means for supplying fuel and air to each of said spaced metal screens and for providing flameless infra-red heat radiation from the screens to the interior of said unit, a movable supporting frame attached to said heating unit, guided movement means for said frame providing reciprocatory movement of the latter along a short defined path, motive powered means connecting with said frame and operative to move said frame and supported heating unit back and forth along said path, at least one movement sensing element associated with the movement of said material passing through said heating unit, a control means connected with said sensing element and with said motive powered means, whereby the latter is operated responsive to a signal from said sensing element and whereby said frame and heating unit are retracted along said defined path away from said fixed wall section and the material being heated.

2. The apparatus of claim 1 further characterized in the provision of a comparatively thick flame proof gas diffusing material adjacent each of said metal screens on the side thereof opposite the interior of the heating unit.

3. The apparatus of claim 1 further characterized in that said motive powered means connecting to said frame comprises a two-way acting air cylinder providing movement of said frame responsive to a signal from said movement sensing element connecting to said control means.

4. The apparatus of claim 3 still further characterized in that said control means comprises a four-way air control valve connecting with said air cylinder, electrical solenoid means connecting with said four-way valve, and an amplifying-controller connecting with said movement sensing element and with said electrical solenoid means whereby said sensing element provides for the retraction of said frame and said heating unit away from said material being heat treated when the latter stops moving and for the opposite action of said air cylinder and for return movement of said frame and heating unit to an operating position when the material again starts moving.

5. A retractable radiant heating apparatus for heat treating normally moving material, which comprises in combination, opposing and spaced elongated radiant heating sections having catalytically activated metal screen exterior faces, a wall section connecting between an opposing pair of edges of said spaced sections and

forming thereby an open-sided elongated heating unit of U-shaped cross-section, framing means supporting said heating unit, air and fuel supply conduit means to said spaced heating sections, flow adjustment means in said supply conduits and diffusion means adjacent said faces providing a low velocity fuel distribution to said catalytically activated faces whereby flameless infra-red heat is provided therefrom, a base member and movable guide means connective between said base member and said frame for permitting reciprocating movement of the latter in a defined path, motive powered means connecting to said frame and operative to move said heating unit back and forth along said defined path to alternative positions, an elongated substantially fixed wall section with a reflective face extending from said base member in an aligned position opposing the open side of said U-shaped heating unit and forming a closure therefor when the latter is in a heating position, said fixed wall section further forming thereby an open-ended tubular heating unit for heating material moving through said heating unit, a movement sensing element associated with the material moving through said heating unit, and a control means connecting with said movement sensing element and with said motive powered means, whereby the latter is operated responsive to a signal from said sensing element indicating a decreased movement of said material and whereby said frame and heating unit are retracted along said path away from the material being heat treated.

6. The apparatus of claim 5 further characterized in that said movable guide means comprises, a plurality of spaced toothed-racks attached to said supporting frame perpendicular to the length of said tubular heating unit and in longitudinal alignment with the defined path of movement of the frame, opposing rotatable spur gear means are mounted on a rotatable shaft in engagement with said racks, said shaft is supported from said base member by a plurality of spaced bearings, and roller means are mounted between said frame and said base member whereby said supporting heating unit is maintained in readily movable substantially uniform alignment with said base and with said closure wall as said motive powered means moves said frame and heating unit back and forth along said defined path.

7. The apparatus of claim 5 further characterized in that at least one temperature sensing element is positioned adjacent said heating sections, and said temperature sensing element is connected with a control means connecting with said motive powered means whereby the latter is operated by said control means responsive to a predetermined temperature change received from said sensing element and whereby said frame and heating unit are retracted along said defined path away from the material being heat treated.

8. The apparatus of claim 5 further characterized in that said motive powered means comprises a two-way acting air cylinder positioned to move said frame with respect to said base member in a reciprocating manner through said defined path.

9. The apparatus of claim 8 further characterized in that a four-way air control valve connects with said air cylinder, electrical solenoid means connects with said four-way valve, and said control means includes an amplifying-controller connecting with said movement sensing element and with said electrical solenoid means, whereby said sensing element provides for the movement of said frame and said radiant heating unit away from and back around said material being heat treated.

10. Retractable heating apparatus adapted to heat treat normally moving material, which comprises in combination, an elongated open-sided heating unit having opposing spaced radiant heating sections, each of which sections has at least one exterior layer of perforate catalytically activated metal screens and a flame proof gas diffusing material adjacent said exterior layer, gas distributing chamber means encompassing the interior and edge portions of said layers of material, air and fuel supply conduit means connecting to each of said gas distributing chamber means of said spaced sections, an elongated fixed wall section positioned to be in closeable contact with the open sided portion of said heating unit, a movable supporting frame attached to said heating unit, guided movement means for said frame providing reciprocatory movement of the latter along a short defined path, motive powered means connecting with said frame and operative to move said frame and supported heating unit back and forth along said path, at least one movement sensing element associated with the movement of said material passing through said radiant heating unit, and a control means connecting with said sensing element and with said motive powered means whereby the latter is operated responsive to a signal from said sensing element and whereby said frame and heating unit are retracted along said defined path away from said fixed wall section and the material being heated.

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