Oct. 1, 1935. R. R. SNOW 2,016,125

DRYING APPARATUS

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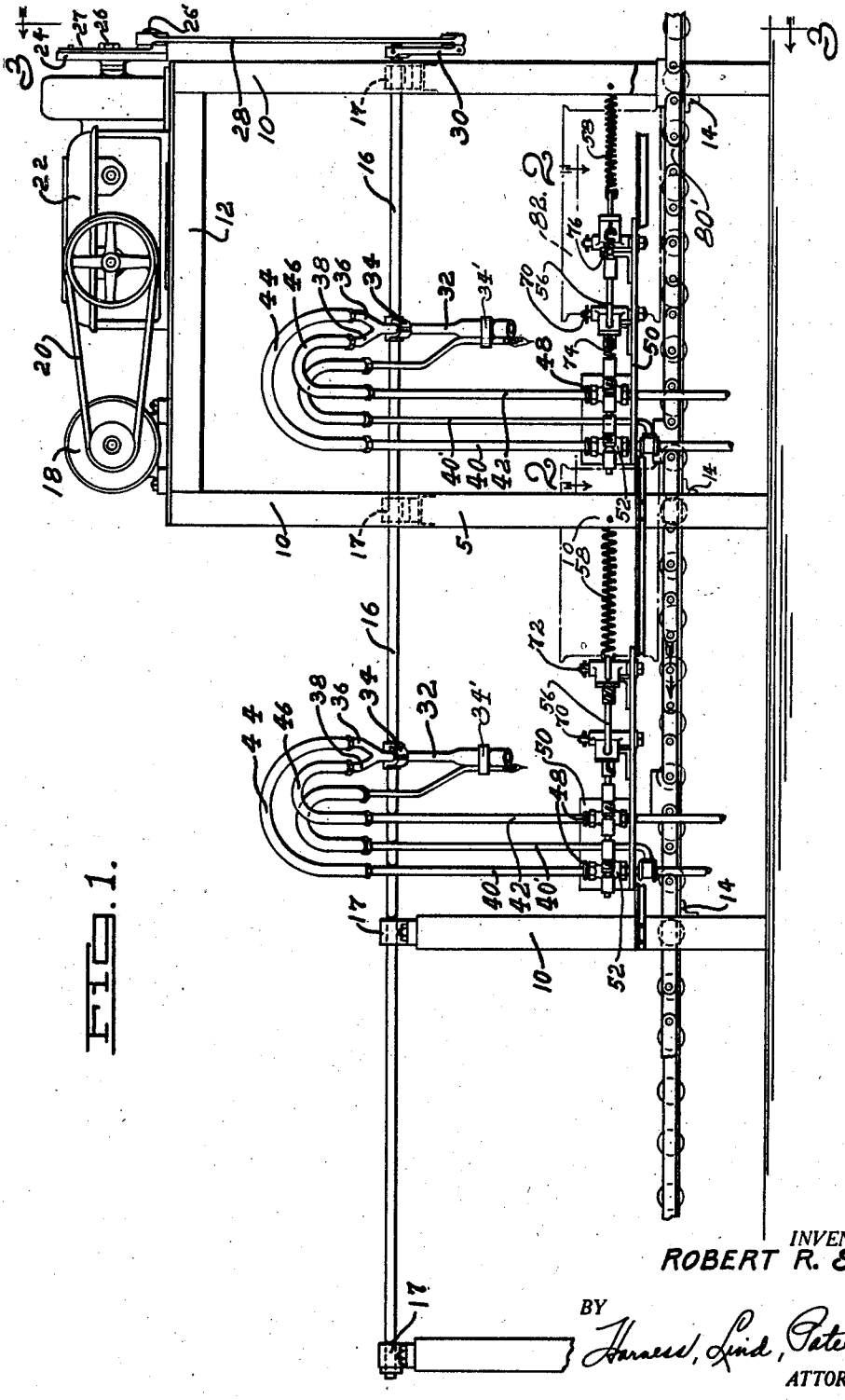

FIG. 1.

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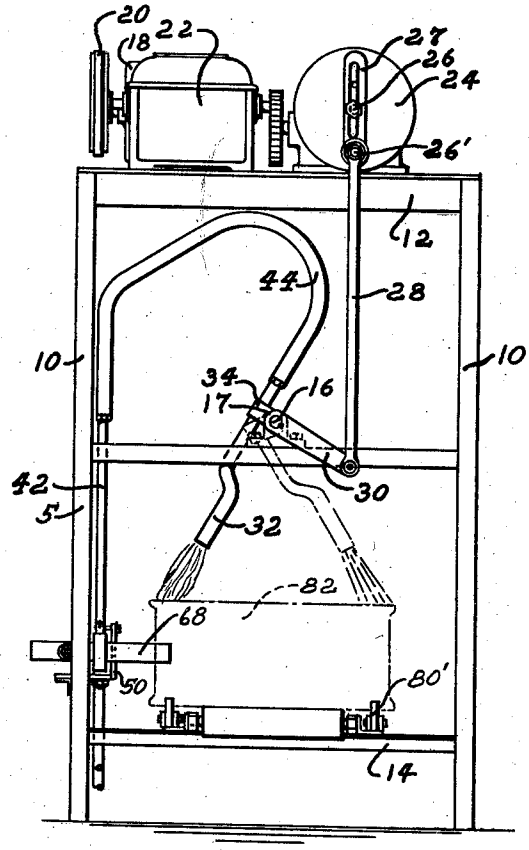
Fig. 3.



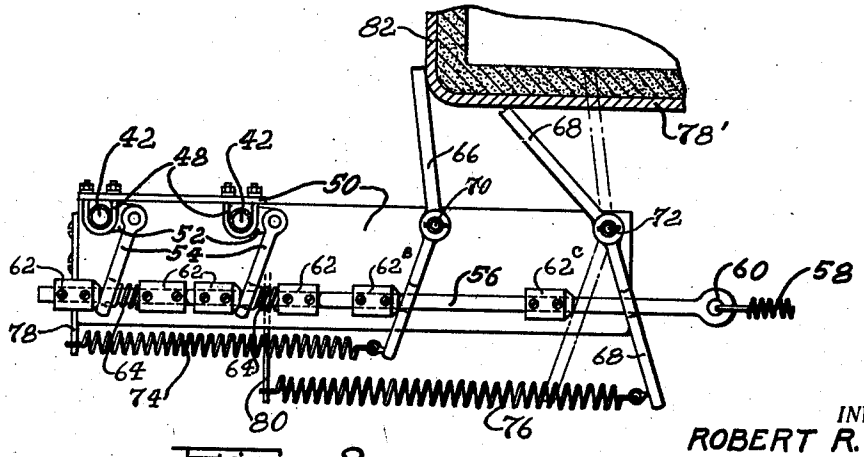


Fig. 2.

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Patented Oct. 1, 1935 2,016,125

UNITED STATES PATENT OFFICE

2,016,125

DRYING APPARATUS

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Application February 11, 1935, Serial No. 6,031

10 Claims. (Cl. 34—12)

This invention relates to a drying apparatus.

While the embodiment of the invention is herein illustrated and described in connection with the drying of green sand molds, it should be understood that the invention is not to be so limited but may be used for a similar purpose in connection with various articles of different shapes and mass.

It is common practice in connection with green sand molds to treat the internal surface with a solution forming a skin which is subsequently dried. Heretofore the practice has been to pass molds so washed through a drying oven and to later complete the drying of the surfaces by a manually directed torch. In oven drying the entire surface of the mold is exposed to a constant application of heat, frequently resulting in blistering due to the generation of steam faster than it can escape through the sand and pores of the skin.

An object of the invention is to provide an apparatus adapted to dry the skin on molds evenly throughout the entire molding surface without blistering or otherwise injuring the skin or other portions of the mold structure.

Another object of the invention is to provide an apparatus of this kind which applies heat at one time to localized areas of the surface of the mold.

A further object of the invention is to provide an apparatus which is completely automatic in its operation and adapted to accurately predetermine the length of time all portions of the mold surface are exposed to the drying action.

A still further object of the invention is to provide means for controlling the application of heat to an article which is so constructed and arranged as to operate uniformly and consume fuel only when the article is suitably positioned with respect to the drying apparatus.

A further object of the invention is to provide fully automatic drying mechanism of this character which does not require manual attention of any kind and in the operation of which variations incidental to the human element involved in manual control are completely eliminated.

Other objects of the invention are to provide a heat producing element wherein the supply of fuel thereto is controlled by progressive movement of the work within the drying area of the heating element; to provide apparatus of this kind which includes a plurality of intermittently burning, oscillatably mounted heating elements, and control mechanism for each element which may be adjusted to predetermine the period during which such elements are operative; to provide control mechanism of this character which is adapted to initiate the operation of a heating element after any selected portion of an article has passed thereby and to discontinue the operation of such a heating element before any selected portion of the article has passed from within the effective range of the heating element, and to provide a single means for oscillating the heating elements which may be adjusted to predetermine the lengths of the arcs of movement thereof.

The apparatus herein described has been found particularly adaptable in the drying of green sand molds which have been washed with a solution to provide a skin, and it embodies a series of spaced mechanically oscillated torches arranged above a conveyor mechanism. Each torch is continuously oscillated and intermittently supplied with gas and air under pressure controlled by a valve mechanism operable by contact with the mold as the latter is moved under the torch by the conveyor. As the mold passes under a particular torch it contacts a valve control member which opens the valve mechanism admitting a fuel mixture to the associated torch and the latter is ignited by a continuously burning pilot light. The surface of the mold is then swept by successive oscillations of the torch during the period the valve mechanism is retained in open position by the moving mold. The period between the application of heat from successive torches permits the generated steam to escape from the mold and prevents blistering of the skin which, in practice, frequently results from the accumulation of steam beneath the skin. The torch flame can be adjusted for use on articles of different shapes and masses so as to control the intensity of heat and the length of the strokes thereof may be varied to conform with the dimensions of articles of diverse sizes and shapes. Any loose sand or dirt collected on the mold surface is blown from the cavities thereof by the force of the flame created by fuel supplied under pressure.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which:

Fig. 1 is a side elevational view of a drying apparatus embodying the invention.

Fig. 2 is a fragmentary, horizontal sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a right end elevational view illustrating the apparatus shown in Fig. 1 as viewed from lines 3—3 thereof.

In the form shown in the drawings, the drying apparatus includes a supporting structure, generally designated by the numeral 5, which

structure comprises upright posts 10, upper and lower cross members 12 and 14, respectively, and an intermediate horizontally extending oscillatably mounted shaft 16, journaled in bearings 17. Mounted on the upper cross members 12 is a driving motor 18 which is operatively connected by a belt 20 to a suitable variable speed reducing mechanism 22. The latter has a driving disc 24 provided with an axially extending aperture in which a bolt 26 is threaded. A slotted arm 27 is adjustably mounted on the disc 24 and releasably held in adjusted position by the bolt 26. One end of a connecting rod 28 is pivotally connected with a pin 26' carried by the arm 27. The other end of the rod 28 is pivotally attached to a crank arm 30 fixed to one end of the shaft 16. The length of the arc of oscillatory movement of the shaft 16 may be varied by adjusting the arm 27 relative to the axis of the disc 24 whereby the effective length of the rod 28 is increased or decreased to correspondingly alter the length of the oscillatory stroke.

The heating elements each preferably comprises a torch 32 which is fixed by means of a bracket 34 to the shaft 16 for oscillation therewith. While any number of such torches may be employed, the construction and operation is the same and only one is herein described for the purpose of illustrating the invention. Air and gas, constituting the fuel, are supplied to the torch by means of vertically positioned conduits 40 and 42, respectively, the lower adjacent ends thereof being connected with a suitable source of supply of gas and air, respectively, and the upper adjacent ends being connected by sections of flexible hose 44 and 46 with bifurcated end portions 36 and 38, respectively of the torch. The conduits 40 and 42 are secured by U-bolts 48 to a mounting plate 50, the latter being fixed to the lower part of the supporting structure 5.

Passage of fuel through the conduits 40 and 42 is controlled by an individual valve 52 of the whistle type, each valve being provided with a rotatable control arm 54 adapted for operation by a rod 56 and parts carried thereby shiftably supported by the plate 50. The rod 56 is urged to the right, as viewed in Fig. 2, by a coil spring 58, one end of which is provided with a hook received in an eye 60 of the rod 56, the other end thereof being fixed to one of the upright posts 10. Adjustably fixed on the rod 56 are a plurality of stops 62 and a pair of coil springs 64, one of such springs being positioned between a stop 62 and an arm 54 so as to urge the latter in a clockwise direction, as viewed in Fig. 2, and to maintain the associated valve 52 in closed position, the arm 54 being retained against rotation beyond a predetermined position by another stop 62.

A flexible hose 40' having one end thereof communicating with the conduit 40 intermediate the source of fuel supply therefor and the valve 52, and the other end thereof terminating adjacent the discharge end of the torch 32 supplies a sufficient amount of fuel to provide a continuously burning pilot light for igniting the torch. The hose 40' is maintained in position adjacent the torch by a bracket 34'.

Movement of the rod 56 and parts carried thereby for operation of the valves 52 is effected by means of a pair of spaced angularly shaped levers 66 and 68 rotatably mounted on the plate 50 by pins 70 and 72, respectively, positioned vertically with respect to the supporting structure 5 and immediately to the right of the path of travel of the torch 32, as shown in Fig. 1. Coil springs 74 and 76 having one end thereof secured to each of a pair of plates 78 and 80, respectively, fixed to the plate 50, are attached at their opposite ends to an end of one of the levers 66 and 68, respectively, each of which is urged in a clockwise direction against an adjustable stop 62b and 62c, respectively. The tensional strength of the springs 74 and 76 is substantially equal but individually greater than the strength of the spring 58 and therefore the rod 56 is held in the position shown in Fig. 2 and the valves 52 are maintained closed.

From the foregoing it will be understood that the valves 52 are normally retained in closed position, as shown in Fig. 2, and are moved to open position as hereinafter set forth.

The work to be dried, herein illustrated as a mold 78', is progressively moved in a direction parallel to the shaft 16 and immediately below the torch 32 by any suitable conveyor mechanism 80', the speed of which may be adjusted to predetermine the exposure of the mold to drying effect of the torch. As the mold approaches the path of travel of the torch 32 the flask 82 contacts the lever 68, rotating it in a counter clockwise direction, against the action of the spring 76, to the position shown in full lines in Fig. 2. However, the strength of the spring 58 is not sufficient to move the rod 54 to the right, as viewed in Fig. 2, by reason of the greater strength of the spring 74. As the mold is moved farther the flask 82 engages the lever 66 and the latter is rotated in a counter clockwise direction, against the action of the spring 74. When the levers 66 and 68 are thus rotated the forces of the springs 74 and 76 on the rod 56 are released and the rod is moved to the right, as viewed in Fig. 2, by the action of the spring 58. This movement of the rod 56 rotates the arms 54 in a counter clockwise direction by contact of each arm with a respective stop 62, and the valves 52 of the conduits 40 and 42 are opened permitting a supply of fuel to pass to the torch 32, the latter being ignited by the pilot light.

The mold is then swept by successive oscillations of the flame from the torch until moved by the conveyor to a position so that the flask 82 no longer engages the lever 68 and the latter is returned by the spring 76 to the position shown in dotted lines in Fig. 2. The strength of the spring 76 alone is sufficient to return the rod 56, against the action of the spring 58, to the position shown in Fig. 2 thereby closing the valves 52 prior to the time the flask is out of engagement with the lever 66. By so controlling operation of the valves 52 the torch is productive of heat only during the time the internal surface of the mold is within the effective area of the flame, and the operating period of the torch may be made shorter than the time required for movement of the flask through a distance equal to its over-all length.

Opening of the valves 52 by contact of the mold flask 82 with the levers 66 and 68 may be advanced or postponed by movement of the adjustable stop 62b retaining the lever 66 against clockwise direction. For instance, movement of the stop 62b in a direction to the right, as viewed in Fig. 2, will rotate the lever 66 in a counter clockwise direction to a position where it will not contact the mold flask for opening the valves 52 until a predetermined portion of the mold has passed beyond the path of travel of the oscillating torch during the time the latter is productive of heat.

What I claim is:

1. Drying apparatus including a drying station, conveying mechanism for progressively moving articles through said station, a torch oscillatably mounted in said station, and driving mechanism for oscillating said torch throughout a predetermined course.

2. Drying apparatus including a drying station, conveying mechanism for progressively moving articles linearly through said drying station, an oscillatable torch in said station having an axis substantially parallel to the path of travel of said conveyor and having a flame course extending transversely of and in the path of movement of said articles, and driving mechanism for oscillating said torch throughout a predetermined arcuate course.

3. Drying apparatus including a drying station, conveying mechanism for progressively moving articles linearly through said drying station, an oscillatable torch in said station having an axis substantially parallel to the path of travel of said conveyor and having a flame course extending transversely of and in the path of movement of said articles, and driving mechanism for oscillating said torch throughout a predetermined arcuate course, said mechanism being adjustable to vary the length of the stroke of said torch.

4. Drying apparatus including a drying station, conveying mechanism for progressively moving articles through said station, a heating element oscillatably mounted in said station, valve mechanism controlling the supply of fuel to said element, and a control for said valve mechanism adapted to be actuated by engagement with an article during movement thereof by said conveyor.

5. Drying apparatus including a drying station, conveying mechanism for progressively moving articles through said station, a heating element oscillatably mounted in said station, valve mechanism controlling the supply of fuel to said element, and a control for said valve mechanism adapted to be actuated by engagement with an article during movement thereof by said conveyor, said control being adjustable to open said valve when said article is in a predetermined position relative to said torch.

6. Drying apparatus including a plurality of drying stations, conveying mechanism for progressively moving articles through said stations, a heating element oscillatably mounted in each of said stations having an individual valve mechanism and control therefor, driving mechanism for continuously oscillating said heating elements throughout a predetermined arcuate course, said heating elements being operable intermittently for producing a drying action by engagement of a moving article with said valve control.

7. Drying apparatus including a plurality of drying stations, conveying mechanism for progressively moving articles through said stations, a heating element oscillatably mounted in each of said stations, driving mechanism for oscillating said elements, said mechanism being adjustable to predetermine the arcuate course of said elements for subjecting a portion of a moving article to a heating element, individual valve mechanism and control therefor associated with each heating element, said elements being operable intermittently for producing a drying action by engagement of a moving article with said valve control, said control being adjustable for subjecting a predetermined portion of the moving article to said heating elements.

8. Drying apparatus adapted to operate in conjunction with a conveying mechanism for progressively moving articles relative to said apparatus, an oscillatably mounted heating element, driving mechanism for continuously oscillating said element, a fuel supply system for said element including valve mechanism and a control therefor, said control comprising rotatably mounted members, means retaining said members in a predetermined position closing said valve mechanism, said means including resilient elements, said members being rotatable against the action of said yieldable elements by engagement with a moving article for moving said valve to open position.

9. A drying apparatus including an oscillatably mounted torch, conveying mechanism for progressively moving articles into the path of travel of said torch, valve mechanism controlling the supply of fuel to said torch, control for said valve mechanism operable by engagement with a moving article, said control being adjustable to open said valve mechanism when said article is in a predetermined position relative to said torch for subjecting a selected portion of said article to drying action, and driving mechanism for continuously oscillating said torch, said mechanism being adjustable for limiting the oscillatory stroke of said torch to a course conforming substantially to a dimension of said article.

10. A drying apparatus including a drying station, conveying mechanism for progressively moving articles through said station, an oscillatably mounted heating element in said station, valve mechanism controlling the supply of fuel to said heating element, control apparatus normally retaining said valve mechanism in closed position, said control apparatus including a member engageable by said article for opening said valve mechanism and another member engageably by said article for closing said valve mechanism, said members being so constructed and arranged as to initiate operation of said heating element after a predetermined portion of the article has moved through the effective range of said heating element and to discontinue the operation of said heating element before a portion of the article has moved within the effective range of said heating element.

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