United States Patent

Westbrook et al.

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[45] **Sept. 5, 1972**

[54] **MOULDING APPARATUS**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**.....**B29f 5/00**

[58] **Field of Search**.....18/26 RR, DIG. 13, 2 V, 4 V, 18/6 R, 17 R, 30 HM; 164/338

[56] **References Cited**

UNITED STATES PATENTS

3,555,613	1/1971	Westbrook et al.	18/26 RR
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[57] **ABSTRACT**

A rotational moulding apparatus which comprises a heating station and a cooling station disposed end to end each within an inverted U-shaped structure defined by a roof and two side walls, a carriage having an upstanding panel and supporting a mould rotating means for rotating a hollow mould about two axes, means for moving the carriage so that a mould on the mould support means is located in a heating position at the heating station and in a cooling position at the cooling station, means to spray a liquid heating medium into the heating station and a cooling liquid into the cooling station is characterized in that, each side wall of the heating station, at least at its lower end, extends to a position which is between two vertical planes, each of which is parallel to and passes through a different one of two spaced-apart tracks on which the carriage moves.

4 Claims, 2 Drawing Figures

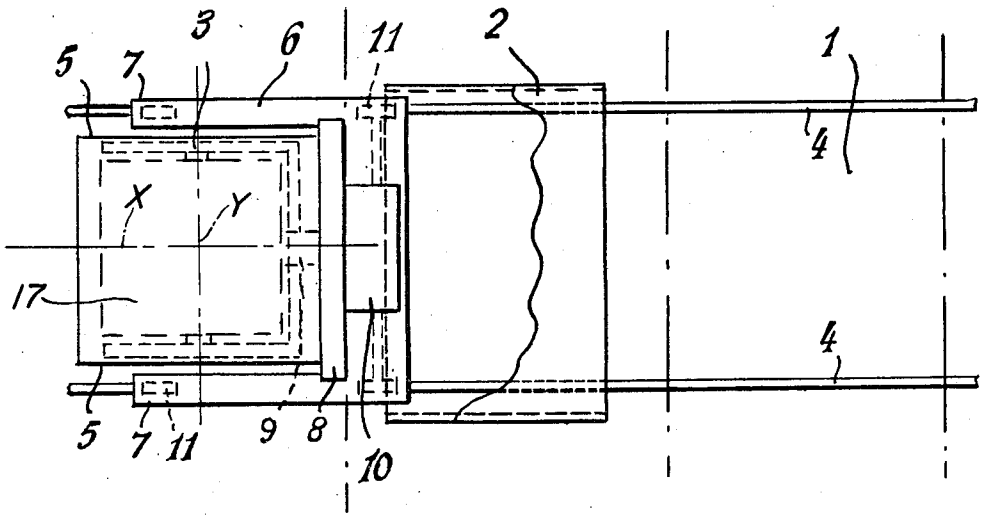
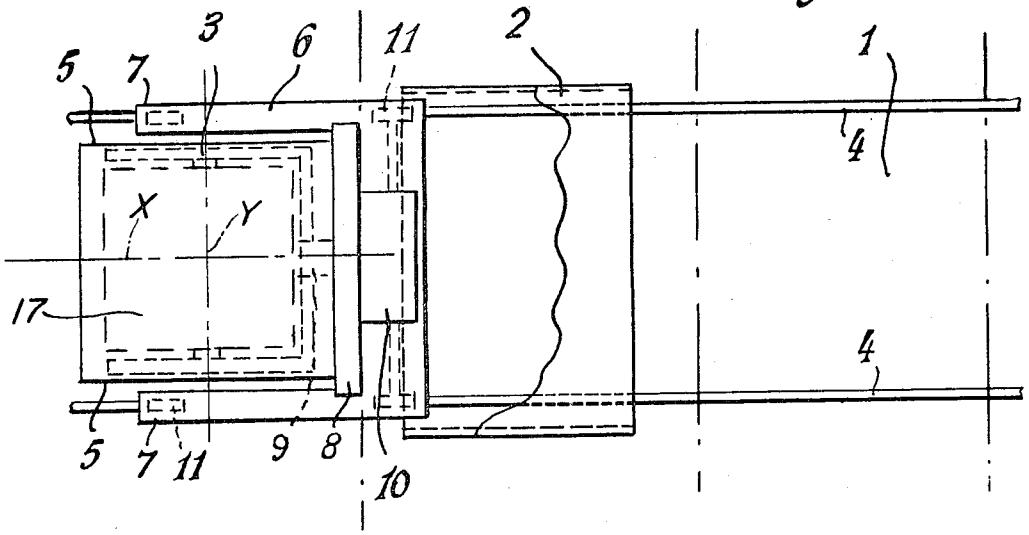


Fig. 1.



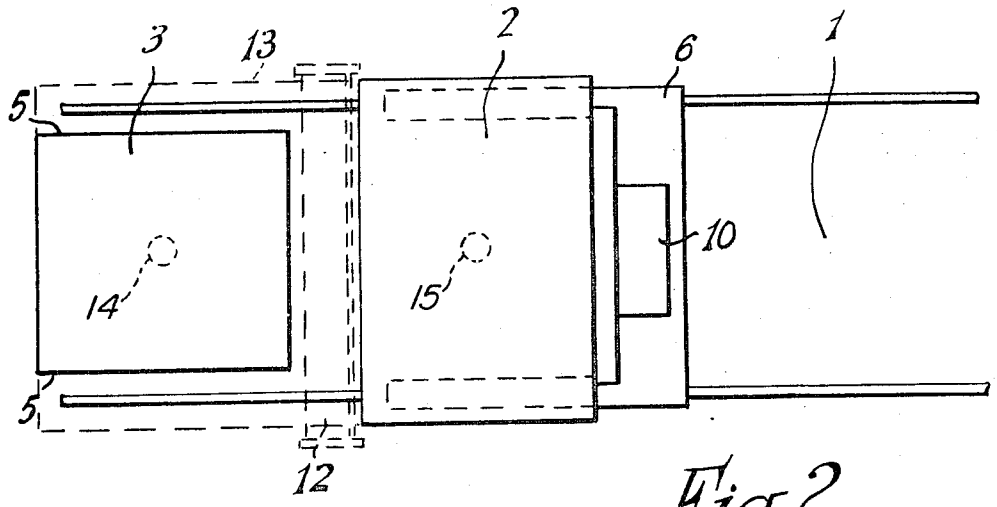


Fig. 2.

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MOULDING APPARATUS

This invention relates to an improvement in or modification of the rotational moulding apparatus claimed and described in the specification of our U.S. Pat. application No. 746,354 issued as U.S. Pat. No. 3,555,613, filed July 22, 1968.

In the apparatus claimed and described in the above-mentioned specification rotational moulding apparatus comprises a heating station and a cooling station disposed in end to end relationship within an inverted U-shaped structure defined by a roof and two side walls, a track extending between the said walls from a position at least to one end of the structure, a bogie movable along the track from a heating position between the side walls in the heating station to the cooling station and to a third position outside the structure, mould rotating means for supporting a hollow mould over the bogie and rotating the same about two axes, means for spraying a liquid heating medium into the heating station, means for supplying cooling water to the cooling station and an upstanding panel on the bogie disposed so that in the heating position thereof it divides the heating station from the cooling station.

We have now found that an improved form of rotational moulding apparatus comprising a heating station and a cooling station disposed end to end each within an invert U-shaped structure defined by a roof and two side walls, a carriage having an upstanding panel and supporting a mould rotating means for rotating a hollow mould about two axes, means for moving the carriage so that a mould on the mould support means is located in a heating position at the heating station and in a cooling position at the cooling station, means to spray a liquid heating medium into the heating station and a cooling liquid into the cooling station, can be obtained if each side wall of the heating station, at least at its lower end, extends to a position which is between two vertical planes, each of which is parallel to and passes through a different one of two spaced-apart tracks on which the carriage moves.

With this arrangement, it is possible to have the mould located between the side walls of the heating station while most of the structural members of the carriage which support the mould are shielded from the heating medium by the side walls of the heating station. This has a twofold advantage insofar as there is a saving on the heat consumed during a moulding operation (the structural members of the carriage are not cycled to moulding temperature and back each time a moulding operation is effected) and a saving in heating medium employed: since the heating medium dows not come into contact with the aforementioned structural members of the carriage, there is no danger of it remaining on the carriage to be withdrawn from the heating station when the mould is removed therefrom.

It is convenient to line the walls of the heating station with thin sheets of metal (which may be corrugated or ridged for added strength), and in one arrangement, the lower ends of such sheets may slope inwardly and downwardly to pass over the spaced-apart tracks. With this arrangement, the structural walls of the heating station may be mounted outside the tracks with the lower end of the lining sheets serving to shield the tracks, and the structural members of the carriage running thereon, from the heating medium.

The upstanding panel can be made larger than the inlet opening of the heating station and can close the latter by abutting against the ends of the side walls and roof of the heating station. This arrangement dispenses with the need for movable flaps to effect a seal to the upstanding panel when the carriage is located in its heating position (as was preferred with the apparatus described in the aforementioned specification). Where a solidifiable heating medium is being employed, even if there is a build up of solidified medium around the join between the upstanding panel and the walls and/or roof of the heating station, the tractive power employed for moving the carriage is available to pull the upstanding panel away from the end of the heating station when the carriage moves from its heating position.

If the upstanding panel is dimensioned to pass below the roof and between the side walls, a simple form of edge sealing for the vertical sides of the panel can be obtained by the interengagement of flexible resilient strips on the panel and similar strips on the side walls of the heating station. When the carriage is in the heating position, the two strips overlap one another to form a vertically extending seal between the vertical edge of the panel and the adjacent side wall. By making these strips thin (and thus of low thermal capacity), we find that a negligible amount of heating medium is retained on the strips and by virtue of their resilience, any heating medium which might solidify across the seal is easily broken when the carriage moves. Stainless steel, brass or phosphor bronze are suitable materials for the construction of such sealing strips which should not be thicker than 20 gauge.

In a preferred embodiment of apparatus in accordance with the invention the cooling station is disposed adjacent to the heating station, the track being defined by spaced-apart rails which run inside the walls defining the cooling station but outside the lower ends of the walls defining the heating station. This means that the carriage is wholly contained within the cooling station although substantially only the mould is contained within the heating station. During a heating operation, the upstanding panel on the carriage seals the heating station and during a cooling operation, a roller shutter can be drawn down between the two stations to close the otherwise open entrance of the heating station and prevent cooling medium entering the heating station.

One embodiment of rotational moulding apparatus in accordance with the present invention is schematically illustrated, by way of example, with reference to the accompanying drawing, in which:

FIG. 1 shows the apparatus, from above with the carriage in the heating position, and

FIG. 2 is a view corresponding to FIG. 1 showing the carriage in the cooling station.

Referring to the drawing, the apparatus comprises three stations 1, 2 and 3. Station 1 is a loading and unloading station, station 2 is a cooling station and station 3 a heating station. The latter two stations have spray means 14 and 15 for spraying a liquid heating and cooling medium respectively onto a mould therein. Extending through the stations 1 and 2 are spaced-apart tracks 4 which pass outside the side walls 5 of the heating station 3. A wheeled carriage (generally designated 6) has a bifurcated leading end 7, an upstanding panel 8, a

cantilevered mould support means 9, driving means 10 for driving the carriage and rotating the mould support means 9 and turning a mould 17 mounted thereon about two mutually perpendicular axes designated with *x* and *y* in FIG. 1, and four wheels 11 adapted to run on the tracks 4. In FIG. 1, the carriage is shown in the heating position with the upstanding panel 8 closing the otherwise open end of the heating station 3 but with the bifurcated ends 7 of the carriage lying outside the heating station 3. In FIG. 2, the carriage is shown in the position adopted during cooling (e.g. when drenched with water sprays generated from above) in which case a roller blind (schematically indicated at 12) is employed to separate the heating and cooling stations.

A continuous tunnel may be employed to contain the cooling station 2 and the heating station 3, the tunnel extending over the heating station as illustrated by the dotted line 13 in FIG. 2.

The modified construction of apparatus as described in the present specification (compared with that described in the aforementioned specification) has the advantages listed below:

1. Since the carriage is substantially wholly outside the heating station during a heating operation, less heat is wasted in raising the temperature of masses not directly involved in the moulding operation.

2. Since the carriage is not brought into contact with the heating medium (other than the upstanding panel) the conservation of heating medium can be more accurately controlled.

3. Because of the bifurcated leading end of the carriage there is nothing to obstruct the free fall of heating medium from the mould and its efficient drainage from the heating station.

4. Since the tracks are located outside the side walls of the heating station these do not come into contact with the heating medium.

5. The simplified construction of the apparatus is cheaper to produce.

What is claimed is:

1. Rotational moulding apparatus comprising a heating station having a roof and two sidewalls each having lower portions; a cooling station having a roof and two side walls and disposed adjacent to said heating station; a pair of parallel tracks disposed in a substantially horizontal direction, the tracks being spaced a predetermined distance from each other, said lower portions being spaced a distance less than said predetermined distance so as to be positioned between said tracks; carriage means for carrying a mould and arranged to movement along said tracks between said heating station and said cooling station, said carriage means being substantially exterior to said heating station during heating of the mould at said heating station, and having an upstanding panel which lies in a plane substantially perpendicular to the direction of said tracks and which separates said heating station from said cooling station when the mould carried by said carriage is heated at said heating station; carriage moving means for moving said carriage means along said tracks at least between said heating and cooling stations; first spraying means for spraying a liquid heating medium into said heating station; and second spraying means for spraying a liquid cooling medium into said cooling station.

2. Rotational moulding apparatus as defined in claim 1, wherein said roof and two side walls of said heating station form an inlet opening in the proximity to said cooling station, and said upstanding panel has dimensions greater than those of said inlet opening of said heating station, whereby the former closes the latter when the mould is in the heating position by abutting against the ends of said side walls and said roof of said heating station.

3. Rotational moulding apparatus as defined in claim 1, said side walls of said cooling station being spaced a distance greater than said predetermined distance so that said tracks are positioned between said latter sidewalls, said carriage means being movable interiorly within said cooling station in its entirety.

4. Rotational moulding apparatus as claimed in claim 1, in which a roller shutter is provided between the two stations to close said inlet opening of the heating station, the upstanding panel on the carriage closing the end of the cooling station remote from the heating station.

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Disclaimer

3,689,191.—*Aubrey Joseph Westbrook*, Kilwinning, and *Ian David MacKnight Thomson*, Irvine, Scotland. MOULDING APPARATUS. Patent dated Sept. 5, 1972. Disclaimer filed Feb. 28, 1972, by the assignee, *Plastic Rotational Moulding Limited.*

Hereby disclaims the portion of the term of the patent subsequent to Jan. 19, 1988.

[*Official Gazette November 6, 1973.*]