March 9, 1948. F. G. R. MAGNUSSON ET AL 2,437,395

APPARATUS FOR TREATING GRANULAR MATERIALS

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Fig. 1.

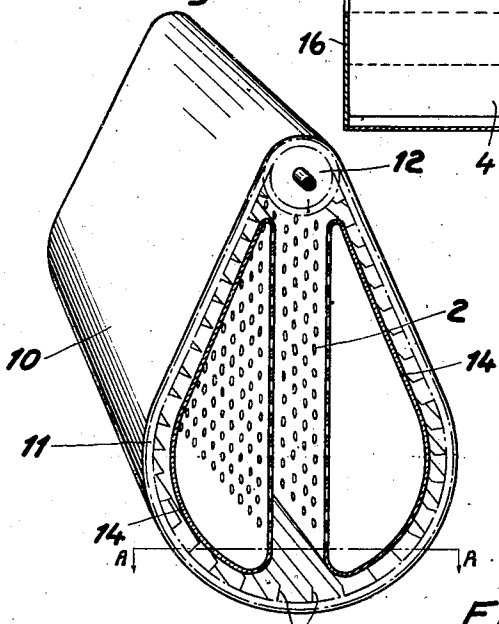

Fig. 4.

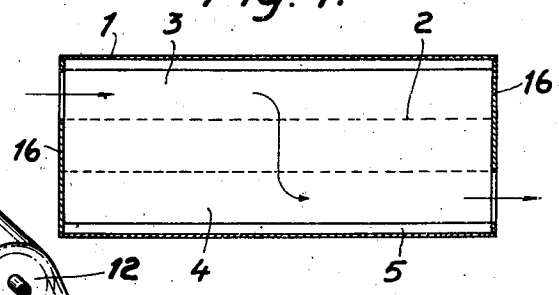

Fig. 5.

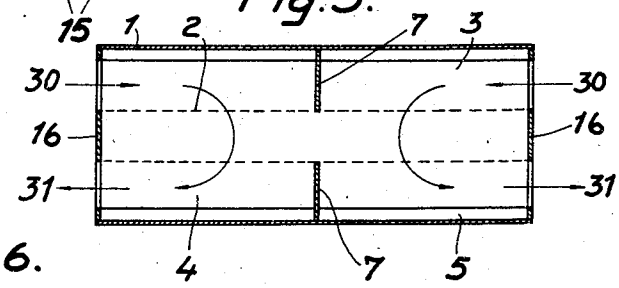

Fig. 6.

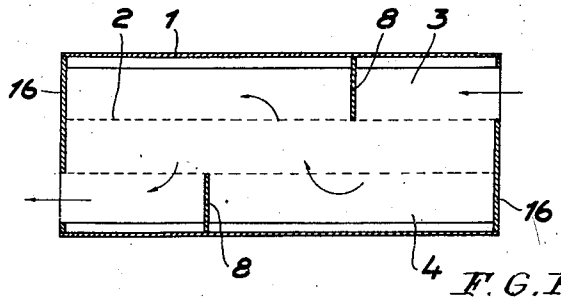

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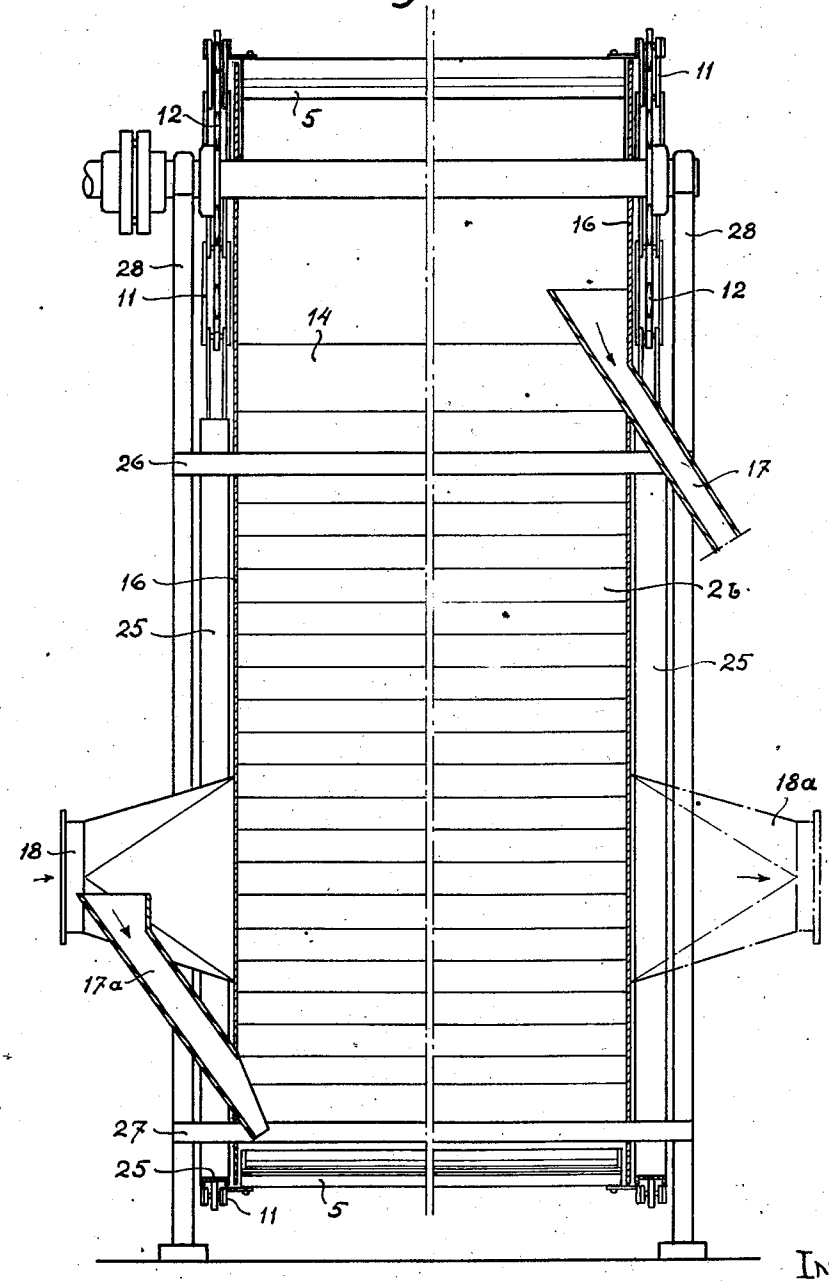
Fig. 2.



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APPARATUS FOR TREATING GRANULAR MATERIALS

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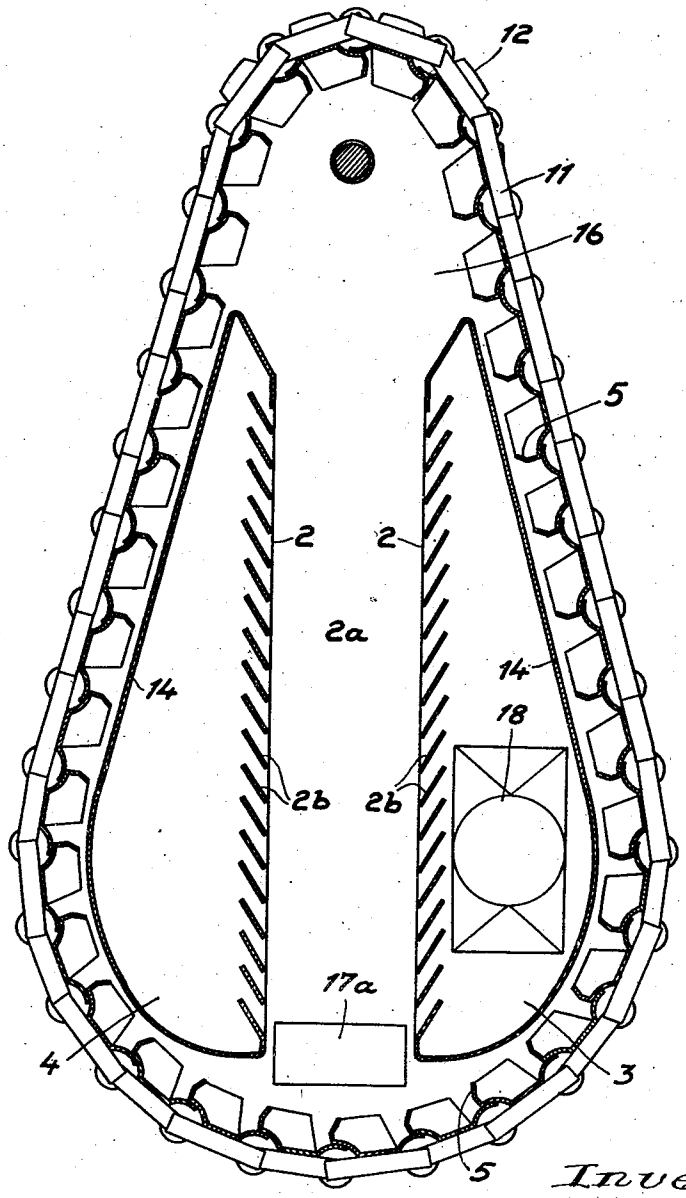
Fig. 3.



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APPARATUS FOR TREATING GRANULAR MATERIALS

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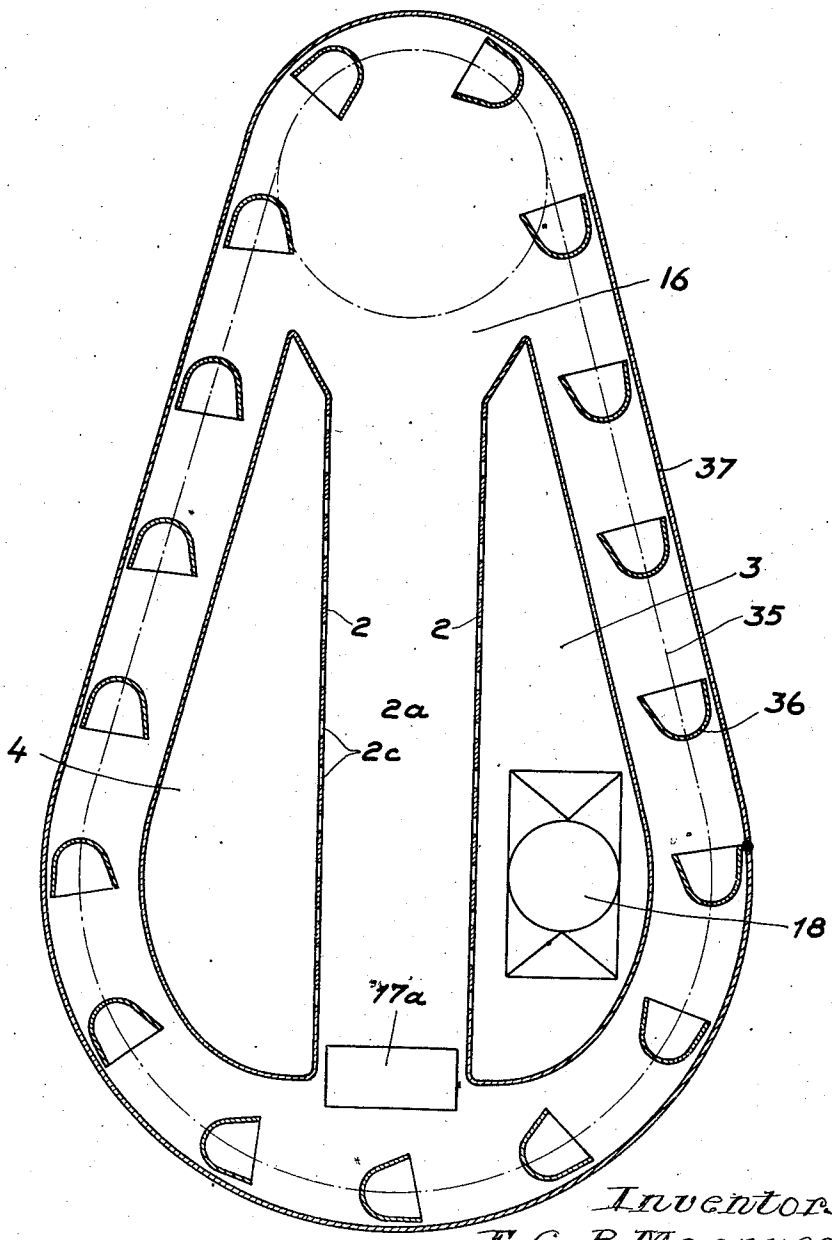
Fig. 7.



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UNITED STATES PATENT OFFICE

2,437,395

APPARATUS FOR TREATING GRANULAR MATERIALS

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In Sweden June 20, 1942

5 Claims. (Cl. 34—102)

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This invention relates to an apparatus for subjecting small materials such as grain and other granular materials in a drum to a gaseous medium in order to dry or moisten the material or actuate it for other purposes.

This invention eliminates certain drawbacks in earlier known processes. In drying of piece goods in rotating drums one has in the known devices proceeded along two lines. According to one of said methods the drying medium passes through perforations or apertures in the shell of the drum and through the layer of the material to be dried in the drum. According to the other method the drying medium is blown into a stationary channel in the material to be dried, and during its rotation the drum forces the material to circulate around the channel, which through apertures in the bottom of the channel lets out the drying medium into the material to be dried. The first mentioned method involves the drawback that packings must be provided around the pressure chamber for the drying medium because said medium is to be admitted into the cylindrical portion of the rotating drum from a stationary pressure chamber. Said packings are complicated, and cause, moreover, always greater or smaller losses of heat. The other method is, for example, connected with the drawback that the drying medium is to pass through material layers of very varying thickness, whereby the drying medium is utilized ineffectively.

The invention has for its purpose to remove said drawbacks. It is substantially characterized by the fact that the material is introduced into a drum, the shell of which surrounds a lower and an upper turning centre, and at one side of the drum is raised to the edge of a shaft, an inclined wall or other fall guiding means along which the material time after time sinks more or less slowly to the bottom of the drum, and that the gaseous medium is blown through the material column or layer thus formed.

The invention is illustrated diagrammatically on the accompanying drawings in two embodiments.

In Figs. 1, 2 and 3 one embodiment is shown applied in an apparatus in which the drum is carried out as an endless conveyor with at least two turning centres. Fig. 1 is a perspective view, and Figs. 2 and 3 show substantially two sections perpendicular to one another on a larger scale.

Figs. 4 to 6 show a longitudinal section A—A of Fig. 1 of the drum in various detail constructions.

Fig. 7 shows diagrammatically the invention

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applied in a drum with stationary shell surrounding a conveyor.

In the embodiment according to Figs. 1 to 3 the shell of the drum consists of an endless conveyor 10 preferably of gas tight material. In order to give an idea of the outer aspect of the conveyor the same is shown in perspective in Fig. 1. At each edge the conveyor is fixed in, or formed with, a conveyor chain 11 engaging a chain wheel 12. The two chain wheels, which may be located on a common shaft passing from end to end, or each on its individual journal are driven synchronously by a drive device not shown. Two upright walls 2 extend along the whole length of the drum at such a distance from one another that a shaft 2a is formed between them and end walls 16. The upper and lower ends of each wall 2 are connected with curved walls 14 so that a chamber is obtained on each side of the shaft 2a. The walls 2 are shown perforated in Fig. 1 and in Figs. 2 and 3 provided with spaced members 2b. The conveyor moves between the stationary end walls 16, which are provided with inlet and outlet openings for material and treating medium. Said openings are visible in Fig. 2, one of them 17 being outlet for material and the other 18 inlet for treating medium. The inlet for the material is indicated by 17a and the outlet for the treating medium by 18a. The conveyor is guided around the chambers 3 and 4 by guides 25. Said guides are by means of stays 26, 27 connected with the frame 28 carrying the bearings for the upper turning point of the conveyor and the stationary end walls 16 of the drum.

The apparatus works in the following manner: The material which is to be subjected to the treating medium, is introduced through the inlet into the drum opposite the shaft 2a, is conveyed from the bottom of the drying shaft, below the walls 2 up to the upper edge of the shaft by means of buckets 5 located on the inside of the conveying drum shell, is emptied into the shaft, sinks more or less rapidly to the bottom of the shaft, is caught again by the conveyor, and is raised to the shaft edge, i. e. a small portion falls at each revolution out of the drum through the outlet 17. The speed, at which the material sinks through the shaft, is dependent upon the capacity of the conveyor 5. The feeding through the drum is effected through the action of the inclination of the drum.

The chambers 34 on both sides of the drying shaft are used for distribution and removal of the treating medium. In the described case the drying air is distributed from the inlet in the chamber 3, passes through the shaft and the

sinking material via the perforations of the shaft walls, flows out into the chamber 4 and further to the outlet 18a (Figs. 2 and 3).

The simple gas flow shown in Figs. 3 and 4 can be made more effective by providing partitions in the chambers 3, 4 as shown in Figs. 5, 6. Through partitions 7, Fig. 5, and inlet openings 30 and outlet openings 31 at the drum ends two gas currents may be led through the drum as shown by the arrows in the figure. By this the material can be subjected to treatment by mediums having different properties in the same apparatus, for example simultaneously by superheated vapour in one end portion and by flue gases in the other end portion or by drying air and cooling air.

By providing partitions 8 according to the principle shown in Fig. 6 the treating medium can be led in zigzag through the material, and thus the gas path can be prolonged, and consequently the actuation of the gas upon the material can be delayed. Another way is to pass the medium from one end of the drying chamber 3 through the shaft to the other chamber 4, from there back to the first chamber, and then to take out the same from the drum. By means of several partitions the drying medium can be forced to pass several times to and fro through the drying shaft.

In the embodiment according to Fig. 7 the shell is stationary but surrounds a conveyor 35 having shovels 36 performing the transport of the material from the lower portion of the shaft 2a to its upper portion. The shell 37 forms together with the end walls 16 a closed chamber. As in the previous embodiment the apparatus is provided with inlet and outlet openings for material to be dried as well as for drying medium, and the shaft walls 2 are made with perforations 2c.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:

1. An apparatus for treating materials comprising two substantially vertical, stationary end walls, two substantially horizontal hollow bodies located between and fixed to said end walls and having mutually facing walls spaced from one another to form a vertical shaft between the hollow bodies, said mutually facing walls having perforations for the passage of a medium from one

hollow body to the other right across the shaft, inlet and outlet pipes for the medium in said end walls communicating with the interior of the hollow bodies, guide means above the hollow bodies, an endless conveyor arranged between the end walls and depending from said guide means and extending about the outer surfaces of the hollow bodies, an inlet pipe in one end wall for directing material to be treated on to the lower portion of the conveyor, and an outlet pipe in the other end wall for receiving treated material falling from the upper portion of the conveyor.

2. An apparatus as claimed in claim 1, in which the conveyor and end wals constitute a substantially fluid tight shell.

3. An apparatus as claimed in claim 1, in which the general contour of the apparatus in vertical section is pear-shaped, being narrower at the top than at the bottom.

4. An apparatus as claimed in claim 1, provided with means for guiding the lower portion of the conveyor about the hollow bodies.

5. An apparatus as claimed in claim 1, provided with a partition arranged in each hollow body.

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