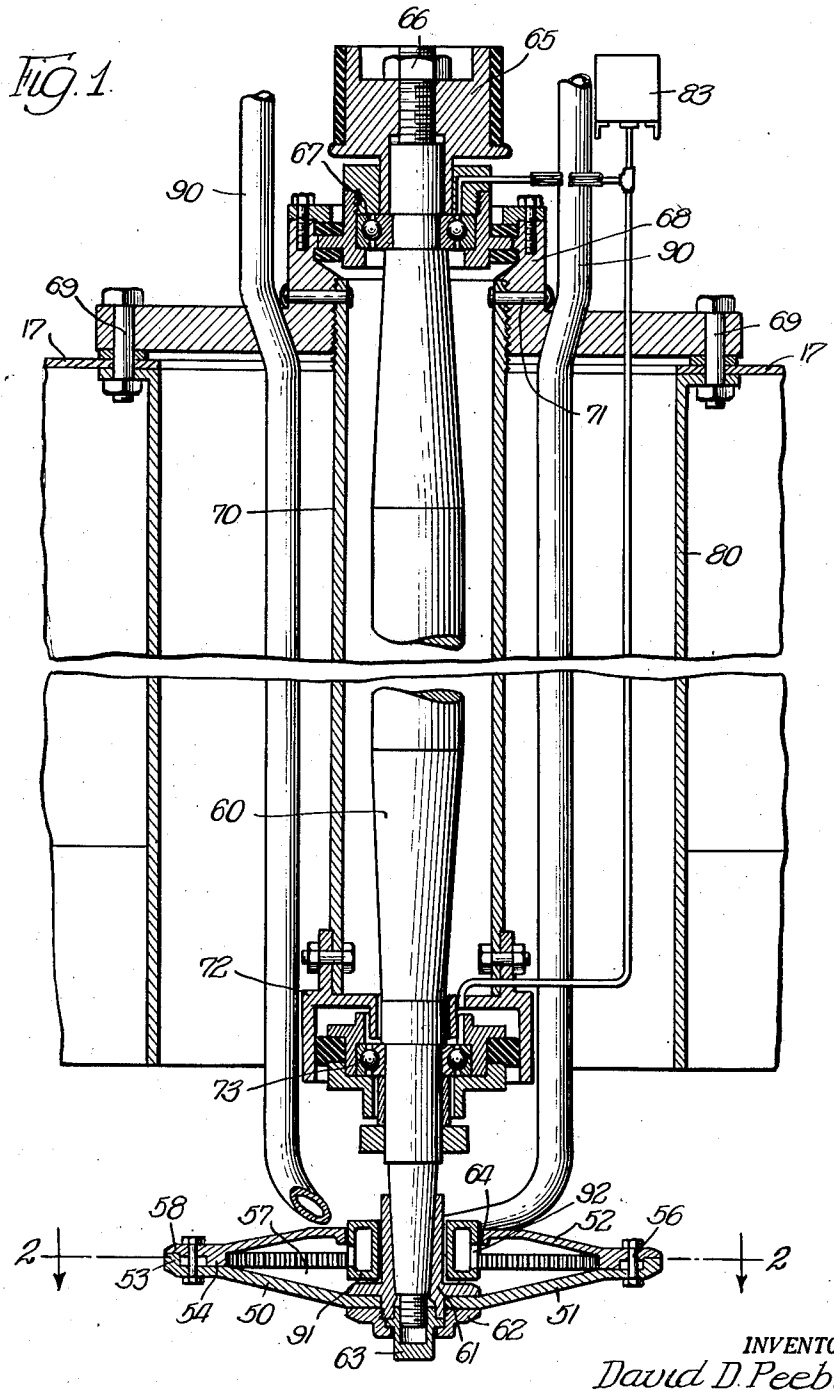
Nov. 13, 1951 D. D. PEEBLES 2,574,705

ATOMIZING APPARATUS

Original Filed July 3, 1942 2 SHEETS—SHEET 1

Fig. 1.



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Fig. 2

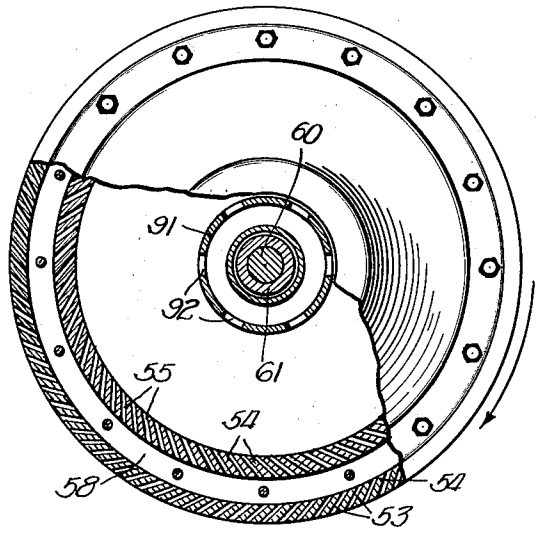


Fig. 4

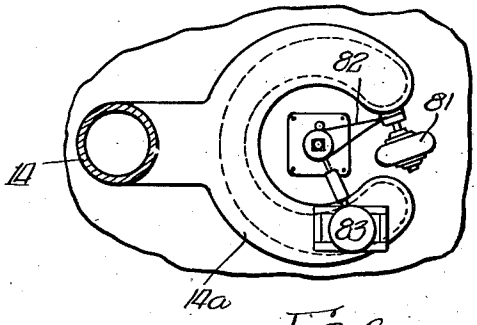
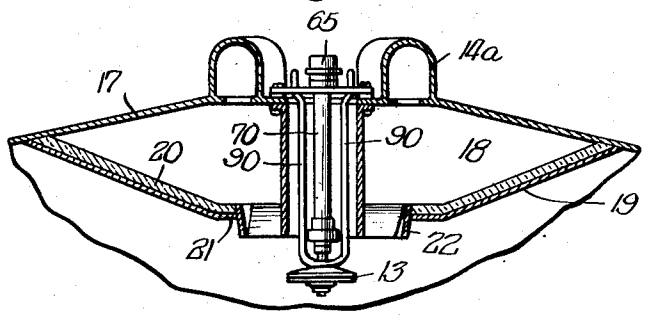


Fig. 3



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2,574,705

ATOMIZING APPARATUS

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2 Claims. (Cl. 299—63)

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This invention relates to a new and improved atomizing apparatus.

It is an object of this invention to provide a new and improved atomizing apparatus, especially adapted for the treatment of viscous substances in an efficient, satisfactory, and relatively inexpensive manner.

A further object of this invention is to provide an apparatus that may be used for cooling or drying highly viscous substances, such as, for instance, corn syrup, molasses and the like. When used for drying, this apparatus utilizes the combined action of surface evaporation and simultaneous boiling of moisture from the interior of minute particles of such materials.

The subject-matter constituting this invention was divided from applicant's disclosure set forth in U. S. Patent No. 2,415,527, issued February 11, 1947. The atomizing apparatus here disclosed and claimed is the same as that disclosed in said patent but not specifically claimed therein. In said patent, a full description will be found of a complete atomizing and desiccating apparatus including the chamber, conducting pipes, and similar parts. For a full understanding of such apparatus, reference is made to the specification of said patent.

It is to be understood that the atomizing apparatus here described and claimed is adapted to be used in conjunction with different types of apparatus, but for the disclosure of one illustrative form, reference is made to said patent.

In the accompanying drawings—

Figure 1 is an enlarged elevational view in cross section of the upper central portion of the drying apparatus shown in such Letters Patent No. 2,415,527, which more clearly shows the construction of the rotary runner or so-called basket and its associated parts.

Figure 2 is a cross sectional view taken on the line 2—2 of Figure 1 and looking in the direction of the arrows.

Figure 3 is a slightly enlarged view of the upper end of the drier; and

Figure 4 is a fragmentary plan view showing the upper part of the drier as it would appear when looking down upon it.

It will be noted that these figures correspond to Figures 2 to 5, inclusive, of said patent.

Referring now to the drawings it will be noted that the runner or rotary atomizing device comprises a horizontally disposed circular member 50 formed of a lower part 51 and an upper part 52. At the periphery of the lower part 51 are a plurality of spaced lugs 53 which are separated

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one from the other by angularly disposed slots 54 (see Figure 2). These lugs collectively form an annular support on which rests the outer edge of the upper member 52. The upper member 52 has a series of similarly formed lugs 54 which are separated by angularly disposed slots 55, as more clearly shown in Figure 2. It will be noted particularly that the angularly disposed slots 55 of the inner ring attached to the upper member 52, extend in a direction opposite to that of the slos 54 of the outer ring. It will also be observed that the inner series of lugs also form a supporting surface, but these depend from the upper members 52 into position for engagement with the opposed or lower member 51. The upper and lower members of the runner are preferably held together by bolts 56 which extend through the peripheries thereof, as clearly shown in Figures 1 and 2.

From the foregoing description, it will be apparent that the runner is provided with an internal space 57 adapted to receive the material to be desiccated, and that the space 57 has communication with the exterior through the slots 55 and 53, respectively. It will further be noted that an annular chamber 58 is formed between the inner and outer annular series of lugs, through which space the material must pass on its way from the interior of the runner to the exterior.

As clearly shown in Figure 1, the upper half 52 of the runner is entirely supported on the lower half, and the lower half provides the means of attachment of the runner on the shaft 60. The runner is fitted on the sleeve 61 and held by means of the nut 62. The sleeve 61 is held on the shaft by means of the nut 63 which is locked in position by the nut 62. The opening in the upper member 52 is sufficiently large to provide a space 64 between the inner edge of the runner and the sleeve for the purpose of accommodating a feeding bowl, hereinafter more fully described.

The shaft 60 extends upwardly beyond the upper wall 17 of the drying chamber and is equipped with a pulley 65 mounted on the upper end thereof by means of the nut 66. The upper end of the shaft is mounted in an antifriction bearing, designated generally 67, which is suitably mounted in a support 68 mounted by means of bolts 69 on the upper wall 17 of the drying chamber. The support 68 also serves as a mounting for the downwardly extending sleeve 70 which may be screw-threaded into the support and also held by rivets 71. This sleeve extends downwardly and serves as a mounting for a collar 72 which in turn serves as a mounting for a suitable anti-

friction bearing 73 which supports the lower end of the shaft 60.

It will be noted that this entire assembly derives its main support from the upper support member 68, and that it is hung on the upper wall of the drying chamber. It will also be noted that it extends down through the central opening provided in the upper wall 17 into what constitutes a cylindrical space defined by the wall 80. This wall is attached to the upper wall 17 of the drying chamber and it constitutes the inner wall of an annular feeding passage for hot drying gas.

As more clearly shown in Figure 4, the pulley 65 on the upper end of the shaft 60 may be driven by a suitable motor 81 connected by means of the belt or other gearing element 82. The container 83, shown in Figures 1 and 4, are for lubricant for the upper and lower antifriction bearings, respectively.

From the above description, it will be apparent that the runner is adapted to be mounted in the upper end of the drying chamber, and that it is capable of being given a relatively high speed of rotation by means of the electric motor.

The material to be desiccated is fed to the runner by means of pipes 90—90 which extend downwardly from a point above the upper wall of the desiccating chamber into the annular space defined by the cylindrical wall 80. These pipes extend down below the lower edge of the wall 80, or, in other words, into the upper portion of the drying chamber, and are caused to bend at right angles so as to extend horizontally and then to communicate tangentially with the upper, outer edges of an annular feeding bowl 91. This feeding bowl fits within the space provided between the inner surface of the upper wall 52 of the runner and the collar 61 of the shaft, and it serves to effectively close such space. The annular bowl 91 is provided with a series of windows 92 around its outer cylindrical face, which communicate directly with the interior space 57 of the bowl. Any suitable number of windows may be employed, but it is found that good results are obtained when six windows are employed.

The tangential feed of the material to be desiccated through the pipes 90—90 acts to give the material being treated a rotary motion within the annular bowl, the direction of which is opposite to that of the direction of rotation of the runner itself. It is to be understood that the runner rotates in the direction indicated by the arrow of Figure 2, or, in other words, a direction opposing the outlet openings at the ends of the slots 53.

The manner of feeding and discharging the material through the runner, according to this invention, is effective to impart to the material undergoing treatment the energy required to raise its temperature to and above the boiling point in the manner hereinbefore pointed out. The heated air which comes in at the top through the duct 14a, passes through the annular air space provided by the sleeve 22 and the inner wall 80, and in passing therethrough it is preferably given at least a slight rotary motion which in most instances will be concurrent with the direction of rotation of the runner. In addition, and as shown in said Patent No. 2,415,257 good results will be obtained when currents of air are introduced at the lower part of the drying chamber, so as to create a swirl rotating in a direction opposite or counter to the direction of rotation of the runner.

By means of the foregoing apparatus, it is found that the high speed of rotation which is employed serves to build up a pressure opposing the outward centrifugal feed of the material through the runner; and that the feeding of the material in opposition to such pressure, coupled with the instantaneous and prompt release thereof into the drying atmosphere, causes a rise in temperature from a point slightly below the boiling point to a point above the boiling point, with the result that an instantaneous boiling and drying is effected at the instant the material is atomized and exists in finely divided form in the drying space.

For purposes of illustration, the following specific examples of actual runs carried out with the apparatus of this invention will now be given. These operations involved the treatment of corn syrup, which was sprayed from the nozzle at approximately 38.5° Baumé and 40° Baumé, respectively:

Example No. 1

The first run is the 38.5° Baumé run, which was carried out under the following conditions: The temperature of the material fed to the runner was approximately 210° F. The inlet temperature of the air fed into the drying chamber was between 326° F. and 344° F. The temperature of the tangent inlets was approximately 189° F. to 192° F. The temperature of the outlet gas was approximately 229° F. to 238° F. Approximately 71.37% of solids were recovered, and the output of commercial product for the unit as run was 2525 pounds per hour.

The atomizing runner was 12½ inches in diameter and was operated by a 50 horsepower motor, which was operated at 3450 revolutions per minute when the runner was under load.

The atomizer was operated by a 3 inch pulley carried on the runner shaft, which in turn was driven by a 10½ inch pulley on the motor.

Example No. 2

A similar run was carried out with 40° Baumé syrup in which the material was supplied to the runner at a temperature between 208° F. and 210° F. The inlet temperature of the drying gas was 336° F. to 340° F. The tangent temperature was between 196° F. and 200° F. The outlet temperature was between 228° F. and 236° F.

The runner, motor, and runner drive, as well as the revolutions per minute, were the same as in the first example. In this run, the output of commercial product was 2828 pounds per hour.

Example No. 3

A run was conducted in all respects like the run of Example No. 1, with the exception, however, that the material was fed to the runner at a temperature of approximately 213° F. A product having a slightly different physical form resulted, and the product was in all respects an excellent commercial product.

Example No. 4

A run was conducted in all respects like the run of Example No. 1, with the exception, however, that the material was fed to the runner at a temperature of approximately 224° F. A product having a slightly different physical form resulted, and the product was in all respects an excellent commercial product.

Example No. 5

A run was conducted in all respects like the

run of Example No. 1, with the exception, however, that the material was fed to the runner at a temperature of approximately 228° F. A product having a slightly different physical form resulted, and the product was in all respects an excellent commercial product.

From the foregoing it will be seen that this invention provides an apparatus by which the substance to be desiccated, such as syrup, is brought to the nozzle under a temperature and pressure relationship which is closely approaching the boiling point of the substance treated, and that through the action of the nozzle itself, additional energy derived from the motion of the nozzle is imparted to the material, with the result that heat is added to the material and the temperature thereof is increased; and finally, that the material is suddenly released into the zone of low pressure, whereby an instantaneous flashing and boiling of the water present takes place, which is productive of an instantaneous drying of the material.

It is recognized that it is old to deliver substances of this type to nozzles under pressure and at temperatures above the boiling point, and applicant does not make any claim to such procedure, but the applicant does contend that it is novel to subject material being treated to the action of a nozzle or atomizing device while the same is undergoing a rapid and extensive movement at a temperature-pressure relationship below the boiling point of the material, and to impart to the material kinetic energy derived from the motion of the nozzle or atomizing device, and finally to cause the substance to be suddenly released into an atmosphere of lower pressure, with the result that its temperature is instantaneously raised above the boiling point through the energy conversion and a consequent boiling and drying of the product occurred.

The atomizer is also intended to be used in operations other than drying operations. In fact, it can be used wherever an atomization of liquid products is desired. Hence, it can be used in cooling apparatus for molten syrup and the like.

What is claimed is:

1. A centrifugal atomizing device adapted to be mounted on a rotary member, comprising top and bottom walls fixed to rotate with said rotary member and defining with said rotary member an annular material-receiving space therebetween, an annular member surrounding said space located between said walls and disposed coaxially therewith, substantially straight elongated slots of relatively narrow width extending through said annular member and extending at an angle to the radius of said device and inclined toward the direction of rotation thereof, and a second annular member disposed inside of and coaxially with said first-named annular member and having substantially straight, elongated slots of relatively narrow width extending at an angle to the radius of said device and in the direction opposite to the angular direction of the slots in said first-named annular member.

2. A centrifugal atomizer of the construction defined in claim 1, further characterized in that one of said annular members is formed integral with said top wall and the other of said annular members is formed integral with said bottom wall, and detachable means are provided for holding said parts in assembled relation.

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