Feb. 17, 1953

A. H. BOILEAU

2,628,773

CENTRIFUGAL TESTER

Filed Oct. 21, 1947

2 SHEETS—SHEET 1

Fig. 1.

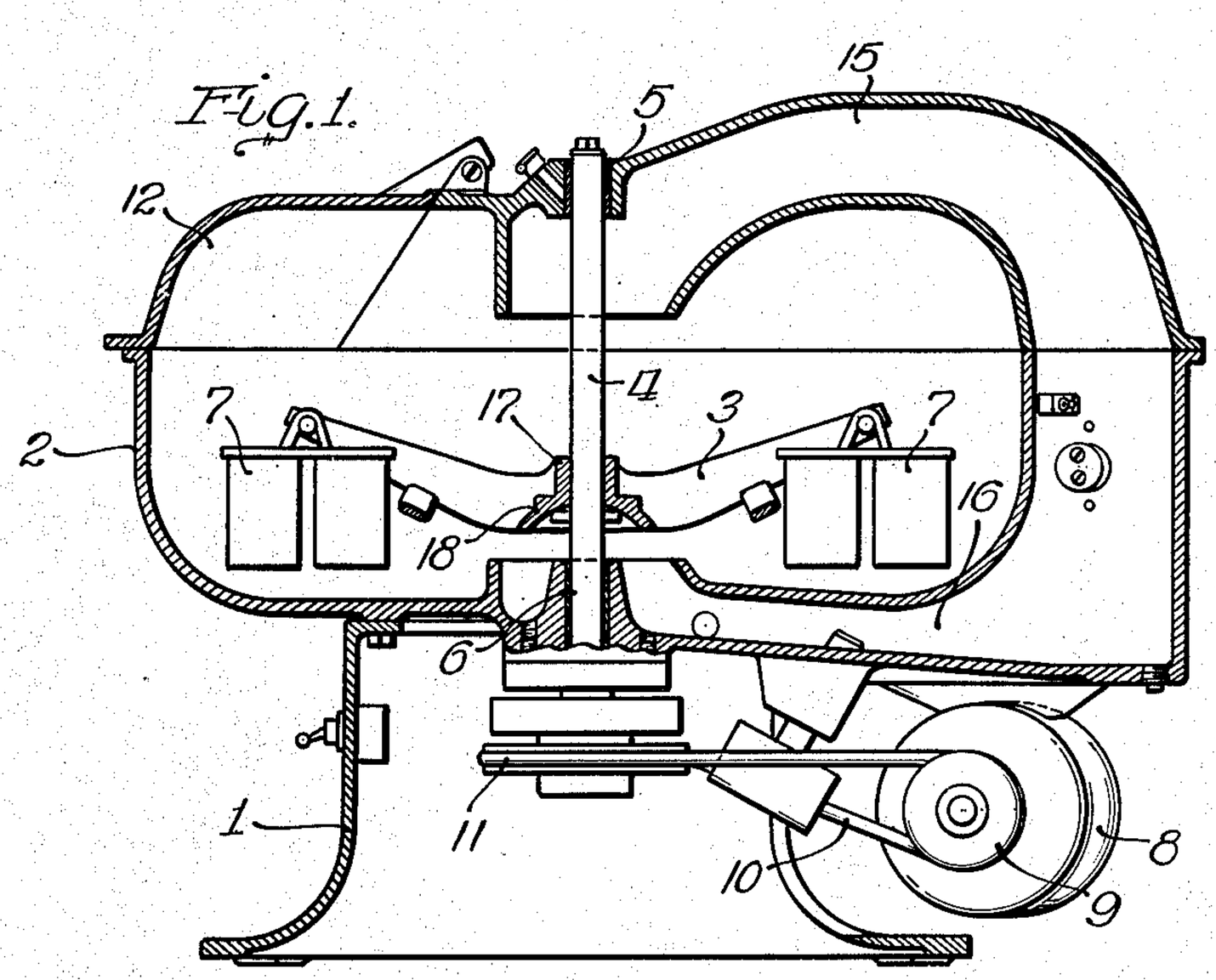
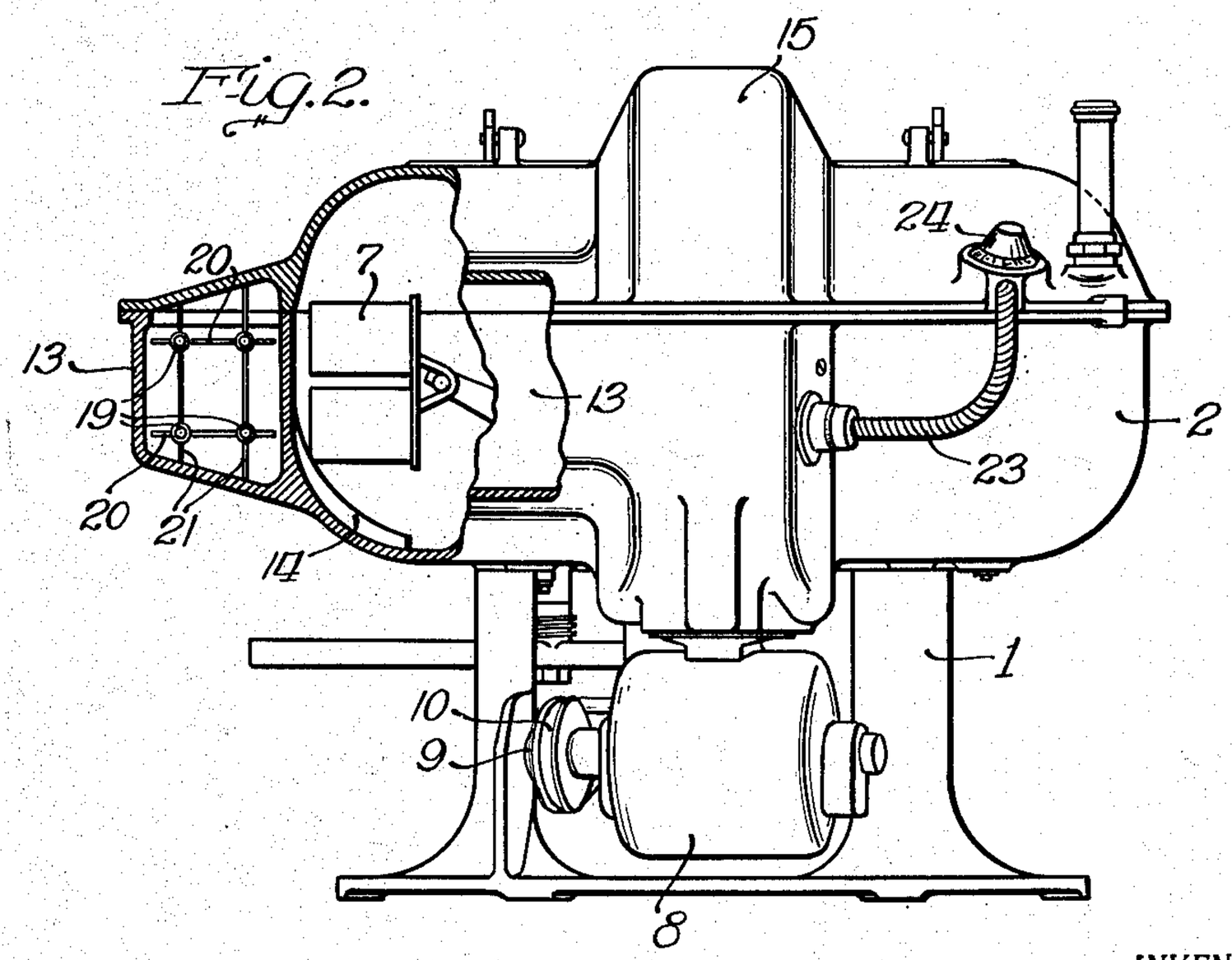


Fig. 2.



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2 SHEETS—SHEET 2

Fig. 3.

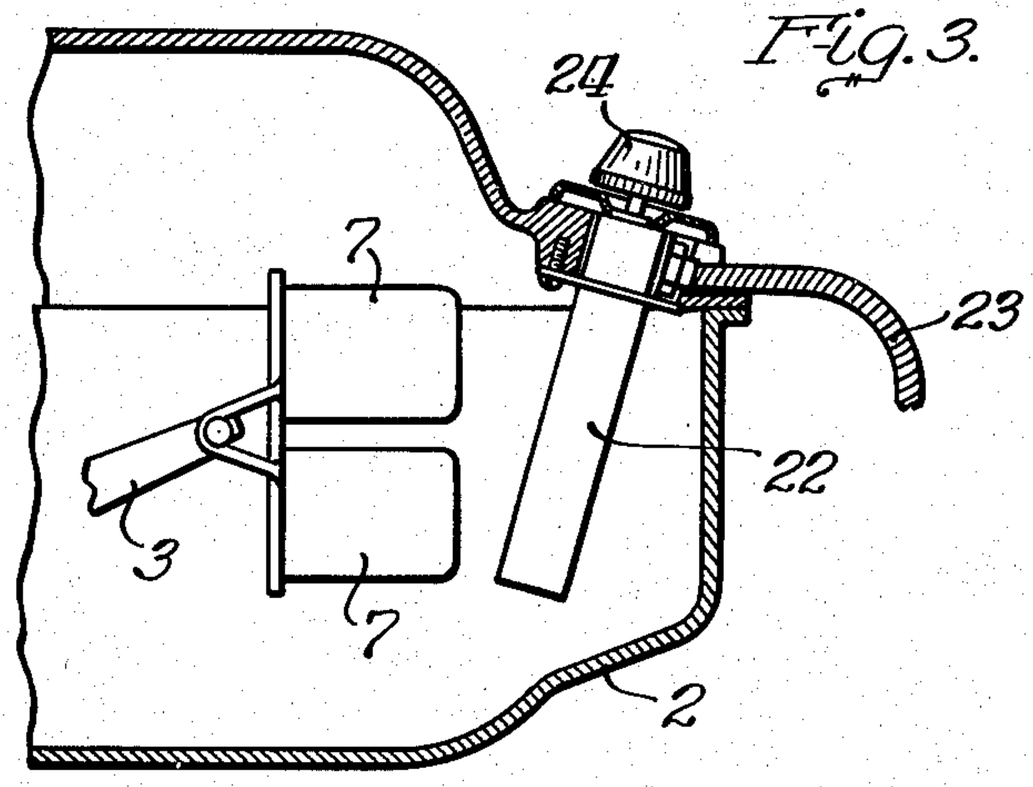
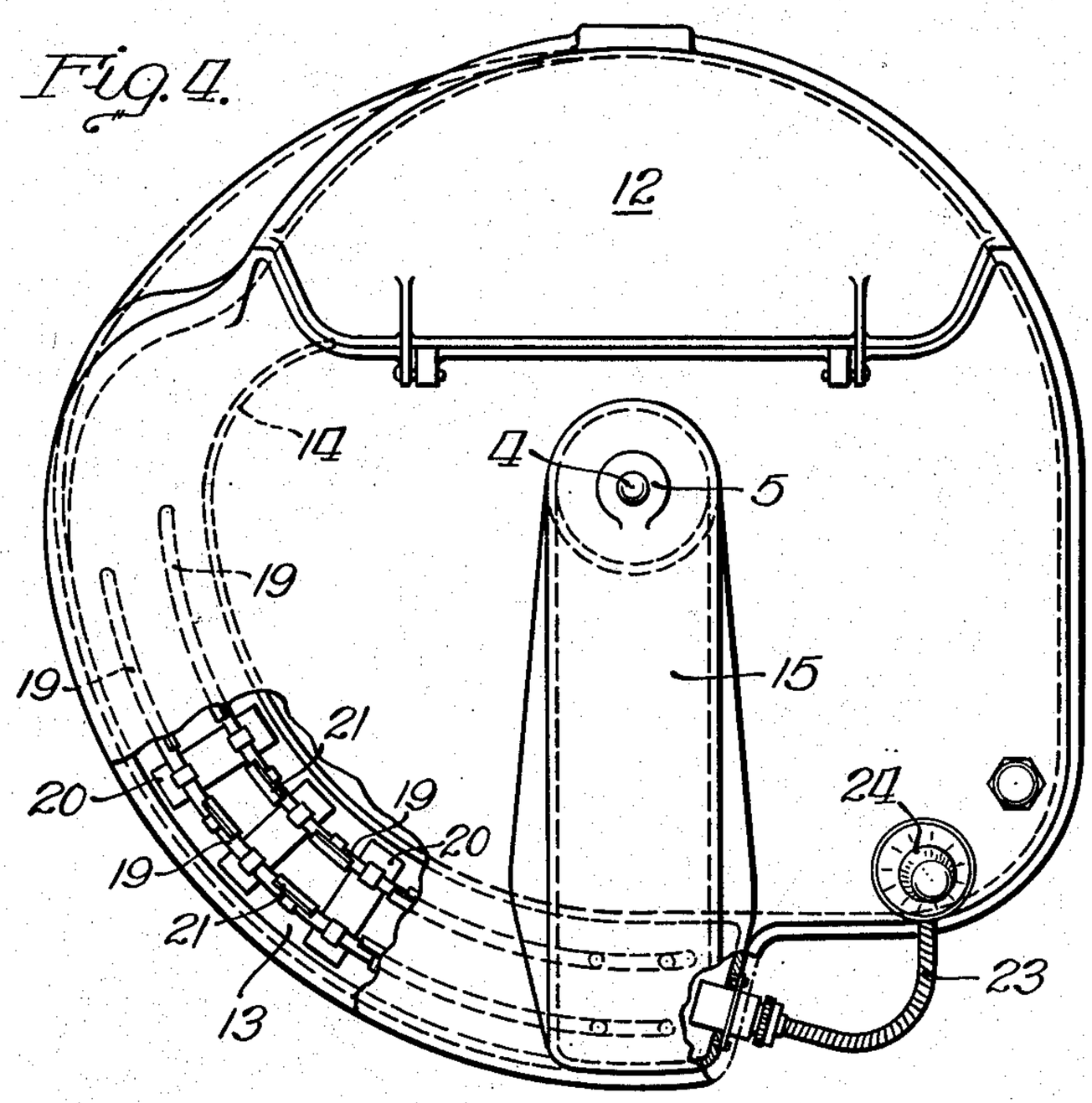


Fig. 4.



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Patented Feb. 17, 1953 2,628,773

UNITED STATES PATENT OFFICE

2,628,773

CENTRIFUGAL TESTER

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Application October 21, 1947, Serial No. 781,111

3 Claims. (Cl. 233—11)

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This invention pertains to centrifugal testing machines. More particularly, this invention pertains to the type of centrifugal testing machine used for determining the percentage of butterfat in milk or cream or the like, in which the material being tested is put into a specially designed container and then whirled in the rotary carrier of the centrifuge to cause the separation of the fat contained in the material from the remaining portion of the material.

The objects of this invention include the provision of a centrifugal type testing machine housed within a casing, wherein substantially uniform, predetermined temperatures may be maintained throughout the entire interior of the testing machine casing.

Centrifugal testers of the type contemplated by this invention, available for use prior to this invention in substantially all instances, have commonly been defective in that it has been impossible to maintain in them uniform temperatures throughout the interior of the centrifugal tester casing.

Obviously, such centrifugal testers, which are not housed in a casing, are adapted only for use for relatively inaccurate testing. Accurate testing requires the subjecting of all of the test samples to the same conditions of centrifugal force, while being maintained under the same temperature conditions, assuming that all other conventional testing procedures, such as accurate measurements, etc., have been observed.

In the enclosed type of centrifugal tester, which is now provided with means for heating the interior of the tester, it obviously becomes impossible to accurately test the product, particularly when the separation of the product is effected by the temperature, as is the case in the separation of milk fat from the remaining components of milk.

Some of the prior art centrifugal testers of the type contemplated by this invention have included means for heating a portion of the interior of the centrifugal tester or a portion of the tester casing. However, it has been found that such heating, as contemplated by the prior art, is wholly inadequate, in that invariably the fan action of the rotor of the centrifuge tends to prevent the satisfactory circulation of air within the centrifuge casing from one side of the plane in which the rotor operates to the other side of that plane. The result of such a situation is that even though the air may be heated in one portion of such a centrifuge, the fan action of such a centrifuge prevents the satisfactory heating of the air in

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the remaining half of the centrifuge. Thus, if the lower half of the centrifuge is heated, the fan action of the rotor prevents the proper distribution of heat in the upper portion of the centrifuge and thereby prevents the maintenance of the desired uniform temperatures throughout the centrifuge.

The objects of this invention, therefore, are to overcome the aforementioned difficulties, which have been mentioned in connection with the heating of centrifugal testing machines and to provide an efficient, simple, practical and convenient means for uniformly heating the interior of centrifugal testing machines and for accurately regulating the degree of heat within such testing machines.

The foregoing and other objects and advantages of this invention will become more apparent and will be more readily understood when considered in connection with the accompanying drawings of the preferred embodiment of the present invention, which, without desire of limitation, will be described and illustrated as an improved type of centrifugal milk fat testing apparatus.

In the accompanying drawings:

Figure 1 is a vertical, sectional view of applicant's improved type of centrifugal testing machine.

Figure 2 is an elevational view, partially in broken-away section, of the hot air circulating duct and the arrangement of the heating elements therein, and the manner of dividing the discharge end of the air duct to conduct the heated air to the upper and lower portions of the interior of the centrifuge.

Figure 3 is a sectional view of a portion of the casing of the centrifuge, illustrating the positioning of the thermostat within the centrifuge casing, whereby to control the heating of the electrical resistance units, which comprise the heating elements positioned in the hot air duct.

Figure 4 is a plan view of the improved centrifugal testing machine, partially in broken-away section, illustrating the placement of the heating units in the hot air duct, and the volute type of intake end of the hot air duct, which extends into the interior of the centrifuge casing.

Referring to the drawings, in which like numerals are used to identify like elements, 1 represents the centrifuge base upon which the sectional, substantially circular centrifuge casing 2 is mounted. A rotary test bottle support spider 3 is mounted on the rotary spindle 4, centrally of the circular casing 2. The upper and lower

ends of the spindle 3 are supported in bearings 5 and 6, respectively, in the upper and lower walls of the casing 2.

The test bottle rotor or whirler 3 is provided in the conventional manner with the test bottle supporting baskets 7 hinged thereto. As illustrated in Figure 1 of the drawings, the baskets or corners 7 are in the position which they occupy when the machine is not in operation.

As illustrated in Figure 2 of the drawings, the corners 7 are in the position which they occupy while the spider 3 and basket 7 are rotating at high speed. As illustrated in Figure 2 of the drawings, the baskets 7, extending outwardly from the outer periphery of the spider 3, act as vanes of a fan, and, together with the spider 3, produce a high speed fan action within the centrifuge casing 2.

As illustrated in Figure 1 of the drawings, the spindle 3 may be driven by any suitable means, such as electric motor 8, supported on the casing 2, and connected by means of motor pulley 9 and belt 10 and spindle pulley 11 to the driving spindle 4 for the rotation thereof at the desired speed.

In the conventional manner, the casing 2 is provided with a removable or replaceable section 12, the upper portion of which comprises a door or entryway for the introduction of the test bottles into the basket 7 and for the withdrawal of test bottles from the basket 7, as well as for the inspection and cleaning of the interior of the centrifuge.

Substantially all of the hereinbefore described aspects of the applicant's improved centrifugal testing machine are, in substance, the same as comparable aspects of the conventional centrifugal butterfat testing machines. However, it will be noted from Figures 2 and 4 of the drawings that the casing 2 of the applicant's improved centrifugal tester is provided with a volute type of lateral passage or hot air duct 13 formed in one side of the outer wall of the centrifugal tester casing 2. One end of the hot air duct passage 13, as clearly illustrated in Figure 4 of the drawings, opens into the interior of the centrifuge casing 2, immediately adjacent the outer path of motion of the test bottle rotor assembly when the baskets 7 are in their elevated position, as shown in Figure 2 of the drawings.

The end of the air duct 13, which communicates with the interior of the casing 2 through an opening in the outer peripheral wall of the casing 2, is provided with an inwardly extending flange 14, which extends into close proximity to the path of travel of the outer portions of the basket 7 when in their elevated position, as shown in Figure 2 of the drawings. The flange 14 is adapted to act in the fashion of an air scoop to receive the air from the fan-like test bottle air agitating rotor assembly when rotating at high speed in counter-clockwise direction, as viewed in Figure 2 of the drawings, and to guide the air into the duct 13. The air enters the air duct 13 from the outer peripheral portion of the casing 2, adjacent what may be referred to as the front part of the tester, in the general vicinity of one end of the tester door 12. This is clearly illustrated in Figure 4 of the drawings. The air passes rearwardly through the air duct 13 to the divided duct portion at the rear of the machine where the air is divided into substantially equal portions, with one portion of the air traveling upwardly through the upper discharge branch 15. Through branch 15 the air

is discharged into the central portion of the interior of the casing 2, immediately above the central portion of the rotor spider 3. The remaining air flowing through the duct 13 flows into the downwardly extending discharge branch 16. Through branch 16 the air is discharged into the central portion of the interior of the centrifuge casing 2 immediately below the central portion of the rotor spider 3.

As will be apparent upon an inspection of Figure 1 of the drawings, the hub portion 17 of the rotary spider 3 is provided with an outwardly and downwardly depending flange 18, which acts as a baffle for the air being introduced into the interior of the casing 2 from the ducts 15 and 16. Flange 18 tends to distribute the air, thus received from the ducts 15 and 16, uniformly and outwardly into the space above and below that portion of the casing in which the rotor spider 3 and the baskets 7 rotate.

To enable the prompt heating of the air within the interior of the centrifuge, heating elements 19 are provided within the air duct 13, extending longitudinally thereof and uniformly spaced from the walls thereof in the four quadrants of a cross section of the duct 13. In the preferred embodiment of the applicant's invention, the heating elements 19 are in the form of electrical resistance units, which are conveniently supported on suitable spacers 20 and 21.

Like unto the motor 8, the electrical resistance units 19 in the preferred embodiment of applicant's invention are attached to a convenient and suitable source of electric power. A suitable type of thermostat 22 extends through the casing 2 into the outer peripheral portion thereof immediately adjacent the outer portion of the path of travel of the rotor baskets 7, for the accurate determination of the temperature of the air within the casing, immediately adjacent the path of travel of the rotor baskets 7, and for the control, when necessary, of the electrical power being supplied to the electrical resistance heating units 19 to secure and maintain the desired heating of the air in the centrifuge. For this purpose, the thermostat 22 is connected to the resistance units 19 in a conventional manner by means of the necessary electrical connections housed in the conduit 23.

Under some circumstances, it may be preferred to vary the predetermined air temperatures within the casing 2. Such desired predetermined temperatures may readily be obtained by the appropriate actuation of the adjustment 24 of the thermostat 22, by means of which the amount of electrical power supplied to the resistance units 19 may be accurately controlled.

It will be apparent from the foregoing description of the applicant's improvement in a centrifugal bottle testing device that the applicant has provided a highly efficient, relatively simple mechanism for the uniform heating and maintenance of accurately controlled, uniform temperatures throughout the entire interior of the casing of a centrifugal testing machine.

Having thus described and illustrated the preferred embodiment of the present invention in a centrifugal testing device, the invention is not to be restricted to the specific embodiment thereof, as illustrated in the drawings and as hereinbefore described, excepting insofar as may be necessary in view of the disclosure of the prior art and the appended claims.

The invention is hereby claimed as follows:

1. In a device of the class described, the com-

bination of a substantially circular casing, a rotor within said casing having a plurality of arms carrying bottle supports, means for rotating said rotor in a definite direction, and a duct having a volute section opening into the outer peripheral wall of said casing and extending in the direction of rotation of said rotor, said duct having two branches leading centrally into said casing, one above and the other below the rotor, whereby upon rotation of said rotor a continuous flow is imparted to the air within the casing in the direction of such rotation thereby causing air to flow into the volute section of said duct and then through the respective branches of said duct back into said casing.

2. In a testing device of the class described the combination of a substantially circular casing, a rotor within said casing having a plurality of arms carrying bottle supports, means for rotating said rotor in a predetermined direction, and an external duct integral with said casing, said duct having a volute section opening into the outer peripheral wall of the casing and extending in the direction of rotation of said rotor and having two branches communicating with said volute section and leading centrally into said casing one above and the other below said rotor, whereby upon rotation of said rotor a continuous flow is imparted to the air within said casing in the direction of such rotation thereby causing air to enter and pass through said duct into said casing.

3. In a testing device of the class described the combination of a substantially circular casing, a rotor within said casing having a plurality of arms carrying bottle supports, means for rotating said rotor in a predetermined direction, a duct having a volute section opening into the outer peripheral wall of the casing and extending in the direction of rotation of said rotor and having two branches communicating with said volute section and leading into said casing one above and the other below said rotor, and heating means within said duct, whereby upon rotation of said rotor a continuous flow is imparted to the air within said casing in the direction of such rotation thereby causing air to enter and pass through said duct, to be heated by said heating means, and thereupon to flow back into said casing.

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