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RESISTANCE HEATED FUNNEL

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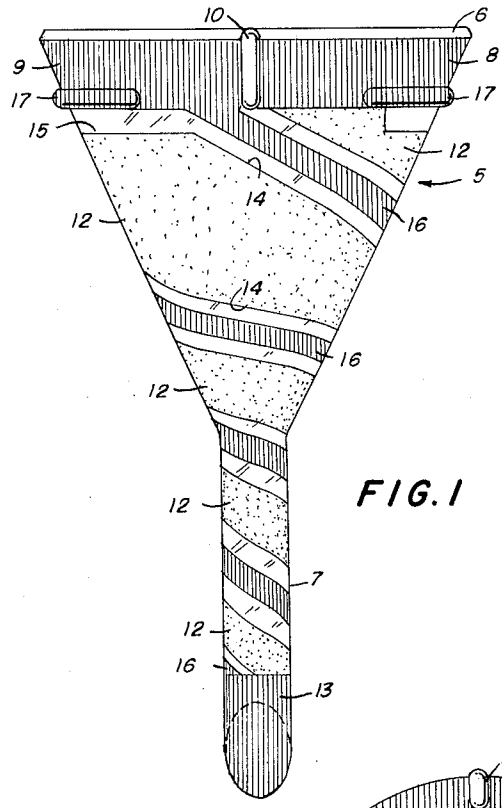
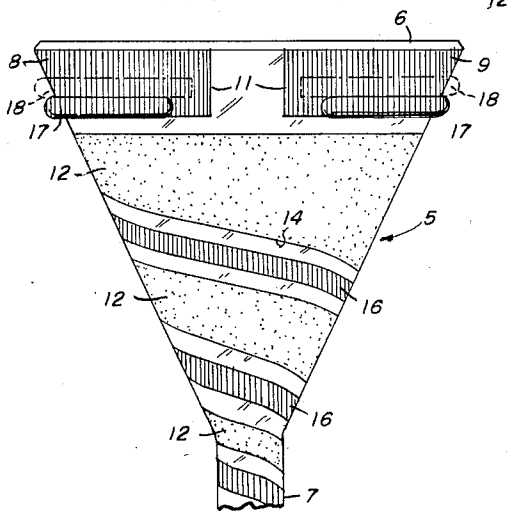



FIG. 1

FIG. 2



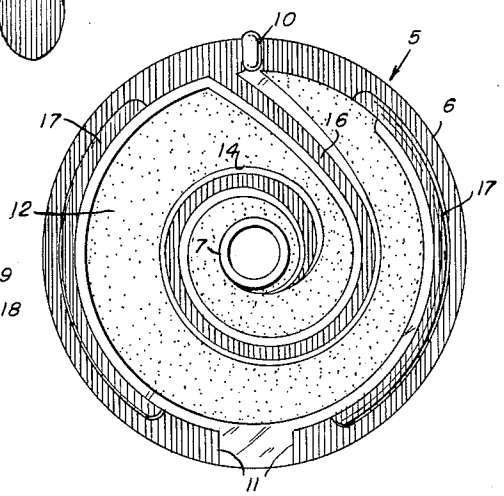




FIG. 3

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# RESISTANCE HEATED FUNNEL

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This invention relates to funnels and the like for laboratory and similar uses and consists more particularly in new and useful improvements in a glassware funnel having integrated heating means.

Frequently, in the use of funnels and similar articles of laboratory equipment formed of glass and like materials, it is desirable and sometimes necessary to control the temperature and viscosity of the materials being handled. The application and maintenance of a controlled uniform temperature in funnel-like structures has presented a considerable problem which has created a need for a simple and efficient funnel having a self-contained heating unit.

An object of the invention is to provide a laboratory funnel of glass or like material, having an electrical resistance coating arranged to distribute heat throughout the contour of the funnel, in relation to surface-volume ratio.

Another object of the invention is to provide a unit of laboratory glassware in the form of a funnel, incorporating a heating surface of electrical resistance material to thereby facilitate convenience in use.

Still another object of the invention is to provide an electrical resistance coating for glassware funnels, the width and arrangement of said coating being variable to meet the conditions to be maintained and the particular materials being handled.

A further object of the invention is to provide a simple and expedient means for heating a glassware funnel while suspended from supporting electrodes.

With the above and other objects in view which will appear as the description proceeds, the invention consists in the novel features herein set forth, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

Referring to the drawings in which numerals of like character designate similar parts throughout the several views:

Fig. 1 is a view in side elevation showing one side of the funnel according to the present invention;

Fig. 2 is a similar view partially broken away, taken from the opposite side of the funnel, and

Fig. 3 is a bottom view of the funnel shown in Fig. 1.

Briefly, the invention consists in applying to the outer periphery of a glassware funnel, a film or coating of resistance material, arranged in a relatively wide spiral band, connected at its upper end to one of a pair of terminal strips, and at its lower end to a connecting band of conducting material. The spiral band of resistance material is so arranged that its convolutions are spaced from one another a distance to accommodate a narrow intervening, spaced conductor band which likewise follows a helical path, said conductor band being connected at its upper end to the other of said pair of terminal strips and at its lower end to said connecting band. Thus, the application of electrodes to said pair of terminal strips causes electrical current to flow around the funnel through said resistance band and return through the intervening conductor band in a complete circuit.



In the drawings, 5 generally represents a funnel of the present invention comprising the usual flaring body 6, the walls of which converge and terminate in an elongated stem 7. The outer periphery adjacent the mouth of the flaring body 6 is provided with a pair of terminal strips 8 and 9, preferably formed by coating the surface of the body 6 with a film of silver which is baked on the funnel body. The terminal strips 8 and 9 are separated from one another on one side of the body 6 by a radially projecting clear glass knob or enlargement 10, formed on the body 6 which, as will later appear, serves the added function of facilitating the location of the supporting electrodes. On the other side of the body 6, the terminal strips 8 and 9 are separated by a space of clear glass 11, as seen in Fig. 2.

A band of electrical resistance material 12, preferably comprising a coating of platinum applied to the outer periphery of the funnel, extends in a helical path from adjacent the upper end of the body 6 where it contacts the terminal strip 8, to the lower end of the steam 7 where it contacts a silver connecting band 13 which also may be in the form of a coating applied to the stem 7. The convolutions of the band 12 are separated from one another by a helical space or gap 14 which continues at the upper end of the body 6 where it merges with an annular space 15, separating the resistance band 12 from the terminal strip 9.

The circuit is completed by providing a helical current conducting return band 16, connected at its upper end to the terminal strip 9 and following the path of the helical gap 14 to its lower end where it is in electrical contact with the connecting band 13. The return band 16 is preferably formed of the same material as the terminal strips 8 and 9 and is applied in the form of a coating directly on the surface of the glass funnel, the coating being spaced from the opposed boundaries of the gap 14 so as to be completely isolated from the convolutions of resistance coating 12.

In a companion application Serial No. 862,331, filed December 28, 1959, we described and illustrated a combined support-clamp and electrical connecting device for use with a generally similar heating unit. This device comprises a body portion adapted to be connected into a suitable electrical outlet and provided with a pair of arcuate electrodes for engaging complementary contacts on the unit to be heated. The funnel of the present invention is designed for use with a similar combined support-clamp and electrical connecting device and to this end, the upper portion of the funnel body 6 is provided with a pair of annular ribs 17 fused to the body and spaced a short distance from the flaring upper extremity thereof. Thus, as shown in Fig. 2, in dotted lines, the electrodes 18 of the connecting device engage the flaring periphery of the body 6 immediately above the respective ribs 17, in electrical contact with the terminal bands 8 and 9. The electrodes 18 thereby support the funnel proper and at the same time energize the terminal bands 8 and 9.

Preferably, although not necessarily, the ribs 17 are included in the silver coated area of the respective terminal bands 8 and 9. Also, while I have described the terminal bands 8 and 9 and the return band 16 as formed of silver, it will be understood that they may be formed of other suitable conducting materials or they may be of the same material as the resistance coating 12.

The resistance coating 12 has been described as preferably composed of platinum but it may be stated that various other metals, such as silver, tin, aluminum and gold may be employed. The platinum coating is preferably applied by spraying and baking in an oven at temperatures in excess of 1100° F. and the thickness of the coating may vary but generally should not exceed .0015 inch and should not be less than 0.0003 inch. The thickness

of the terminal bands and the return band may be of a thickness in the order of .008 inch and not less than .003 inch.

The present invention affords maximum control of the surface to be heated and by varying the distance between the convolutions of the band **12** at the top and bottom of the funnel, the effective heat can be selectively distributed.

It will be apparent that the principle of the present invention may be applied with equal effect to various types of funnels including separatory funnels or in fact, to any similar tapered article of glassware or the like where it is desired to control the temperature and viscosity of materials being handled.

From the foregoing, it is believed that my invention may be readily understood by those skilled in the art without further description, it being borne in mind that numerous changes may be made in the details disclosed without departing from the spirit of the invention as set forth in the following claims.

We claim:

1. A unit of glassware or the like, having a helical coating band of electrical resistance material applied to its periphery, the convolutions of said band being spaced by a helical non-conducting gap, a pair of separate terminal strips applied to the surface of the upper end of said unit, one of said terminal strips being in electrical contact with the adjacent extremity of said coating band, a connecting band applied to the surface of the lower end of said unit in electrical contact with said coating band, and a helical circuit completing band lying within said non-conducting gap, its lower end contacting said connecting band and its upper end contacting the other of said pair of terminal strips.

2. A unit of glassware or the like, having a helical coating band of electrical resistance material applied to its periphery, the convolutions of said band being spaced by a helical non-conducting gap, a pair of separate terminal strips comprising coatings of electrical conducting material applied to the surface of the upper end of said unit, one of said terminal strips being in electrical contact with the adjacent extremity of said coating band, a connecting band comprising a coating of electrical conducting material applied to the surface of the lower end of said unit in electrical contact with said coating band, and a helical circuit completing band comprising a coating of electrical conducting material applied to the surface of said unit within said non-conducting gap, its lower end contacting said connecting band and its upper end contacting the other of said pair of terminal strips.

3. A funnel of glassware or the like, having a helical coating band of electrical resistance material applied to its periphery, the convolutions of said band being spaced by a helical non-conducting gap, a pair of separate terminal strips comprising coatings of electrical conducting material applied to the surface of the upper end of said funnel, one of said terminal strips being in electrical contact with the adjacent extremity of said coating band, a connecting band comprising a coating of electrical conducting material applied to the surface of the lower end of said funnel in electrical contact with said coating band, and a helical circuit completing band comprising a coating of electrical conducting material applied to the surface of said funnel within said non-conducting gap, its lower end contacting said connecting band and its upper end contacting the other of said pair of terminal strips.

4. A funnel as claimed in claim 3, wherein said coating band, terminal strips, connecting bands and circuit completing band comprise coatings of noble metal applied directly to the surface of said funnel.

5. A funnel of glassware as claimed in claim 4, wherein the coatings forming said terminal strips, connecting band and circuit completing band are of lesser resistance than said helical coating band of resistance material.



6. A funnel of glassware or the like, having an electrical resistance band of platinum applied to its periphery in helical form, the convolutions of said band being spaced by a helical non-conducting gap, a pair of separate terminal strips comprising coatings of silver applied to the surface of the upper end of said funnel, one of said terminal strips being in electrical contact with the adjacent extremity of said coating band, a connecting band of silver applied to the surface of the lower end of said funnel in electrical contact with said coating band, and a helical circuit completing band of silver applied to the surface of said funnel within said non-conducting gap, its lower end contacting said connecting band and its upper end contacting the other of said pair of terminal strips.

7. A funnel as claimed in claim 6, wherein said helical coating band is gradually reduced in width from the top to the bottom of said funnel.

8. A funnel of glassware or the like, comprising a flaring body terminating in a reduced stem, a helical coating band of electrical resistance material applied to the surface of said body and stem, the convolutions of said band being spaced by a helical non-conducting gap, a pair of separate terminal strips comprising coatings of electrical conducting material applied to the surface of said body adjacent its flaring end, one of said terminal strips being in electrical contact with the adjacent extremity of said coating band, a connecting band comprising a coating of electrical conducting material applied to the surface of the lower end of said stem in electrical contact with said coating band, a helical circuit completing band comprising a coating of electrical conducting material applied to the surface of said body and stem within said non-conducting gap, its lower end contacting said connecting band and its upper end contacting the other of said pair of terminal strips, and a pair of radially projecting ribs formed on the surface of said body adjacent said terminal strips, in spaced relation to the extremity of the flaring end of said body to facilitate the application of electrodes to respective terminal strips.

9. A funnel as claimed in claim 8, wherein adjacent ends of said terminal strips are separated by clear glass areas of said body.

10. A funnel as claimed in claim 9, including a radial projection of glass adjacent one of said spaced areas, for locating a supporting electrode device.

11. A heated funnel assembly comprising a funnel of glassware or the like, having a helical coating band of electrical resistance material applied to its periphery, the convolutions of said band being spaced by a helical non-conducting gap, a pair of separate terminal strips comprising coatings of electrical conducting material applied to the surface of the flaring upper end of said funnel, one of said strips being in electrical contact with the adjacent extremity of said coating band, a pair of radially projecting ribs integrated with the periphery of said funnel in spaced relation to its flaring end and adjacent said terminal strips, supporting electrodes engageable with said terminal strips in abutment with said ribs, a connecting band comprising a coating of electrical conducting material applied to the surface of the lower end of said funnel in electrical contact with said coating band, and a helical circuit completing band comprising a coating of electrical conducting material applied to the surface of said funnel within said non-conducting gap, its lower end contacting said connecting band and its upper end contacting the other of said pair of terminal strips.

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