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RESISTANCE HEATED STOPCOCK

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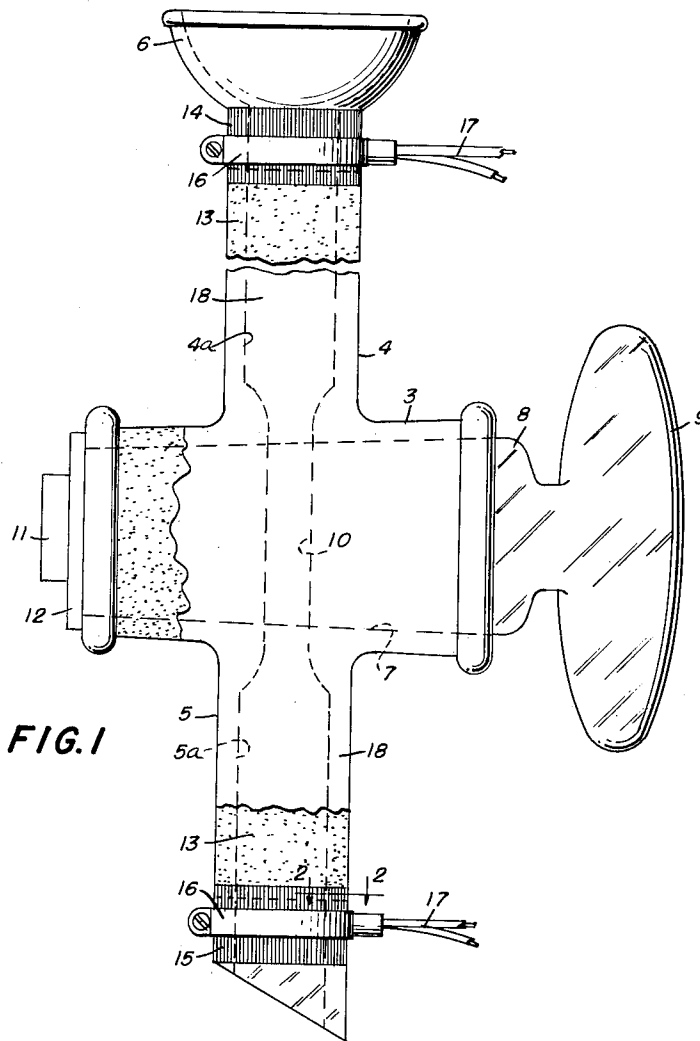


FIG. 1

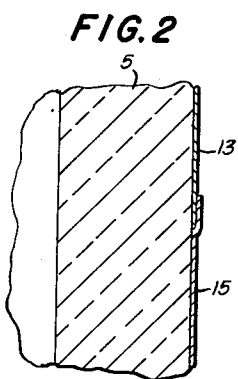


FIG. 2

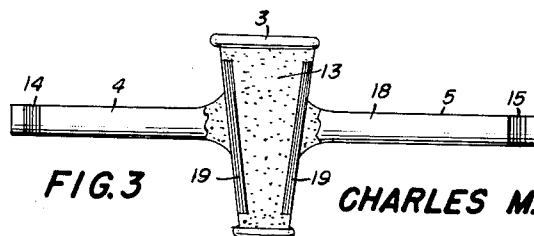


FIG. 3

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RESISTANCE HEATED STOPCOCK

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1 Claim. (Cl. 219-19)

This invention relates to laboratory glassware and the like, and consists more particularly in new and useful improvements in a stopcock which is heated by means of an electrical resistance coating applied to its outer surface, this application being the copending application of the applicant and others, Serial No. 862,331, filed December 28, 1959.

Chemical handling apparatus in the past has been plagued with complications in dealing with molten solids, particularly those of an organic nature. Heat from some source is necessary to prevent solidification within the container and its connecting parts, such as stopcocks and adjacent lines. Stopcocks in particular, have been troublesome and several methods have been employed in an effort to eliminate "freezing."

For example, the container to which the stopcock is connected, as well as the contents thereof, have been heated to a temperature which is high enough to prevent the formation of a solid plug within the bore of the stopcock when it is closed. The higher the melting point, the greater is the danger of decomposition of the material, and other means eventually become necessary.

Also, stopcocks have been steam or vapor jacketed but this is cumbersome and often impossible with small stopcocks. Auxiliary vaporizing means too, are required which could be as large as the handling apparatus.

In another form, an electrical heating element is wrapped around the stopcock, the heating wire being either bare or covered with asbestos or braided glass fiber insulation.

Experience has shown that the physical shape of the stopcock makes it difficult to wrap in order to properly heat the central portion between the arms. Bare wire cannot be overlapped and is generally useless and the wire coverings of insulated wire, both tend to abraid in use and they also have other disadvantages such as heat insulating quantities and bulk, high application costs, poor appearance, and liquid absorbency which makes it necessary to remove the wire when cleaning the stopcock.

It is therefore the primary object of the present invention to overcome the disadvantages above noted in connection with conventional equipment.

An object of the invention is to provide a stopcock of glassware or the like having an integral heating means incorporated therein in the form of a resistance coating to thereby facilitate convenience of use.

Another object of the invention is to provide a heated stopcock capable of producing higher temperatures with greater safety than is possible with conventional equipment.

Still another object is to provide a stopcock having a resistance coating including shunt strips of lesser resistance material at selected locations to intercept the major portion of the current and redistribute the same to effect more uniform heating.

A further object is to provide a heated stopcock having a resistance coating and an integral insulation having heat and chemical resistant properties.

A still further object of the invention is to provide a heated stopcock designed to facilitate the control of normally solid or highly viscous materials which are frequently handled in laboratory equipment.

Another object is to provide a heated stopcock of this nature which is neat in appearance, easy to manipulate and

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clean, and requires less space than those which are heated by the use of auxiliary heating means.

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 claim.

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

FIGURE 1 is a view in side elevation showing one form of stopcock embodying the invention, certain areas being broken away for illustrative purposes;

FIGURE 2 is an enlarged sectional view taken on line 2-2 of FIGURE 1, showing the relationship of the resistance coating and one of the terminals; and

FIGURE 3 is a modified form of the invention including shunt strips.

As shown in the drawings, the stopcock is basically of conventional structure, that shown in FIGURE 1 purely for purposes of illustration, comprising a barrel 3 having integral stems or side arms 4 and 5 projecting from opposite sides thereof. The stems may be plain at their free ends, or, as shown, one or both of the stems may carry a ball and socket fitting 6 to facilitate connection to other pieces of laboratory equipment.

The hollow barrel 3 is provided with a tapering bore 7 adapted to receive the correspondingly contoured body of a plug 8, having the usual handle or knob 9. The plug 8 is provided with a transversely drilled passageway or port 10 adapted for alignment with the passageways 4a and 5a respectively, of the stems 4 and 5. A suitable nut 11 and washer 12 retain the plug 8 in place in the barrel 3 in the usual manner.

As before indicated, the structure just described is conventional and may comprise many known variations in stopcock design. Briefly, the invention consists in applying to the outer periphery of a stopcock of glassware, or similar material having a normally non-conducting surface, a film or coating of resistance material arranged in a complete conducting circuit and having terminal means adapted to receive opposed contact members or electrodes arranged at spaced points in electrical contact with the resistance coating.

Considering the invention in greater detail and referring to FIGURE 1, a thin coating or film of electrical resistance material 13 is applied to the periphery of both the stems 4 and 5 and the intermediate barrel 3. Preferably, the resistance coating consists of platinum applied by spraying one or more coats of a solution containing platinum and baking in an oven at temperatures in excess of 1100° F. after the coating has dried. The thickness of the resulting metallic platinum or platinum alloy coating may vary but generally should not exceed .0015 inch and should not be less than .0003 inch. It will be understood that while platinum is preferred, various other metals such as silver, tin, aluminum and gold may be used, the thickness of which will vary with the metal used. For instance, a coating resulting from a tin salt may be in the order of .000016 inch.

At opposite ends of the stems 4 and 5, and at least partially overlying the adjacent portions of the resistance coating 13, we provide terminal bands 14 and 15 preferably consisting of coatings of silver or other metal of less resistance than the coating 13. The thickness of the terminal bands is in the order of 0.008 inch and generally not less than .003 inch. In any event, the thickness of the terminals should be greater than that of the coating 13, and, if desired, the terminal coatings may be of the same material as that employed in the resistance coating, but in this case, the subsequent coats are applied in localized well-defined geometric patterns. The

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metallic coatings of the bands 14 and 15 are in electrical contact with the adjacent areas of the resistance coating 13 and are adapted to receive suitable contact clamps 16 on conductors 17 connected to a suitable source of electrical current.

An insulating jacket 18 overlies the resistance coating 13 and is preferably formed by dipping the resistance coated stopcock in silicone rubber catalyzed latex and curing to a resilient form with heat, or applying any suitable high temperature electrical insulation, such as a ceramic glaze or silicone resin. Silicone rubber has been found to possess the desired insulating properties and its resilience also serves the added purpose of protecting the stopcock against breakage. However, other materials having these properties could obviously be used.

FIGURE 3 represents a modification of the invention which under some conditions may be preferable to the one just described. In this form of the invention, the barrel 3, in addition to the resistance coating 13, is provided adjacent the junctions of the stems 4 and 5, with longitudinally extending shunt strips 19 which overlie the resistance coating 13 at these points. These shunt strips may consist of a coating of silver or other material of lesser resistance than the coating 13, similar to the terminal bands 14 and 15. The purpose of the shunt strips 19 is to intercept most of the current as it reaches these points and to redistribute the same so that the barrel is heated more uniformly. In other words, with the form of the invention shown in FIGURE 1, the current tends to flow in a straight line across the barrel, while with the shunt strips 19, a more uniform distribution of current is effected.

With regard to the overlying terminal bands and shunt strips described above, it may be noted that this arrangement possesses a distinct advantage over certain known resistance coating methods wherein the more conductive material employed as a bus bar is applied directly to the base of glass and underlies the resistance coating. For example, the fact that the coefficients of expansion of terminal band material such as silver or silver ceramic mixtures are not sufficient matches for the glass coefficients and introduce strain at the glass surface. On the other hand, when the terminal band material is applied to and overlies a compatible noble metal surface, the ductility of the underlying metal will tolerate differential movement.

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The operation and advantages of the present invention are generally similar to those described in said copending application. It will be apparent that by providing an electrical resistance film or coating on the periphery of the stopcock and arranging said coating in an electrically conducting circuit and having terminal means for positively locating and retaining electrical contacts, that stopcocks of glassware and the like may be heated under controlled and safe condition. Also, by providing integral electrically conducting shunt strips, a controlled pattern of heat intensity is provided.

In the claim, the term "glassware" is intended to include glass-coated, or vitreous enameled metal and similar materials as a base for the resistance coating.

From the foregoing, it is believed that the 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 appended claim.

I claim:

A heated stopcock formed of glassware, comprising a barrel and at least two stems, the outer surface of said barrel and stems being coated with an electrical resistance material, opposite terminal bands on said stems, electrically connected to said coating material, and shunt strips of a material of less resistance than said coating, formed on the coating of said barrel adjacent the junctions of said stems for intercepting a portion of the current flowing through said coating and redistributing the same to provide uniform heating.

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