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APPARATUS FOR COOLING HOLLOW GLASSWARE

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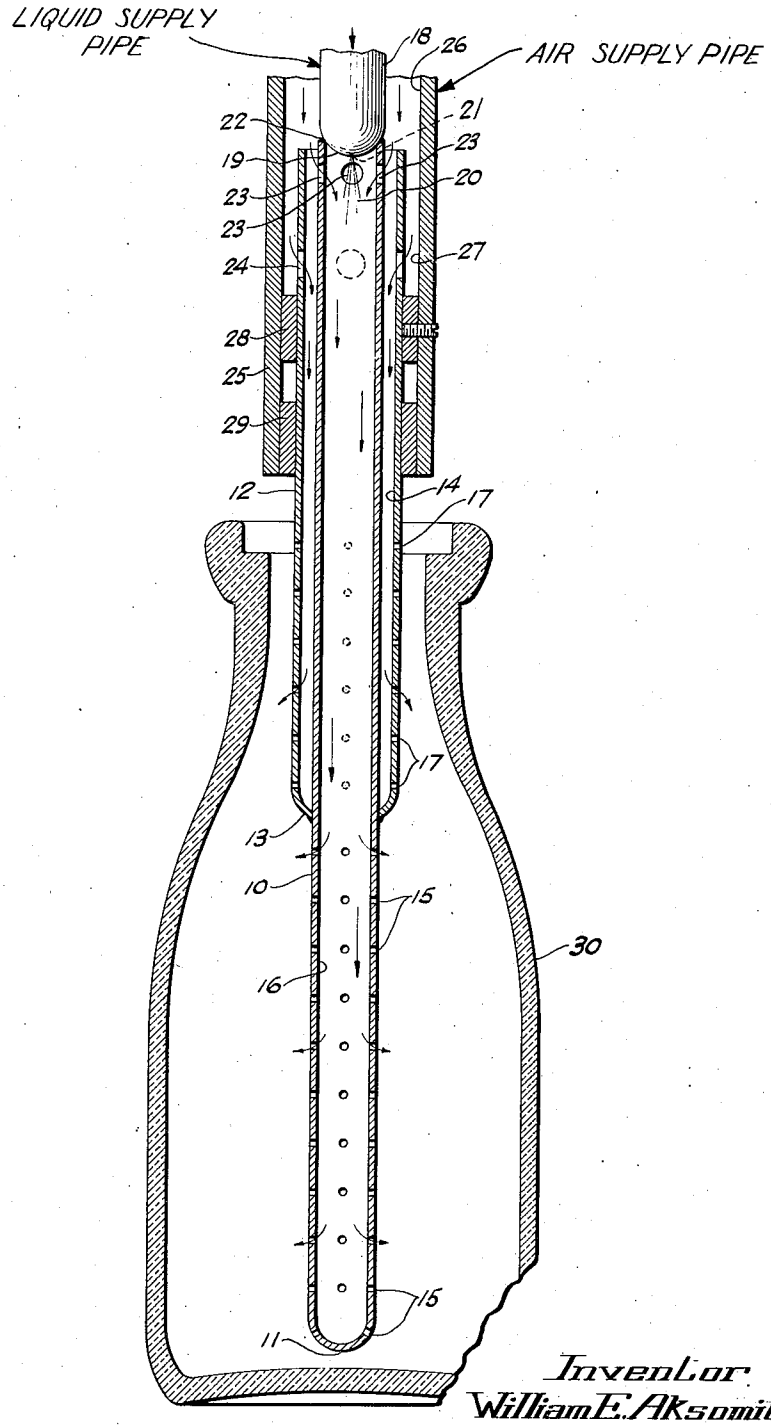

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APPARATUS FOR COOLING HOLLOW GLASSWARE

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1

This invention relates to improvements in means for applying cooling fluid to the internal surface of a bottle, jar or other hollow glass article to effect cooling thereof, as in tempering such an article.

An object of the invention is to provide a spray nozzle constructed and arranged to discharge jets of gaseous fluid-liquid spray into one part of a hollow glass article and jets of a different coolant, as gaseous fluid alone, into another part of the glass article.

Another object of the invention is to provide a nozzle of the character described by which part of a supply stream of air is mixed with liquid spray and the resultant spray product is conducted to jet holes in the lower part of a hollow glass article that is to be cooled while another part of the air supply stream is conducted to jet holes for discharging jets of the air into the upper part of the glass article.

A further object of the invention is to provide a novel means for cooling the internal surface of a bottle, jar or similar glass article so that a more vigorous fluid coolant, such as a suitable gaseous fluid-liquid spray mixture, may be effectively applied to the internal surface of the article from its bottom upward throughout the greater part of its height and a milder coolant, such as compressed air alone or mainly air, may be effectively applied to the remaining upper part of the internal surface of the article.

Other objects and advantages of the invention will hereinafter be pointed out or will become apparent from the following description of a practical embodiment of the invention as illustrated in the accompanying drawing, in which the view is a longitudinal vertical section of a nozzle structure of the present invention in position for use to effect cooling of the internal surface of a bottle.

As shown in the drawing, the nozzle provided by the present invention may comprise an inner tubular member 10 which may be closed at the free or forward end thereof, as at 11. A second tubular member, designated 12, of greater diameter than the tubular member 10, surrounds the rearward end portion of the latter and extends forwardly for only part of the length of the member 10. The tubular member 12 may be swaged or bent inwardly at its forward end, as at 13, to fit tightly around the tubular member 10 at that place, whereby to space the tubular member 12 from the inner tubular member 10 so as to provide an annular passage 14 between these members. This passage 14 may be made fluid

2

tight at its forward end, as by brazing the inturned forward end portion 13 of the member 12 to the inner tubular member 10. Any other suitable known means may be employed to fasten the forward end of the tubular member 12 to the tubular member 10 to maintain these members in spaced concentric relation with each other and so that the annular passage between them will be closed at its forward end.

The portion of the inner tubular member 10 that projects beyond the forward end of the member 12 may be provided with jet holes 15 from which jets of fluid from the internal passage or bore 16 of the tubular member 10 may issue. The number, relative arrangement and size or sizes of these jet holes may have been predetermined and selected in view of the requirements of the service for which the particular nozzle is intended.

The tubular member 12 likewise is provided with jet holes, designated 17, through which jets of cooling fluid from the annular passage 14 may be discharged. These jet holes may be of any suitable total number, size or sizes, and relative arrangement that are deemed to be required or best suited for the service intended.

The invention provides a means for supplying jets of a suitable liquid, as water, to the internal passage or bore 16 of the inner tubular member 10. In the example shown, a liquid spray supply pipe 18 has a convexo-concave forward end wall 19 disposed in the rearward end of the tubular member 10 so that liquid spray, indicated at 20, from a spray hole 21 in the end wall 19, will be projected in a generally forward direction in the internal passage or bore 16 of the tubular member 10. As shown, the pipe 18 may be aligned with the tubular member 10 and secured to the rearward end of the latter, as by brazing or welding at 22, so that the liquid spray discharging forward end wall 19 will serve as a closure for the rearward end of the internal passage or bore 16 of the tubular member 10. Any other suitable known means may be employed to fasten these parts together and to maintain them in suitable operating relationship.

The tubular member 10 is provided at about the place at which liquid spray is discharged thereinto from the supply pipe 18 with intake air openings 23 through which streams of air or other gaseous fluid under pressure may enter the internal passage or bore of the tubular member 10 to commingle with and carry forwardly in the passage 16 the liquid spray particles therein. The fluid discharging from the jet holes 15 thus

will be a mixture of air or gaseous fluid under pressure and minute particles of the liquid from the pipe 18.

As shown, the air intake openings 23 are arranged in a circular series around the tubular member 10 slightly in advance of the discharge end of the liquid supply pipe 18.

The tubular member 12 is provided with air intake openings 24 for supplying streams of air or other gaseous fluid under pressure to the annular passage 14 and through such passage to the jet holes 17. According to the present invention, air from a common source may be supplied to both the air intake openings 23 in the inner tubular member 10 and the more forwardly located air intake openings 24 in the tubular member 12. To this end, an outer air supply pipe 25 is disposed in concentric spaced relation with the liquid supply pipe 18 and with the rearward end portion of the tubular member 12. An air supply passage 26 thus is provided within the air pipe 25 around the liquid pipe 18 in open communication with the annular passage 14 of the pipe 12 at the rearward end of the latter. Air from the supply passage 26 thus may pass into the rearward end portion of the annular passage 14 whence some or all of such air may pass through the air intake openings 23 to the internal passage or bore 16 of the inner tubular member 10 for the purpose hereinbefore pointed out.

Some of the air entering the rearward end of the passage 14 may continue past the air intake openings 23 forwardly in the passage 14 for discharge through the jet holes 17. However, the air supply passage 26 may have a forward reduced continuation air passage 27 located between the rearward end portion of the tubular member 12 and the surrounding portion of the air pipe 25. This continuation air passage 27 may be closed at a place forwardly of the air intake openings 24, as by a closure ring or bushing 28 fitting between the pipe 25 and the member 12. As shown, there is another of these bushings or closure members, indicated at 29, between the parts 25 and 12. These bushings or closure members 28 and 29 serve to close the forward end of the continuation air passage 27 and to maintain the desired spaced concentric relation between the outer pipe or tubular member 25 and the tubular members therewithin. Obviously, these two bushings might be combined into but one bushing or any other suitable known means might be employed to close the passage 27 at its forward end and to connect the members 25 and 12 so as to maintain them in spaced concentric relation with each other.

The nozzle structure may be operatively supported by any suitable known nozzle supporting and operating means for locating the nozzle in position to project into the interior of an article of hollow glassware that is to be cooled and so that the air passage 26 and the liquid supply pipe 18 may be supplied with air and liquid as required for the cooling operation to be performed. The nozzle is shown in the drawing in position to effect cooling of the internal surface of a bottle 30. No means have been shown for operatively supporting the nozzle and the bottle in the positions shown as such means may be readily provided. Such means may provide for a relative rotation between the article to be cooled and the nozzle, in which event the discharge portions of the inner tubular member 10 and the intermediate tubular member 12 of the nozzle structure may have fewer jet holes than would be desirable or required in the absence of such relative rotation.

Operation of the nozzle shown to effect cooling of the internal surface of the glass article 30 in accordance with the method of the present invention will be readily understood. The jets of the cooling fluid-liquid spray mixture passing from the jet holes 15 into the bottle 30 against the internal surface of such article from its bottom upward for a predetermined, in this instance, the major part of the length of the bottle, will have a relatively greater cooling action than the jets of fluid discharging from the jet hole 17 against the upper remaining part of the internal surface of the bottle. The latter jets may consist entirely, or mainly, of air or gaseous fluid. The air or other gaseous fluid jets will aid in effecting the desired cooling of the internal surface of the upper or neck portion of the bottle and will promote or aid emigration or outward passage of the gaseous fluid-liquid spray coolant from the lower portion of the article. This outgoing coolant will of course also serve to cool the upper or neck portion of the bottle.

It will be understood that the external surface of the bottle may be cooled by any suitable means, not shown, in coordination with the internal cooling, especially when the cooling operation is to effect tempering of the bottle.

Many modifications of the nozzle structure shown in the accompanying drawing and of the operation thereof herein described will readily occur to those skilled in the art.

I claim:

1. In apparatus for use in tempering hollow glass articles, a cooling nozzle having a body suitable to be projected into the interior of a hollow glass article, said body comprising an inner tubular member closed at one end, a second tubular member surrounding said first-named tubular member for only part of the length of the latter so that the closed end portion of the inner tubular member projects a substantial distance beyond the second tubular member, said second-named tubular member being of sufficiently greater diameter than the first-named tubular member to provide an annular passage between itself and the first-named tubular member, said first-named tubular member having longitudinally spaced jet holes in a wall of the portion thereof projecting beyond said second-named tubular member, the latter also having longitudinally spaced jet holes in a wall thereof, a liquid supply pipe located at the end of the first-named tubular member opposite the closed end of the latter and having liquid spray discharge holes arranged to direct a spray of liquid into the interior of the first-named tubular member, said first-named tubular member having air intake openings in its wall adjacent to the last-named end thereof, and air supply means arranged to deliver air both to said air intake openings and to the annular passage between said second-named tubular member and said first-named tubular member.

2. In apparatus for use in tempering hollow glass articles, a cooling nozzle having a body suitable to be projected into the interior of a hollow glass article, said body comprising an inner tubular member closed at one end, a second tubular member surrounding said first-named tubular member for only part of the length of the latter so that the closed end portion of the inner tubular member projects a substantial distance beyond the second tubular member, said second-

named tubular member being of sufficiently greater diameter than the first-named tubular member to provide an annular passage between itself and the first-named tubular member, said first-named tubular member having jet holes in a wall of the portion thereof projecting beyond said second-named tubular member, the latter also having jet holes in a wall thereof, a liquid supply pipe located at the end of the first-named tubular member opposite the closed end of the latter and having liquid spray discharge holes arranged to direct a spray of liquid into the interior of the first-named tubular member, said first-named tubular member having air intake openings in its wall adjacent to the last-named end thereof, said second-named tubular member also having air intake openings in its wall at a place in advance of the first-named air intake openings, and an air supply pipe overlapping said second-named tubular member in spaced concentric relation therewith and in open communication with both said first-named air intake openings and said second-named air intake openings.

3. In apparatus for use in tempering a hollow glass article, such as a bottle, which is open at one of opposite ends thereof, a cooling nozzle comprising an elongate body having a free end and adapted to be inserted with its free end foremost through the open end of such a hollow glass article in the latter nearly to the opposite end thereof, said elongate body being formed to provide an internal passage therein extending longitudinally thereof for substantially the full length thereof and also being formed to provide a second internal passage therein extending longitudinally thereof for only part of the length of said elongate body, said first passage projecting toward the closed end of the elongate body a substantial distance beyond the second-named passage, said elongate body having a series of longitudinally spaced lateral jet holes for the portion of said first-named passage that projects beyond the second-named passage and also having a second series of longitudinally spaced lateral jet holes for the second-named longitudinally extending passage, and means to supply specifically different cooling fluids concurrently to the individual longitudinally extending passages in said elongate body.

4. In apparatus for use in tempering a hollow glass article, such as a bottle, which is open at one of opposite ends thereof, a cooling nozzle comprising an elongate body having a free end and adapted to be inserted with its free end foremost through the open end of such a hollow glass article in the latter nearly to the opposite end thereof, said elongate body being formed to provide an internal passage therein extending longitudinally thereof for substantially the full length thereof and also being formed to provide a second internal passage therein extending longitudinally thereof for only part of the length of said elongate body, said first passage projecting toward the closed end of the elongate body a substantial distance beyond the second-named passage, said elongate body having a series of longitudinally spaced lateral jet holes for the portion of said first-named passage that projects beyond the second-named passage and also having a second series of longitudinally spaced lateral jet holes for the second-named longitudinally extending passage, an air supply pipe operatively associated with said elongate body to supply air under pressure to said second-named longitudinally extending passage, and liquid spray supply means operatively associated with said first-named longitudinally extending passage to supply liquid spray thereto, said first-named passage also having an air intake port communicating with the second-named passage, whereby some of the air supplied to the latter may enter the first-named passage to mingle with the liquid spray therein.

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