TEMPERATURE CHANGING DEVICE

Inventor: Jordan Baldrige, Lancaster, PA (US)

Correspondence Address:
BARLEY SNYDER
PO BOX 1559
LANCASTER, PA 17608-1559 (US)

Appl. No.: 11/852,453
Filed: Sep. 10, 2007

ABSTRACT

A temperature changing device includes a first tubular member having a top end and a bottom end. The second tubular member is fixed to the first tubular member. A second tubular member communicates with the first tubular member via an air receiving passage. An intake control device is arranged between the air receiving passage and the bottom end of the first tubular member.
FIG. 8
TEMPERATURE CHANGING DEVICE

FIELD OF THE INVENTION

[0001] The invention relates to a temperature changing device comprising a first tubular member that communicates with a second tubular member via an air receiving passage wherein the first tubular member is provided with an intake control device.

BACKGROUND

[0002] It is often desirable to alter the temperature of a consumable liquid prior to the consumption thereof by a consumer. For example, it may desirable to cool a hot consumable liquid, such as coffee or broth, prior to the consumption thereof. Additionally, it may be desirable to warm a cold consumable liquid, such as milkshake, prior to the consumption thereof. It is therefore desirable to provide a temperature changing device that can easily alter the temperature of the consumable liquid immediately prior to or simultaneous with the consumption of the consumable liquid by the consumer.

BRIEF SUMMARY

[0003] The invention relates to a temperature changing device comprising a first tubular member having a top end and a bottom end. The second tubular member is fixed to the first tubular member. A second tubular member communicates with the first tubular member via an air receiving passage. An intake control device is arranged between the air receiving passage and the bottom end of the first tubular member.

[0004] The invention further relates to a method of changing a temperature of a liquid, comprising: inserting a bottom end of a first tubular member into the liquid; applying suction to a top end of the first tubular member; drawing the liquid through a liquid receiving passage in an intake control device toward the top end of the first tubular member; drawing surrounding air through a second tubular member and through an air receiving passage communicating with the first tubular member; and mixing the liquid with the air in a mixing region proximate the air receiving passage.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. 1 is a perspective view of a temperature changing device according to a first embodiment of the invention.

[0006] FIG. 2 is a sectional view of the temperature changing device of FIG. 1.

[0007] FIG. 3 is a sectional view of the temperature changing device of FIG. 1 showing a method of use thereof.

[0008] FIG. 4 is a perspective view of a temperature changing device according to a second embodiment of the invention.

[0009] FIG. 5 is a sectional view of the temperature changing device of FIG. 4 showing a method of use thereof.

[0010] FIG. 6 is sectional view of the temperature changing device of FIG. 4 showing a method of use thereof.

[0011] FIG. 7 is a perspective view of a temperature changing device according to a third embodiment of the invention.

[0012] FIG. 8 is a sectional view of the temperature changing device of FIG. 7 showing a method of use thereof.

[0013] FIG. 9 is sectional view of the temperature changing device of FIG. 7 showing a method of use thereof.

DETAILED DESCRIPTION OF THE EMBODIMENT(S)

[0014] FIGS. 1-3 show a temperature changing device 1 according to a first embodiment of the invention. As shown in FIG. 1, the temperature changing device 1 includes a first tubular member 2 and a second tubular member 3. As shown in FIG. 2, the first tubular member 2 has an open bottom end 5 and an open top end 7. The first tubular member 2 has an internal diameter 12. The second tubular member 3 has an open bottom end 4 and an open top end 6. The second tubular member 3 has an internal diameter 13. The internal diameter 13 of the second tubular member 3 is smaller than the internal diameter 12 of the first tubular member 2. For example, the internal diameter 13 of the second tubular member 3 may be about 60% of the internal diameter 12 of the first tubular member 2. The first tubular member 2 has an open bottom end 5 and an open top end 7. The second tubular member 3 has an open bottom end 4 and an open top end 6. Although the first and second tubular members 2, 3 are illustrated and described herein as having a substantially right circular cylinder configuration, it will be appreciated by those skilled in the art that the first and second tubular members 2, 3 may be formed to have any desired geometrical configuration.

[0015] As shown in FIG. 2, the first tubular member 2 at least partially receives the second tubular member 3. The bottom end 4 of the second tubular member 3 is arranged within and spaced from the bottom end 5 of the first tubular member 2. The top end 6 of the second tubular member 3 is arranged outside of and spaced from the top end 7 of the first tubular member 2. At least a portion on an outer surface 14 of the second tubular member 3 is fixed to at least a portion of an inner surface 8 of the first tubular member 2 such that an air receiving passage 9 is formed between the outer surface 14 of the second tubular member 3 and the inner surface 8 of the first tubular member 2. The outer surface 14 of the second tubular member 3 may be fixed to the inner surface 8 of the first tubular member 2 by any known attachment method or integrally formed in one piece therewith. The outer surface 14 of the second tubular member 3 may be fixed to the inner surface 8 of the first tubular member 2, for example, with an adhesive such as a glue, epoxy, or resin, with a frictional fit, or by heating, melting, and cooling the outer surface 14 of the second tubular member 3 and/or the inner surface 8 of the first tubular member 2 to form a bond there between.

[0016] As shown in FIG. 2, the bottom end 5 of the first tubular member 2 is provided with an intake control device 10. The intake control device 10 is substantially in the form of a washer and extends substantially perpendicular to a longitudinal axis 21 of the first tubular member 2. The intake control device 10 may be fixed to the inner surface 8 of the first tubular member 2 by any known attachment method or integrally formed in one piece therewith. The intake control device 10 may be fixed to the inner surface 8 of the first tubular member 2, for example, with an adhesive such as a glue, epoxy, or resin, with a frictional fit, or by heating, melting, and cooling an outer surface of the intake control device 10 and/or the inner surface 8 of the first tubular member 2 to form a bond there between. The intake control device 10 has a liquid receiving passage 11 formed in substantially a center thereof. The liquid receiving passage 11 has an internal diameter 15. The internal diameter 15 of the liquid receiving
passage 11 is smaller than the internal diameter 12 of the first tubular member 2. For example, the internal diameter 15 of the intake control device 10 may be about 40% of the internal diameter 12 of the first tubular member 2. The temperature changing device 1 may be made, for example, from a thermally insulating material such as plastic, rubber, fiberglass, resin, or epoxy.

[0017] A method of using the temperature changing device 1 will now be described. As shown in FIG. 3, the bottom end 5 of the first tubular member 2 is inserted into a consumable liquid 16, such as coffee, hot chocolate, broth or a milkshake. Upon insertion in the liquid 16, the liquid 16 flows through the liquid receiving passage 11 of the intake control device 10 and substantially fills the temperature changing device 1 up to a point of insertion 17 of the temperature changing device 1 in the liquid. A consumer places their mouth (not shown) around the top end 6 of the second tubular member 3 and applies suction thereto in a direction of arrows 18. The suction causes the liquid 16 to be pulled upward through the second tubular member 3 and toward the top end 6 of the second tubular member 3.

[0018] Simultaneously, the suction causes surrounding or outside air to be drawn in a direction of arrows 19 into the air receiving passage 9 and toward the bottom end 4 of the second tubular member 3. The air encounters the liquid 16 in a mixing region 20 and mixes therewith. If the air is cooler than the liquid 16, the air will cool the liquid 16, as it mixes therewith, prior to consumption of the liquid 16 by the consumer at the top end 6. If the air is warmer than the liquid 16, the air will warm the liquid 16, as it mixes therewith, prior to consumption of the liquid 16 by the consumer at the top end 6. For example, if the liquid 16 was initially at a temperature of about 165 degrees Fahrenheit and the air temperature was at a temperature of about 72 degrees Fahrenheit, then the liquid 16 could be cooled to a temperature range of about 88-125 degrees Fahrenheit prior to consumption by the consumer. Additionally, the intake control device 10 limits the amount of liquid 16 drawn into the temperature changing device 1 during the consumption of the liquid 16 by the consumer in order to optimize the ability of the air to interact with and change the temperature of the liquid 16. It will be appreciated by those skilled in the art that the length of the first and second tubular members 2, 3, the size of the air receiving passage 9, and the size of the liquid receiving passage 11 may be varied to vary the amount of temperature change occurring before consumption of the liquid 16 by the consumer.

[0019] FIGS. 4-6 show a temperature changing device 30 according to a second embodiment of the invention. As shown in FIG. 4, the temperature changing device 30 includes a first tubular member 31 and a second tubular member 32. The first tubular member 31 has an open bottom end 34 and an open top end 39. As shown in FIG. 5, the first tubular member 31 has an internal diameter 33. A valve receiving opening 41 is formed in a wall 42 of the first tubular member 31 proximate the bottom end 34 of the first tubular member 31. Although the first tubular member 31 is illustrated and described herein as having a substantially right circular cylinder configuration, it will be appreciated by those skilled in the art that the first tubular member 31 may be formed to have any desired geometrical configuration.

[0020] As shown in FIGS. 4-5, between the bottom end 34 of the first tubular member 31 and the valve receiving opening 41 is an intake control device 35. The intake control device 35 is substantially in the form of a washer and extends substantially perpendicular to a longitudinal axis 44 of the first tubular member 31. The intake control device 35 may be fixed to an inner surface 45 of the first tubular member 31 by any known attachment method or integrally formed in one piece therewith. The intake control device 35 may be fixed to the inner surface 45 of the first tubular member 31, for example, with an adhesive such as a glue, epoxy, or resin, with a frictional fit, or by heating, melting, and cooling an outer surface of the intake control device 35 and/or the inner surface 45 of the first tubular member 31 to form a bond there between. The intake control device 35 has a liquid receiving passage 36 formed in substantially a center thereof. The liquid receiving passage 36 has an internal diameter 37. The internal diameter 37 of the liquid receiving passage 36 is smaller than the internal diameter 33 of the first tubular member 31. For example, the internal diameter 37 of the intake control device 35 may be about 40% of the internal diameter 33 of the first tubular member 31.

[0021] As shown in FIG. 5, a valve 38 is provided on a side of the intake control device 35 facing the top end 39 of the first tubular member 31. The valve 38 is substantially in the form of a wall and has an end 46 that extends through the valve receiving opening 41 in the wall 42. The valve 38 is moveable between a closed position shown in FIG. 5 where the valve 38 substantially blocks the liquid receiving passage 36 and an open position shown in FIG. 6 where the valve 38 substantially opens the liquid receiving passage 36. The valve 38 may be, for example, rotatable about a pivot 40 mounted on the intake control device 35. The valve 38 may be mounted such that the valve 38 is driven to the closed position in a natural state by either the weight of the valve 38 itself or other driving means (not shown), such as a spring, etc.

[0022] As shown in FIG. 5, the second tubular member 32 has a closed bottom end 43 and an open top end 54. The second tubular member 32 has an internal diameter 47. The internal diameter 47 of the second tubular member 32 is smaller than the internal diameter 33 of the first tubular member 31. For example, the internal diameter 47 of the second tubular member 32 may be about 60% of the internal diameter 33 of the first tubular member 31. The bottom end 43 of the second tubular member 32 has a first segment 48 extending away from a longitudinal axis 50 of the second tubular member 32 and a second segment 49 extending from the first segment 48 and buck toward the longitudinal axis 50 of the second tubular member 32. The first segment 48 and the second segment 49 form a substantially V-shape. A air receiving passage 51 is formed in the second segment 49. Although the second tubular member 32 is illustrated and described herein as having a substantially right circular cylinder configuration, it will be appreciated by those skilled in the art that the second tubular members 32 may be formed to have any desired geometrical configuration.

[0023] As shown in FIG. 4, an outer surface 52 of the second tubular member 32 may be fixed to at least a portion of an outer surface 53 of the first tubular member 31 by any known attachment method or integrally formed in one piece therewith. The outer surface 52 of the second tubular member 32 may be fixed to the outer surface 53 of the first tubular member 31, for example, with an adhesive such as a glue, epoxy, or resin, with a frictional fit, or by heating, melting, and cooling the outer surface 52 of the of the second tubular member 32 and/or the outer surface 53 of the first tubular member 31 to form a bond there between. The second tubular
member 32 is fixed to the first tubular member 31 such that the top end 54 of the second tubular member 32 is spaced from the top end 39 of the first tubular member 31. The bottom end 43 of the second tubular member 32 is arranged proximate the bottom end 34 of the first tubular member 31 such that the air receiving passage 51 communicates with the valve receiving opening 41 and the end 46 of the valve 38 extends into the air receiving passage 41, as shown in FIG. 5. It will be appreciated by those skilled in the art, however, that the second tubular member 32 may alternatively be received inside the first tubular member 31 and fixed thereto similar to the temperature changing device 1 of the first embodiment. The temperature changing device 30 may be made, for example, from a thermally insulating material such as plastic, rubber, fiberglass, resin, or epoxy.

[0024] A method of using the temperature changing device 30 will now be described. As shown in FIG. 5, the bottom end 34 of the first tubular member 31 is inserted into a consumable liquid 55, such as coffee, hot chocolate, broth or a milkshake. Upon insertion in the liquid 55, the liquid 55 flows into the bottom end 34 of the first tubular member 31 up to the intake control device 35. The liquid 55 is prevented from entering the liquid receiving passage 36 of the intake control device 35 by the valve 38, which is driven into the closed position. A consumer places their mouth (not shown) around the top end 39 of the first tubular member 31 and applies suction thereto in a direction of arrows 56, as shown in FIG. 6. The suction causes surrounding or outside air to be drawn in a direction of arrows 57 toward the bottom end 43 of the second tubular member 32 and through the valve receiving opening 41. The air being drawn through the valve receiving opening 41 engages the end 46 of the valve 38 and causes the valve 48 to move into the open position, as shown in FIG. 6.

[0025] After the valve 38 moves into the open position, the suction causes the liquid 16 to be pulled upward into the first tubular member 31 through the liquid receiving passage 36 and toward the top end 39 of the first tubular member 31. Simultaneously, the air encounters the liquid 55 in a mixing region 58 and mixes therewith. If the air is cooler than the liquid 55, the air will cool the liquid 55, as it mixes therewith, prior to consumption of the liquid 55 by the consumer at the top end 39. If the air is warmer than the liquid 16, the air will warm the liquid 16, as it mixes therewith, prior to consumption of the liquid 16 by the consumer at the top end 39. For example, if the liquid 55 was initially at a temperature of about 165 degrees Fahrenheit and the air temperature was at a temperature of about 72 degrees Fahrenheit, then the liquid 55 could be cooled to a temperature range of about 88-125 degrees Fahrenheit prior to consumption by the consumer. Because the valve 38 prevents the liquid 55 from entering the first tubular member 31 until suction is applied thereto by the consumer, all of the liquid 55 entering the first tubular member 31 will be mixed with the air in the mixing region 58 such that even an initial amount of the liquid 55 consumed by the consumer will experience a change in temperature. Additionally, the intake control device 35 limits the amount of liquid 55 drawn into the temperature changing device 30 during the consumption of the liquid 55 by the consumer in order to optimize the ability of the air to interact with and change the temperature of the liquid 55. It will be appreciated by those skilled in the art that the length of the first and second tubular members 31, 32, the size of the valve receiving opening 41, and the size of the liquid receiving passage 36 may be varied to vary the amount of temperature change occurring before consumption of the liquid 55 by the consumer.

[0026] FIGS. 7-9 show a temperature changing device 70 according to a third embodiment of the invention. As shown in FIG. 7, the temperature changing device 70 includes a first tubular member 71 and a second tubular member 72. The first tubular member 71 has a closed bottom end 76 and an open top end 80. As shown in FIG. 8, the first tubular member 71 has an internal diameter 73. An opening 74 is formed in a wall 75 of the first tubular member 71 proximate the bottom end 76 of the first tubular member 71. Between the bottom end 76 of the first tubular member 71 and the air receiving passageway 74 is an intake control device 77. The intake control device 77 includes a plurality of flaps 78. The flaps 78 are formed, for example, by providing a plurality of cuts 79 in the first tubular member 71 that extend from the bottom end 76 of the first tubular member 71 toward the top end 80 of the first tubular member 71. The flaps 78 are then bent inward into the first tubular member 71 such that outside surfaces 81 of the flaps 78 substantially rest on each other. The flaps 78 extend substantially parallel to a longitudinal axis 95 of the first tubular member 71. The flaps 78 are moveable between a closed position shown in FIG. 8 and an open position shown in FIG. 9. As shown in FIG. 9, in the open position, a liquid receiving passage 82 is formed between the flaps 78. The liquid receiving passage 82 has an internal diameter 83. The internal diameter 83 of the liquid receiving passage 82 is smaller than the internal diameter 73 of the first tubular member 71. For example, the internal diameter 83 of the liquid receiving passage 82 may be about 40% of the internal diameter 73 of the first tubular member 71. Although the first tubular member 71 is illustrated and described herein as having a substantially right circular cylinder configuration, it will be appreciated by those skilled in the art that the first tubular member 71 may be formed to have any desired geometrical configuration.

[0027] As shown in FIG. 8, the second tubular member 72 has a closed bottom end 85 and an open top end 86. The second tubular member 72 has an internal diameter 84. The internal diameter 84 of the second tubular member 72 is smaller than the internal diameter 73 of the first tubular member 71. For example, the internal diameter 84 of the second tubular member 72 may be about 60% of the internal diameter 73 of the first tubular member 71. An air receiving passage 87 is formed in a wall 88 of the second tubular member 72 proximate the bottom end 85. Although the second tubular member 72 is illustrated and described herein as having a substantially right circular cylinder configuration, it will be appreciated by those skilled in the art that the second tubular members 32 may be formed to have any desired geometrical configuration.

[0028] As shown in FIG. 7, an outer surface 89 of the second tubular member 72 is fixed to at least a portion of an outer surface 90 of the first tubular member 71 by any known attachment method or integrally formed in one piece therewith. The outer surface 89 of the second tubular member 72 may be fixed to the outer surface 90 of the first tubular member 71, for example, with an adhesive such as a glue, epoxy, or resin, with a frictional fit, or by heating, melting, and cooling the outer surface 89 of the second tubular member 72 and/or the outer surface 90 of the first tubular member 71 to form a bond there between. The second tubular member 72 is fixed to the first tubular member 71 such that the top end 86 of the second tubular member 72 is spaced from the top end 80 of the first tubular member 71. The bottom end 85 of the second
The tubular member 72 is arranged proximate the bottom end 76 of the first tubular member 71 such that the air receiving passage 87 communicates with the opening 74, as shown in FIG. 8. It will be appreciated by those skilled in the art, however, that the second tubular member 72 may alternatively be received inside the first tubular member 71 and fixed thereto similar to the temperature changing device 1 of the first embodiment. The temperature changing device 70 may be made, for example, from a thermally insulating material such as plastic, rubber, fiberglass, resin, or epoxy.

A method of using the temperature changing device 30 will now be described. As shown in FIG. 8, the bottom end 76 of the first tubular member 71 is inserted into a consumable liquid 91, such as coffee, hot chocolate, broth or a milkshake. Upon insertion in the liquid 91, the liquid 91 flows into the bottom end 76 of the first tubular member 71 up to the intake control device 77. The liquid 91 is prevented from entering the liquid receiving passage 82 by the flaps 78, which are in the closed position. A consumer places their mouth (not shown) around the top end 80 of the first tubular member 71 and applies suction thereto in a direction of arrows 92, as shown in FIG. 9. The suction causes surrounding or outside air to be drawn in a direction of arrows 93 toward the bottom end 85 of the second tubular member 72 and through the air receiving passage 87 and the opening 74. The suction also causes the flaps 78 to move into the open position to open the liquid receiving passage 82.

The suction causes the liquid 91 to be pulled upward into the first tubular member 71 through the liquid receiving passage 82 and toward the top end 80 of the first tubular member 71. Simultaneously, the air encounters the liquid 91 in a mixing region 94 and mixes therewith. If the air is cooler than the liquid 91, the air will cool the liquid 91, as it mixes therewith, prior to consumption of the liquid 91 by the consumer at the top end 80. If the air is warmer than the liquid 91, the air will warm the liquid 91, as it mixes therewith, prior to consumption of the liquid 91 by the consumer at the top end 80. For example, if the liquid 91 was initially at a temperature of about 165 degrees Fahrenheit and the air temperature was at a temperature of about 72 degrees Fahrenheit, then the liquid 91 could be cooled to a temperature range of about 88-125 degrees Fahrenheit prior to consumption by the consumer. Because the intake control device 77 prevents the liquid 91 from entering the first tubular member 71 until suction is applied thereto by the consumer, all of the liquid 91 entering the first tubular member 71 will be mixed with the air in the mixing region 94 such that even an initial amount of the liquid 91 consumed by the consumer will experience a change in temperature. Additionally, the intake control device 77 limits the amount of liquid 91 drawn into the temperature changing device 70 during the consumption of the liquid 91 by the consumer in order to optimize the ability of the air to interact with and change the temperature of the liquid 91. It will be appreciated by those skilled in the art that the length of the first and second tubular members 71, 72, the size of the opening 74, and the size of the liquid receiving passage 82 may be varied to vary the amount of temperature change occurring before consumption of the liquid 91 by the consumer.

The foregoing illustrates some of the possibilities for practicing the invention. It will be appreciated by those skilled in the art that elements of each of the first, second, and third embodiments 1, 30, 70 of the temperature changing device 1, 30, 70 could be changed or modified with elements from the other embodiments. Additionally, the temperature changing device 1, 30, 70 could be integrally formed with a liquid holding container and/or with a lid for a liquid holding container. The temperature changing device 1, 30, 70 could also be formed to be flexible and/or collapsible. Further, the temperature changing device 1, 30, 70 could be used in other art fields with liquids other than consumable liquids. Many other embodiments are possible within the scope and spirit of the invention. It is, therefore, intended that the foregoing description be regarded as illustrative rather than limiting, and that the scope of the invention is given by the appended claims together with their full range of equivalents.

What is claimed is:

1. A temperature changing device, comprising:
a first tubular member having a top end and a bottom end;
a second tubular member fixed to the first tubular member,
the second tubular member communicating with the first
tubular member via an air receiving passage; and
an intake control device arranged between the air receiving
passage and the bottom end of the first tubular member.

2. The temperature changing device of claim 1, wherein
the intake control device includes a liquid receiving passage,
the liquid receiving passage having an internal diameter
smaller than an internal diameter of the first tubular member.

3. The temperature changing device of claim 2, wherein
the first tubular member has a mixing region proximate
the liquid receiving passage and the air receiving passage.

4. The temperature changing device of claim 2, wherein
the intake control device is fixed to an inner surface of the first
thubular member.

5. The temperature changing device of claim 2, wherein
the intake control device extends substantially perpendicular
to a longitudinal axis of the first tubular member.

6. The temperature changing device of claim 2, further
comprising a valve moveable between an open position and a
closed position, the valve substantially blocking the liquid
receiving passage in the closed position.

7. The temperature changing device of claim 6, wherein
the valve extends into the air receiving passage.

8. The temperature changing device of claim 2, wherein
the intake control device includes a plurality of flaps extending
substantially parallel to a longitudinal axis of the first
tubular member, the flaps being moveable between an open position
and a closed position.

9. The temperature changing device of claim 8, wherein
the flaps substantially rest on each other in the closed position
and form the liquid receiving passage in the open position.

10. The temperature changing device of claim 1, wherein
the second tubular member is fixed to an outer surface of the
first tubular member.

11. The temperature changing device of claim 10, wherein
the second tubular member has an open top end and a closed
bottom end.

12. The temperature changing device of claim 1, wherein
the second tubular member is fixed to an inner surface of the
first tubular member.

13. The temperature changing device of claim 1, wherein
a top end of the second tubular member is spaced from a top end
of the first tubular member.

14. The temperature changing device of claim 1, wherein
the first tubular member has a continuous closed outer surface.

15. A method of changing a temperature of a liquid, com-
prising:
inserting a bottom end of a first tubular member into the liquid;
applying suction to a top end of the first tubular member;
drawing the liquid through a liquid receiving passage in an intake control device toward the top end of the first tubular member;
drawing surrounding air through a second tubular member and through an air receiving passage communicating with the first tubular member; and
mixing the liquid with the air in a mixing region proximate the air receiving passage.
16. The method of claim 15, further comprising opening the liquid receiving passage of the intake control device.

17. The method of claim 15, wherein the liquid receiving passage has an internal diameter smaller than an internal diameter of the first tubular member.
18. The method of claim 15, wherein the second tubular member is fixed to an outer surface of the first tubular member.
19. The method of claim 15, wherein the second tubular member is fixed to an inner surface of the first tubular member.
20. The method of claim 15, further comprising changing the temperature of the liquid prior to the liquid reaching the top end of the first tubular member.

* * * * *