June 9, 1964 G. A. RUDNICK 3,136,532

LIQUID BLENDING APPLIANCE

Filed Sept. 20, 1961

2 Sheets-Sheet 1

FIG. 1

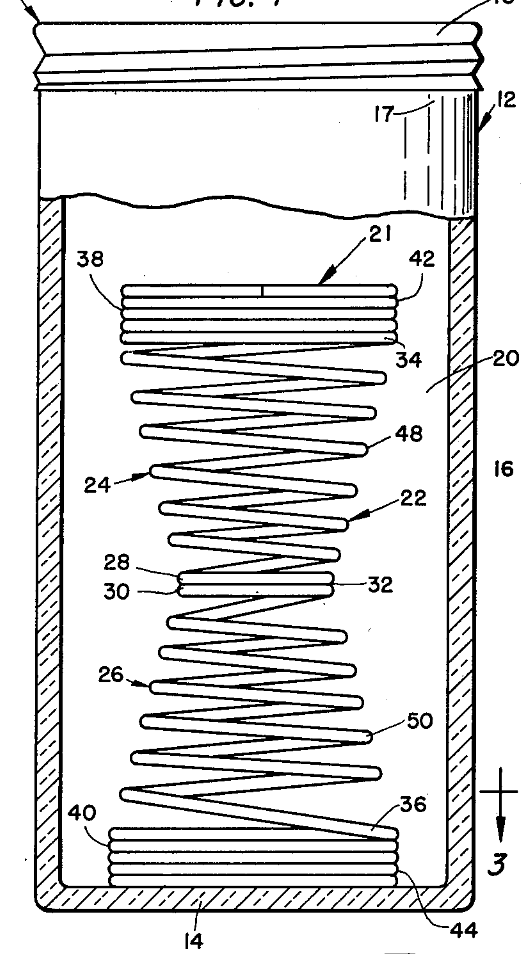


FIG. 2

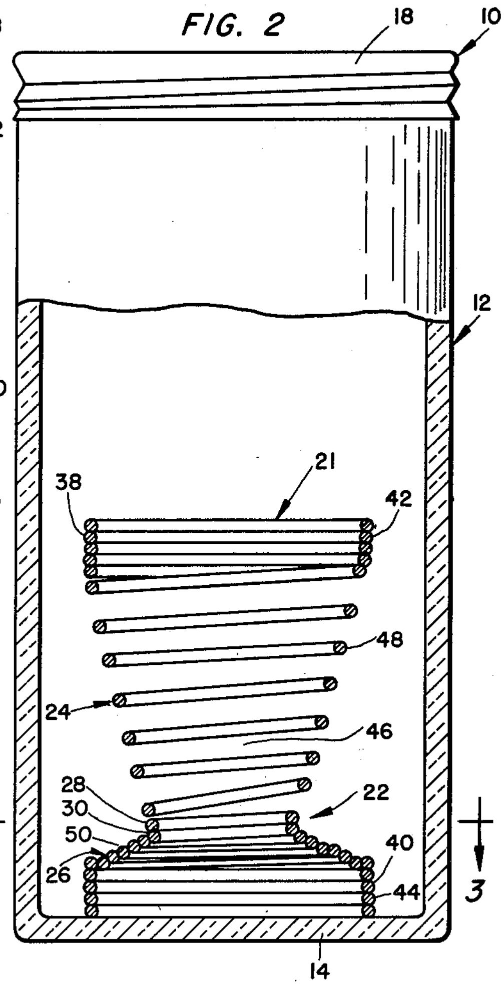
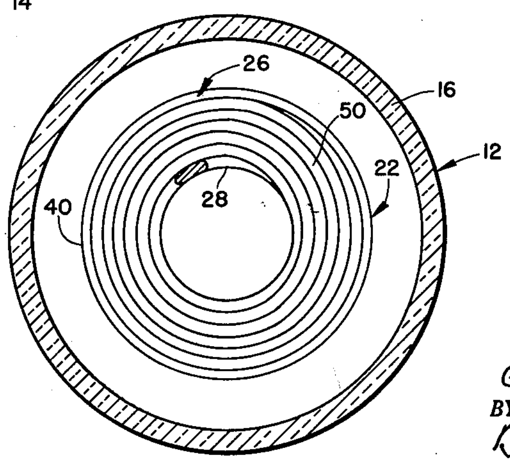


FIG. 3



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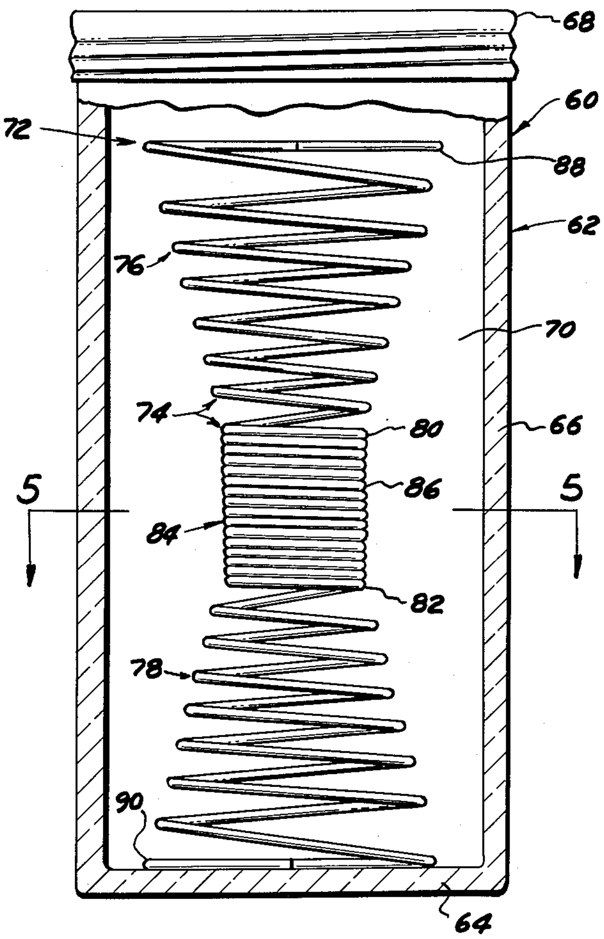

Fig. 4

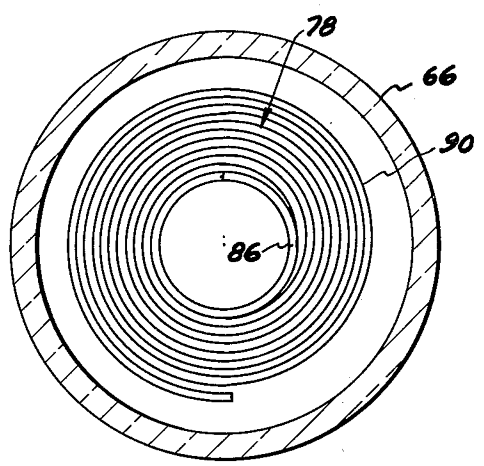

Fig. 5

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LIQUID BLENDING APPLIANCE

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3 Claims. (Cl. 259—72)

This invention relates to blending appliances and, in particular, to liquid blending appliances.

One object of this invention is to provide a liquid blending appliance having a liquid receptacle containing a double-acting resilient blending device including a weighted liquid blending spring structure which, when the receptacle is shaken in an axial direction, automatically and efficiently blends liquids placed in the receptacle.

Another object is to provide a liquid blending appliance of the foregoing character wherein the spring structure is weighted at its opposite ends with the result that the spring convolutions between the opposite ends are open and thus give unobstructed freedom of interflow to the liquids being blended as the spring structure is expanded and compressed by the shaking action imparted to the receptacle.

Another object is to provide a liquid blending appliance of the foregoing character wherein the spring structure is composed of oppositely-directed frusto-conical springs tapering toward a common junction in the approximate mid-portion of the structure thereby enabling the liquids being blended to circulate more freely through the convolutions of the spring structure as well as permitting such convolutions to compress more flatly into a smaller space during operation, hence increasing to a maximum the range of travel of the convolutions and their operating weights.

Another object is to provide a liquid blending appliance of the foregoing character in which the weights at the opposite ends of the spring structure are of open-centered annular shape, so that liquid circulates freely through the open central spaces of the weights and spring structure from one end of the receptacle to the other while being blended through the expansion and compression of the spring convolutions being flexed by the weights.

Another object is to provide a liquid blending appliance as set forth in object immediately preceding, wherein the open-centered annular weights consist of multiple end convolutions of the spring structure disposed in abutting engagement with one another and integral with the springs themselves, thereby providing the necessary force for flexing the springs during the shaking of the receptacle while simplifying the construction and at the same time offering the minimum of resistance to the free flow of the liquids being blended.

Other objects and advantages of the invention will become apparent during the course of the following description of the accompanying drawings, wherein:

FIGURE 1 is a side elevation of a liquid blending appliance, according to one form of the invention, with the side of the receptacle broken away to show the weighted liquid-blending device in its position of rest;

FIGURE 2 is a central vertical section, partly in side elevation, of the liquid blending appliance of FIGURE 1, showing the weighted liquid blending device at the limit of its downward stroke during operation;

FIGURE 3 is a horizontal section, taken along the line 3—3 in FIGURE 2;

FIGURE 4 is a central vertical section, partly in side elevation, through a modified liquid blending appliance according to another form of the invention, with the multiple closely coiled weight-producing convolutions in the central portion of the spring structure; and

FIGURE 5 is a horizontal section taken along the line 5—5 in FIGURE 4.

Referring to the drawings in detail, FIGURE 1 shows

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a liquid blending appliance, generally designated **10**, including an elongated approximately cylindrical receptacle **12** having a lower end wall **14** closing the lower end of the hollow cylindrical side wall **16**, and having an open threaded upper end **17** closed by a correspondingly-threaded cap or cover **18**.

Mounted loosely and reciprocably within the chamber **20** of the receptacle **12** and having a height, in its relaxed condition, of about two-thirds the length of the chamber **20**, is an elongated generally-vertical weighted liquid blending device, generally designated **21**. The liquid blending device **21** includes a spring structure **22** consisting of a pair of frusto-conical upper and lower springs **24** and **26** tapering toward one another to small end convolutions **28** and **30** disposed substantially radial to the central axis of the spring structure **22** and joined to one another in a common plane of junction **32** by welding, brazing or any other suitable manner. The outermost large-diameter convolutions **34** and **36** of the upper and lower springs **24** and **26** terminate in annular integral weight portions **38** and **40** respectively, each of these consisting multiple radial convolutions **42** and **44** disposed in planes radial to the central axis of the spring structure **22** and in substantially-abutting relationship with one another. In this manner the weight portions **38** and **40** comprise open-centered annular or hollow cylindrical masses which give the necessary weight while providing free flow of liquid to the central opening thereof. Thus, from FIGURE 2, it will be seen that there is an unobstructed open passageway **46** through the spring structure **22** from end to end thereof, interfered with solely by the converging convolutions **48** and **50** of the upper and lower springs **24** and **26** which perform the liquid blending action.

In the operation of the invention, the liquids to be blended (not shown), such as beverages, are poured into the chamber **20** through the open upper end **17** of the receptacle **12** and the cap **18** threaded thereon. The user then grasps the liquid blending device **10** and shakes it to and fro along its vertical axis to move the liquid blending device **21** back and forth so as thereby to impart momentum alternately to the annular end weights **38** and **40**, causing them alternately to flex the entire lengths of the springs **24** and **26** which make up the open-convolutioned portions of the spring structure **22**. As the spring structure **22** is thus alternately compressed and expanded by the alternate action of the upper and lower weights **38** and **40** and the resilience of its springs **24** and **26**, the liquid blending device **21** moves back and forth between the cap **18** and the bottom wall **14** of the receptacle **12** because of the space left between the upper weight **38** and the cap **18** in the relaxed condition of the spring structure **22**.

For example, as the upper weight portion **38** moves downward toward the lower weighted portion **40** on its forward stroke it compresses the convolutions **50** of the lower spring **26**, thus reaching the intermediate position of compression shown in FIGURE 2. The upper weight **38** then continues to move downward to compress the upper convolutions **48** of the upper spring **24** in a manner similar to that shown for the lower convolutions **50** of the lower spring **26** at the bottom of FIGURE 2.

When the receptacle **12** is shaken in the opposite direction so that the upper weight **38** moves toward the cap or cover **18** through the upper part of the chamber **20**, the upper and lower springs **24** and **26** expand by reason of their resilience until the spring structure **22** of the liquid blending device **21** reaches its intermediate or relaxed position on its return stroke as shown in FIGURE 1. The liquid blending device **21** containing the spring structure **22** then moves bodily upward until the upper weight portion **38** encounters the inner side of the cap 18 and halts, whereupon the lower weight portion 40 continues to travel in response to its momentum to compress the convolutions 48 and 50 of both the upper and lower springs 24 and 26 in a manner opposite to that described above and passing through a position which is the reverse of that shown in FIGURE 2. The action then continues in the manner described above as the receptacle 12 is shaken to and fro and the liquid blending device containing the spring structure 22 moves back and forth within the chamber 20, alternately expanding and contracting along its central axis in response to the opposing alternate actions of the upper and lower weight portions 38 and 40.

In this manner, the liquids being treated are subjected to a blending action by the flexing of the upper and lower convolutions 48 and 50, the frusto-conical shape of which enables them to compress to the flattest or utmost extent, so that the opposite end weights 38 and 40 travel as far as possible back and forth in the chamber 20, each weight 38 or 40 substantially compressing the entire length of the spring structure 22 in alternating succession. The open-centered construction of the liquid blending device 21 renders it to be more easily cleaned than would be the case with a helical spring structure, and the converging convolutions 48 and 50 act upon different portions of the liquid to create the utmost blending action while the liquids flow freely through the open-centered inner end convolutions 28 and 30 without substantial interference with the blending action of the convolutions 48 and 50.

It will be understood that separate weights may be used in place of the integral weight portions 38 and 40 in the liquid blending device 21, and that the spring structure 22 may be made in a single piece instead of in two separate oppositely tapering frusto-conical springs 24 and 26 joined to one another at their innermost radial convolutions 28 and 30 at a common junction 32. It is found easier to manufacture the upper and lower springs 24 and 26 separately and to join their inner end convolutions 28 and 30 to one another than to make the spring structure 22 in one-piece construction.

Furthermore, the provision in the liquid blending device 21, according to the present invention, of separate weights or weighted portions 38 and 40 at the opposite ends of the spring structure 22 accomplishes the alternate compression, in opposite directions, of substantially the entire length of the spring structure 22 in alternate succession. This stands in marked contrast with a known type of prior liquid mixers having a single weight disposed in approximately the mid portion of the spring structure, where it not only obstructs the free flow of liquid through the center of the spring structure, but also compresses only approximately one-half of the spring structure during each stroke of the weight in each direction.

The modified liquid-blending appliance, generally designated 60, shown in FIGURE 4 includes an elongated cylindrical receptacle 62 having a lower end wall 64 and hollow cylindrical side walls 66 with a threaded open upper end closed by a correspondingly-threaded cap or cover 68. Mounted loosely for free reciprocation within the chamber 70 of the receptacle 62, and in its relaxed condition having a height of about two-thirds the length of the chamber 70, is an elongated generally-vertical weighted liquid blending device 72. The liquid blending device 72 includes a spring structure, generally designated 74, containing a pair of frusto-conical upper and lower coil springs 76 and 78 tapering toward one another to small-diameter end convolutions 80 and 82 disposed substantially radial to the central axis of the spring structure 72 and either integral with or joined by brazing, welding or the like, to a convoluted central hollow cylindrical weight portion 84. The weight portion 84 is made up of tightly packed multiple individual convolutions 86 which are pressed together substantially into abutting relationship or contact with one another to concentrate as much weight as possible in the central weight portion 74. In this manner, the central weight portion 84 comprises in effect an open-centered hollow cylindrical convoluted mass of metal or other spring material which possesses adequate weight while having a hollow central opening or passageway through which liquid may flow freely.

The outermost large diameter convolutions 88 and 90 of the spring structure 74 are also disposed substantially perpendicular to the axis of the spring structure 74 so as to flatly engage the flat-ended cap 68 and bottom wall 64.

The operation of the modified liquid blending appliance 60 is generally similar to that described above for the blending appliance 10 in that the liquid is placed in the chamber 70 and the receptacle 62 shaken to and fro to cause the blending device 72 to move back and forth, imparting momentum to the central hollow weight structure 84 which causes the springs 76 and 78 to flex alternately in the manner described above, for the springs 24 and 26.

As the springs 76 and 78 are thus alternately compressed and expended, the liquid blending device 72 moves back and forth between the cap 68 and bottom wall 64, through the open space resulting from the shorter length of the spring structure 72 than the chamber 70. The flexing of the springs 76 and 78 causes their convolutions to pass quickly through the liquid being blended, accomplishing the blending action quickly and easily, while the hollow construction of the central weight portion 84 provides a central passageway through which the liquid can pass between the upper and lower springs 76 and 78. The advantages and improved action of the modified liquid blender 60 are otherwise similar to those described above for the liquid blender 10 shown in FIGURES 1 to 3 inclusive.

What I claim is:

1. A liquid blending appliance, comprising
an elongated liquid receptacle,
a cover secured to said receptacle in closing relationship therewith,
and an elongated resilient liquid blending device loosely and reciprocably mounted within said receptacle for sliding motion relatively thereto, said blending device comprising
an elongated resilient coil spring structure including a pair of oppositely-tapered frusto-conical coil spring portions converging toward one another and an open-centered connecting portion joining the small-diameter inner ends of said frusto-conical spring portions,
and open-centered weight means connected to said spring structure and having a central liquid passageway extending longitudinally through the central opening thereof,
said weight means comprising a multiplicity of open-centered helical spring convolutions of elongated hollow cylindrical shape disposed substantially coaxial with said frusto-conical spring portions in substantially abutting relationship with one another and integral with said spring portions.

2. A liquid blending appliance, according to claim 1, wherein said weight means includes a pair of weight portions disposed remote from one another integral with the large-diameter outer ends of said frusto-conical spring portions and of elongated hollow cylindrical shape substantially coaxial therewith.

3. A liquid blending appliance, according to claim 1, wherein said inner ends of said frusto-conical spring portions are spaced axially apart from one another and wherein said weight means is disposed in interconnecting relationship with said inner ends.

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