United States Patent

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[54] **BLENDER WITH LATERALLY ILLUMINATED REMOVABLE RECEPTACLE**
8 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** ..... **356/197,** 240/2 LC
[51] **Int. Cl.** **G01n 21/06,** G01n 21/16
[50] **Field of Search** ..... 240/2 FD, 2 LC, 2 MT; 356/197; 259/107, 108

[56] **References Cited**

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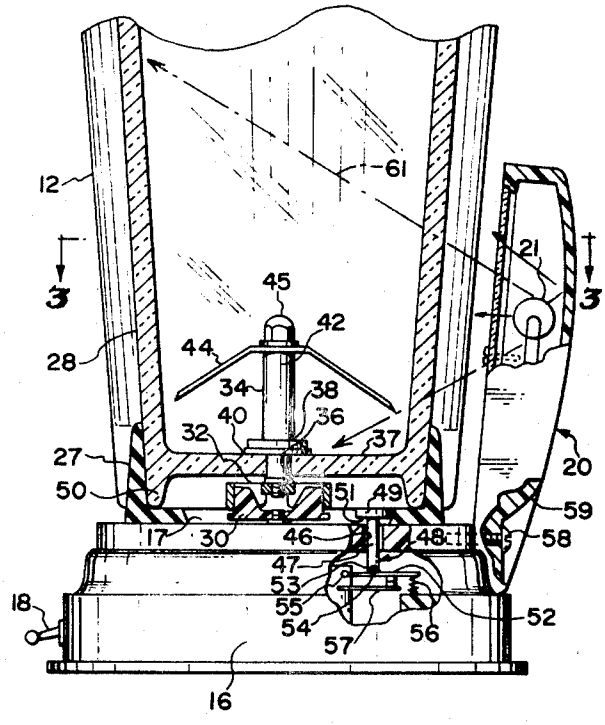
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ABSTRACT: Means are disclosed to illuminate the contents of a vessel at the locale of mixing in such a manner that the condition of the mixture can be readily ascertained. The light source is positioned outside the transparent or translucent wall of the vessel between a pair of convolutions in the wall whereby the interface between the liquid contents and the inner wall of the vessel is illuminated by light that includes transmitted light, reflected light and refracted light transmitted from the light source to, through and in the glass or plastic wall of the vessel. Switch means are provided to connect the light source to the power source as the vessel is placed on the mixer base.



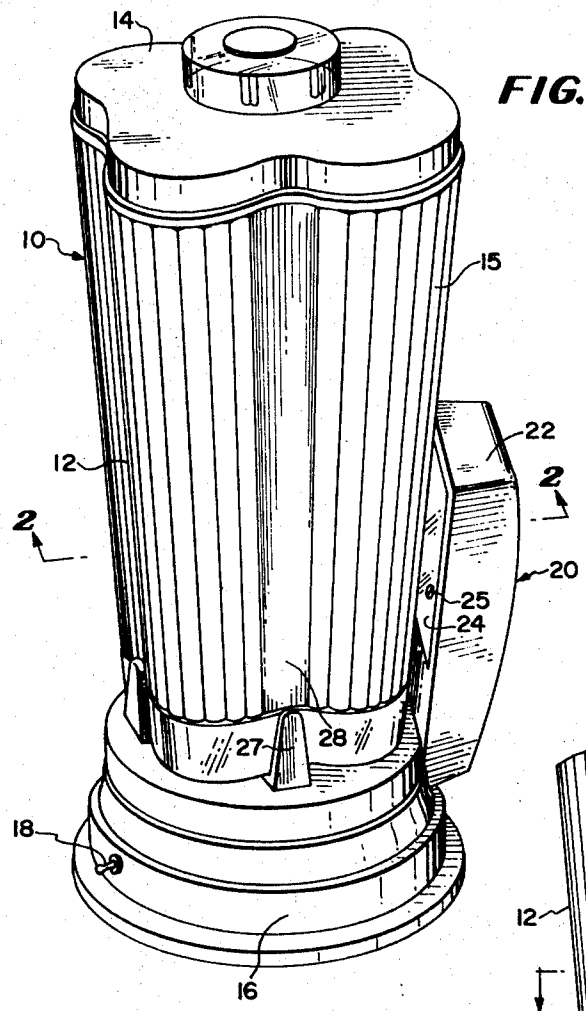


FIG. 1

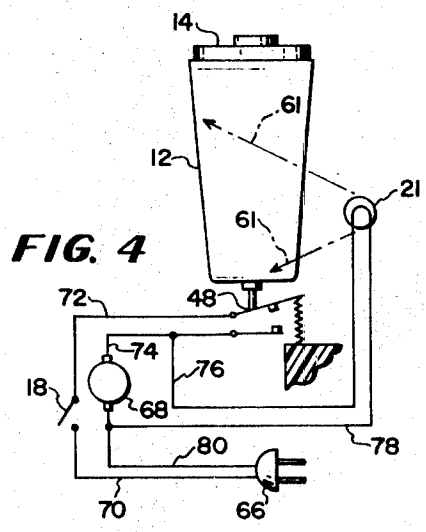


FIG. 4

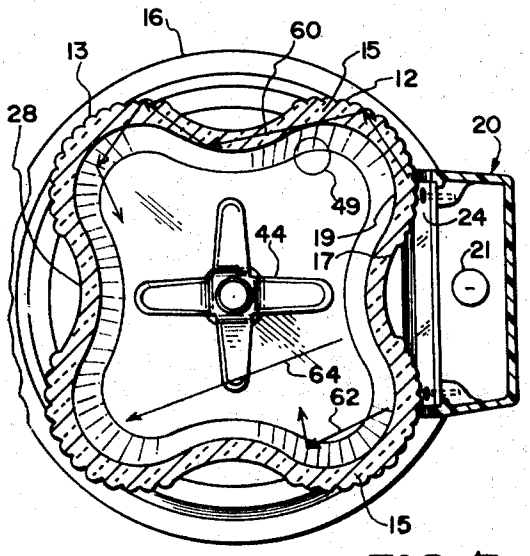
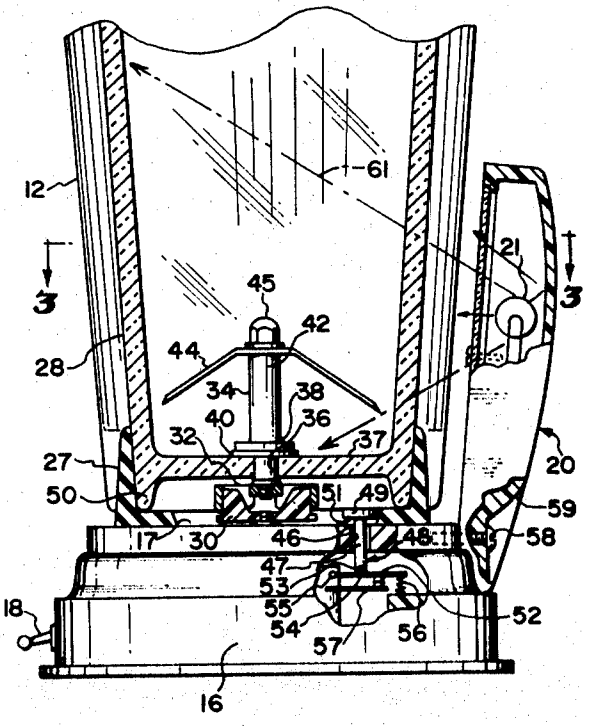


FIG. 3

FIG. 2



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BLENDER WITH LATERALLY ILLUMINATED REMOVABLE RECEPTACLE

CROSS-REFERENCE TO A RELATED APPLICATION

This application is related to application Ser. No. 850,183 filed Aug. 14, 1969.

BACKGROUND OF THE INVENTION

Motor-driven blenders having detachable couplings between a drive shaft and a driven shaft are known where the driven shaft is rotatably mounted through the bottom wall of a receptacle and carries a cutter blade at one end for high-speed rotation within the vessel and a detachable coupling at the other end for engagement with a matching coupling on matching drive shaft. Blenders of this type find extensive use in the home kitchen, and also in laboratories, restaurants, cocktail bars because of the speed with which a given product can be blended and the enhanced properties of the minutely comminuted product. It is now a matter of common knowledge that food and drinks prepared in this manner are far more tasty and better appearing than the products of lesser degrees of comminution or prepared by low speed mixing. Also laboratory samples, specimens and preparations, such as emulsions or colloidal suspensions thus processed, have enhanced properties including not only uniform consistency and appearance but stability of the suspension, and the speed by which a given state of subdivision of solids is attained.

The actual required mixing time for a given composition such as a malt or an alcoholic beverage is relatively short in most instances, but is dependent upon the condition of the ingredients. Thus the solids added may vary in average size, and the proportions of the continuous and dispersed phases can vary because of inaccuracies in following a given recipe. The blenders are used in cabinets and on bar shelves or laboratory benches where the light is not always best for the purpose of seeing the condition of the mixed product. Under these conditions the vessel is often removed and the contents inspected prematurely only to find that further mixing is necessary. The use of a timer is not always satisfactory because of the added necessity of setting the time thereon and the inconsistency of the compositions to be blended, even in compositions of the same kind. Visual observation is often necessary to determine the condition of the mixed product and this is not always possible when the blender is on an unlighted shelf.

SUMMARY OF THE INVENTION

According to the instant invention it has been that the mere provision of an external light source without regard to its orientation to the mixing vessel is not sufficient to allow examination of the condition of the product and the position of the light source in relation to the outer surface of the blender vessel is essentially critical to the visibility imparted to the contents. This invention provides a light source having the rays of a light source concentrated through a diffusion plate substantially parallel to the outer convoluted surface of the vessel and also positioned between a pair of convolutions so that the contents of the vessel is subjected to light that is directly transmitted, light than is reflected from the liquid-solid interface at the vessel wall and light that is transmitted by total internal reflection. By these means an easy to use blender is provided which tells the operator at a glance the condition of the product under preparation and the instant that uniform consistency is attained, thereby eliminating the trial and error procedure of prior art blenders. The invention incorporates the added factor of light produced and transmitted in such a manner that the condition of the comminuted product is instantly visible, and visible from the front of the mixing vessel without the source of illumination being located in the way of the normal movement of the mixing vessel to and from the base.

Furthermore the invention contemplates an "ON" and "OFF" which is actuated when the releasable drive is in engagement, which preferably is resilient, so that the movement of the mixing vessel operates the switch.

DESCRIPTION OF THE DRAWINGS

Illustrative embodiments of the invention are shown in the attached drawings wherein:

FIG. 1 is a perspective view of the blender of this invention;

FIG. 2 is a fragmentary partial sectional view taken along the lines 2—2 of FIG. 1;

FIG. 3 is a fragmentary cross-sectional view taken along the lines 3—3 of FIG. 2;

FIG. 4 is a diagrammatic representation of an illustrative electrical control circuit used in the preferred embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, FIG. 1 shows the blender or a liquidizer **10** which comprises the receptacle **12**, preferably composed of glass or any other transparent or translucent material having optical characteristics similar to that of the proprietary products known as Lucite or Plexiglass (a methyl methacrylate polymer) and having a substantially cloverleaf shaped cross section with the longitudinal beads **13** (see FIG. **3**) on its outer wall. The external beads **13** can be omitted from the structure of the receptacle **12**. The receptacle is provided with the detachable cover **14** and the motor base **16** supports the assembly. The motor base **16** has the on/off toggle switch **18**, mounted on the side by any suitable means. The light assembly **20** includes the housing **22** to which the aperture plate **24** is attached preferably by means of the screws **25** inserted into suitable spaced bosses (not illustrated) molded into the edge **26**. Other means, such as cementing, can be used to attach the aperture plate **24**. The aperture plate **24** is a diffusion plate comprising a flat piece of ground glass, etched glass, milky glass, pigmented or colored glass, or translucent plastic which may also be pigmented or colored. Mounted on the liquidizer base **16** are the radially positioned upstanding lugs or prongs **27** adapted to engage within the bottom ends of the longitudinal recess **28** provided within the outer wall of the receptacle **12**.

The motor base **16** houses the drive motor and drive shaft assembly (not shown) to which is attached the lower drive coupler **30** (FIG. **2**) mounted on the top of the motor base **16** in a position to automatically engage the driven coupler **32** whenever the receptacle **12** is placed on the motor base **16**. The driven shaft **34** is attached to the driven coupler **32**, by any suitable means, and passes through a central opening **36** in the base wall **37** of the receptacle **12** and is secured thereto by means of the locknut **38** and washers **30** or other suitable retaining means. The driven shaft **34** has the upper shoulder **42** and the reduced end portion (not shown) which is threaded and receives the cutter blade **44**, held thereto by means of any suitable locknut **45**. Any form of detachable drive coupling can be used in the blender of this invention which is designed to allow the aforedescribed modes of operation and an illustrative drive coupling is disclosed in copending application Ser. No. 850,183 filed Aug. 14, 1969.

The opening **46** is provided in the top wall **17** of the motor base **16** to accommodate the shaft portion **47** of the pressure switch **48**, the shaft being free to move in a reciprocating relationship within the opening **46**. The shaft portion **47** terminates above the top wall **17** with the head **49**, preferably having a flat upper surface of greater circumference than the shaft portion **47**, and is preferably constructed of an electrical insulating material. The guide opening **46** is so located that the circumferential flanged edge **50** of the receptacle **12** always engages the head **49** in any position of placement on the base (see FIG. **3**). This action presses the flat bottom **51** of the head **49** downwardly toward or against the top wall **17** of the motor base **16** and carries the shaft portion **47** downward through the opening **46**. The bottom end of the shaft portion **47** is pivotally attached to the movable contact member **52** by any suitable means such as the tab members **53** extending upward from opposite edges of the movable contact member **52** and the cross pin **54** inserted through holes (not shown) in the tab member **53** and through the bottom end of the shaft portion **47**.

Direct attachment of the shaft portion 47 to the movable contact member 52 is optional. Other means of attachment can be used such as a C-washer engaging a circumferential slot or a retaining pin in a transverse bore in the shaft portion 47 at a point beneath the opening 46. These means would engage the top wall 17 and prevent accidental displacement or removal of the switch lever assembly.

The movable contact member 52 is conductively connected to the hinge pin 55 at one end while its other end is connected by any suitable means to the compression spring 56. The spring 56 is in turn connected through an electrical insulator to the motor base 16. Mounted directly beneath the movable contact member 52 is the fixed contact member 57 so positioned that when the receptacle 12 is placed on the motor base 16 and the coupling members are engaged, it pushes the shaft portion 47 downward far enough to cause the movable contact member 52 to lower and contact the fixed contact member 57, thus closing the switch. When the receptacle 12 is removed, the spring 56 raises the movable contact member 52 and the shaft portion 47 opens the switch before the drive is disengaged.

The light assembly 20 includes the light source 21 capable of emitting polychromatic light in the visual range. The light source can be incandescent or fluorescent and is preferably a small incandescent bulb operable on 120 volt alternating current. The assembly is secured to the motor base 16 by suitable securing means, such as screws 58 at the recess 59 in the bottom portion of the light assembly 20. A white reflective surface is provided behind the bulb and the aperture plate 24 of the light assembly 20 is substantially parallel to the plane of the outer convoluted surface of the receptacle 12 and preferably positioned between a pair of convolutes 15 (FIG. 3). Although various orientations of the light assembly are possible this preferred configuration yields the best distribution of light through the receptacle 12 and the maximum incidence of light thereon.

Although light incident on the receptacle 12 is directed both upwardly and downwardly from the level of the light source 21, as indicated by the arrows 61 in FIG. 2, the major portion of the incident light is directed substantially horizontally from the diffusion aperture plate 24 toward the locale of mixing. Some dispersion of light results both from the curvature of the receptacle walls and the existence of the optional longitudinal beads 13 causing a greater distribution of light throughout the mixing area. Most of the light incident upon the outside surface 17 (an air-solid interface) (FIG. 3) of the receptacle 12, which is an air-glass or air-Lucite interface in the preferred embodiment, is transmitted directly through the receptacle while some is reflected at this interface; a portion of the light reaches the juncture of inside surface 19 of the receptacle 12 and the liquid contents thereof with an angle of incidence on this inner solid-liquid interface greater than the critical angle for that interface resulting in the total reflection of the light from the interface; also a portion of the light is incident on the air-solid interface 17 at an angle such that the refracted light travels along a path similar to that indicated by the arrow 60 (FIG. 3) missing or bypassing the solid-liquid interface 19 and striking the outside surface of the receptacle 12 with an angle of incidence greater than the critical angle for the solid-air interface again resulting in total reflection. These totally reflected rays travel through the wall of the receptacle 12 experiencing total reflections until they strike an interface with an angle of incidence less than the critical angle so that the light is refracted and transmitted through the interface.

Within the receptacle 12, light is incident on the liquid or suspension surrounding the cutter blade 44 from substantially all directions having entered the liquid phase following a series of total reflections, as shown by the path of the arrow 60, reflection from the liquid-solid interface, as shown by the path of the arrow 62, or direct transmission, as shown by the path of the arrow 64. Some of the light will thereupon be absorbed or reflected by the liquid or suspension imparting characteristic coloring or shading thereto and indicating to the observer whether the blending and comminution are complete. The light is then transmitted through the receptacle 12 in all directions so that an observer on any side of the blender can determine the condition of its contents even in an otherwise unlighted space.

FIG. 4 represents an illustrative and nonlimiting schematic circuit to be used in accordance with the invention. The plug 66 is inserted into the source of alternating current and is connected to one terminal of the on/off toggle switch 18 by the conductor 70. The other terminal of the the toggle switch 18 is connected to one terminal of the pressure switch 48 by the conductor 72. The other terminal of the pressure switch 48 is connected to one terminal of the drive motor 68 by the conductor 74 and to one terminal of the light source 21 by the conductor 76. The other terminal of the drive motor 21 is connected by the conductor 78 to the other terminal of the drive motor 68 and the conductor 80 connects the other terminal of the drive motor 68 back to the plug 66. Thus the switches 18 and 48 are serially connected across the source of alternating current to the parallel combination of the drive motor 68 and the light source 21. Other switching arrangement, however, may also be operable including the use of separate pressure switches for the light source 21 and the drive motor 68.

When the blender of this invention is in use, the on/off toggle switch 18 is generally left in the "on" or closed position. Unless the receptacle 12 is in place, however, the pressure switch 48, and accordingly the circuit, is open and the blender cannot be operated. When the receptacle 12 is placed on the motor base 16, the couplers 30 and 32 engage (see FIG. 2) and the pressure switch 48 is closed, completing the circuit. The drive motor 68 and the light source 21 both begin operation so that the contents of the receptacle 12 are simultaneously comminuted and illuminated. When the contents of the receptacle 12 are seen to be sufficiently blended, the receptacle 12 is lifted from the motor base 16 disengaging the couplers 30 and 32 and releasing the pressure switch 48 opening the circuit. If desired the toggle switch 18 can be omitted although certain electrical standards require such a control switch for safety reasons and it may be desirable to facilitate storage of the blender with the receptacle in place without unplugging the blender.

What is claimed is:

1. In a blender, the combination of:
   - a receptacle having a light transmissive vertical sidewall encompassing a blending zone;
   - a source of light positioned adjacent to and concentrated in a diametral direction upon the outside of said wall at said blending zone;
   - light diffusing means between said light source and said wall whereby diffused light is directed peripherally incident on the interior of said receptacle, optically interacts with material to be blended in said blending zone and is passed peripherally through said sidewall as a combined transmitted and reflected image the density of which is indicative of the blended condition of said material.

2. A blender in accordance with claim 1 in which said light transmissive wall is transparent glass.

3. A blender in accordance with claim 1 in which said light transmissive wall is a transparent methyl methacrylate polymer characterized by its ability to reflect light along its internal surfaces.

4. A device in accordance with claim 1 wherein said encompassing sidewall is provided with facets with convoluted corners causing light rays directed through the outer surface of a facet to be transmitted along said encompassing wall through reflection and passed through the inner surface of another facet.

5. A blender in accordance with claim 1 in which said receptacle is detachably supported on a base with a drive motor therein;
   - blending means rotatably supported within said blending zone from the bottom of said receptacle, said blending means being releasably coupled with said drive motor by relative vertical movement;

pressure switching means mounted in said base and connected serially with said drive motor and said source of light and

said source of light being connected in parallel with said drive motor.

6. A blender in accordance with claim 5 in which:

said pressure switch means is releasably engaged by said receptacle in its working position.

7. A blender in accordance with claim 5 in which:

said source of light is supported by said motor base in an open-sided housing; and

said light diffusing means comprises a translucent panel carried by the open side of said housing, spaced from the side of said receptacle.

8. A blender in accordance with claim 7 in which:

said wall of said receptacle is longitudinally convoluted; and

said translucent panel is spaced from a pair of said convolutions with said source of light aligned with the space between said convolutions.