

FULLY AUTOMATIC GRINDER FOR SOYBEAN MILK AND OTHER BEVERAGES

FIELD OF THE INVENTION

The present invention relates to the technical field of domestic kitchen appliances and, in particular, to a fully automatic grinder for soybean milk and other beverages, which is capable of helping production of bean curd and bean dregs cakes.

BACKGROUND OF THE INVENTION

At present, existing small kitchen appliances, such as domestic soybean milk machines, juicers, and food processors, on the market all employ a motor rotating at a high speed to drive blades to cut and process foodstuffs such as soybeans, thereby crashing the soybeans and foodstuffs; because in this process, the blades cut the foodstuffs at a high speed, heat and impact forces generated from friction and collision with the foodstuffs destroy nutrient contents of the foodstuffs, which are oxidized rapidly after being mixed with water, so that water-soluble nutrients cannot be fully released; and as a result, the foodstuffs are separated from the water and cannot be mixed effectively. In addition, because a processing approach of performing rotary cutting with a high-speed motor is taken, the foodstuffs in a container, together with the container, produce very loud clashes because of the high-speed rotation of the motor, where noises reach 70–95 dB, and even if great improvements and adjustments have been made to the motor, the noises cannot be reduced or eliminated and thus, seriously influence normal daily life of consumers. Furthermore, problems of inconvenient disassembly and cleaning exist in the existing soybean milk machines and are unfavorable to hygienic use and food safety.

SUMMARY OF THE INVENTION

The technical problem the present invention attempts to solve is providing a low-noise fully automatic grinder capable of producing soybean milk and other beverages having better tastes.

In order to solve the aforementioned technical problem, the present invention provides a fully automatic grinder, including a machine head component, where the machine head component includes: upper and lower grinding discs adapted to grind against each other and a low-speed motor that drives the upper and lower grinding discs to rotate relative to each other; and a temperature sensor is arranged on one side of the upper and lower grinding discs, and the

temperature sensor is connected to an intelligent circuit board used for controlling a rotation speed of the low-speed motor according to a temperature detected by the temperature sensor.

An anti-overflow sensor used for detecting a liquid level on the upper grinding disc is arranged adjacent to an upper end surface of the upper grinding disc, the anti-overflow sensor is connected to the intelligent circuit board, and the intelligent circuit board is connected to a control valve used for controlling a water outlet amount of a water storage chute according to an output signal of the anti-overflow sensor to prevent overflow. A foodstuff pusher used for making foodstuffs even is arranged adjacent to the upper end surface of the upper grinding disc for pushing soybeans to enter a feeding hole of the upper grinding disc and arrive at a lower surface of the upper grinding disc, which then, together with a static lower grinding disc 4, squeezes and grinds the soybeans

A stirring vane rotating synchronously with the upper grinding disc or lower grinding disc is arranged adjacent to a bottom of the lower grinding disc and is used for stirring a liquid mixture in a cup body to prevent the foodstuffs from sticking to a bottom or being burned. A material-dropping hole is arranged on the upper grinding disc; an outlet at a bottom of the material-dropping hole intersects with a lower end surface of the upper grinding disc via a slope surface. The slope surface is beneficial to squeezing the foodstuffs into a position between the upper and lower grinding discs when the upper grinding disc rotates. Grooves are distributed on end surfaces, opposite to each other, of the upper and lower grinding discs, an end, distal to the material-dropping hole, of the slope surface intersects with the grooves on the upper grinding disc, and while squeezing the foodstuffs into the position between the upper and lower grinding discs, the slope surface feeds the foodstuffs into the groove to facilitate fast and sufficient grinding.

A water storage chute used for storing and delivering water used for grinding and a feeding chute used for storing and delivering foodstuffs to be ground are arranged above the upper grinding disc. An annular groove is arranged on the upper end surface of the upper grinding disc, and an axially distributed trip lever is arranged inside the annular groove; a bottom of the water storage chute is in communication with a conduit, a knockout pin is arranged inside the conduit, and a top of the knockout pin extends from a top opening of the conduit and is connected to a sealing gasket used for sealing the top opening of the conduit; when the upper grinding disc rotates, the trip lever is adapted to move to a bottom of the knockout pin and push the knockout pin upward, to make water in the water storage chute flow into the annular groove via the conduit; and the annular groove is in communication with the material-dropping hole, so that

each time the low-speed motor drives the upper grinding disc to make a full rotation, the trip lever is in contact with the knockout pin once to ensure that an amount of water flowing into the upper grinding disc is basically consistent, thereby preventing too much water from affecting a grinding effect and a foodstuff taste.

The sealing gasket is adapted to use gravity of the knockout pin to seal the top opening of the conduit; as a further preferable solution, a spring is sleeved on the knockout pin, and the spring is elastically arranged between the bottom of the knockout pin and an upper middle portion of an inner wall of the conduit; and the spring is adapted to provide a downward tensile force to the knockout pin, so as to make the sealing gasket seal the top opening of the conduit.

In order to push the knockout pin upward, as a solution, the bottom of the knockout pin and/or a top of the trip lever are/is in a truncated cone shape. As another solution, the trip lever has a slope surface used for pushing the knockout pin upward when the upper grinding disc rotates.

In the fully automatic grinder of the present invention, a stainless-steel double-layer cup body, a heating element on a lower part of the cup body, a lower connector mounted on a handle portion of the cup body, and a power input socket on the lower part of the cup body constitute a cup body portion; a motor base, a low-speed motor, an upper grinding disc, a lower grinding disc, a temperature sensor, an anti-overflow sensor, a foodstuff pusher, a water storage chute, a surface cover, a detachable water tank, a feeding chute, a transformer, an intelligent circuit board, an upper connector, a screw rod, a stirring vane, and a display panel key on the surface cover constitute the head machine portion. With regard to a combination of two portions, by means of the upper connector of the machine head, the lower connector on the handle portion of the cup body, and the power input socket, the two portions constitute a complete circuit connection, are connected to respective electrical devices in parallel or in series, and are controlled by a chip of the intelligent circuit board and a relevant element, so as to enable each electric device to work normally, ensure output of high and low-level signals, and intelligently control the grinder to work. No complete circuit can be constituted in the absence of any one of the two portions. The detachable water tank is separated from the surface cover and forms, together with the water storage chute, a screw-in structure, and the detachable water tank and the feeding chute form a separable structure; and a volume of the detachable water tank ranges from 400 to 2000 ml.

The fully automatic grinder is provided with a reservation function, and a reservation time may be freely set to be 0.25 to 24 hours.

Grooves are arranged on the upper and lower grinding disc, where a size of a groove

includes a length of 5 to 50 mm, a width of 1 to 10 mm, and a depth of 0.2 to 3 mm; the upper grinding disc is circular, has a thickness of 10 to 30 mm, and is provided with a material-dropping hole having a diameter of 5 to 30 mm thereon; and the lower grinding disc is circular, has a thickness of 10 to 30 mm, and is provided with a through hole thereon.

The stirring vane is at angle α of 15° to 30° to a horizontal plane, has a width d of 10 to 30 mm and a thickness h of 0.5 to 3 mm, whereof a stirring piece has a length L of 5 to 60 mm, and is provided with two to four stirring blades.

The technical problem the present invention further attempts to solve is providing a fully automatic grinding capable of being conveniently disassembled and cleaned.

In order to solve the foregoing technical problem, the present invention provides a fully automatic grinder, including upper and lower grinding discs arranged vertically and adapted to grind against each other and a housing; the lower grinding disc is fixed to an upper end of the housing, a low-speed motor used for driving the upper grinding disc to rotate is arranged inside the housing, a separable water tank is arranged on a top of the housing, a storage bucket capable of isolating water is arranged inside the water tank, and a foodstuff outlet of the storage bucket is arranged vertically opposite to a motion track or an inner portion of the motion track of a material-dropping hole on the upper grinding disc; and the low-speed motor extends from a central through-hole of the upper grinding disc and fits a screw nut in a threaded manner.

During use, it is only necessary to detach the separable water tank from the top of the housing and loosen the screw nut to be able to clean bacteria-infested components, such as the upper and lower grinding discs, which is beneficial to ensuring hygienic use.

A water pump is arranged on an outer side wall of the water tank, and the water pump pumps water from the water tank through a water outlet pipe into an inlet at a top of the storage bucket, so as to control a water addition amount in real time during a grinding process.

A water level probe is arranged on an inner wall at a bottom of the water tank, the water level probe is connected to a water level probe connector fixed inside the housing; and the water level probe connector is connected to an intelligent circuit board and forms a loop together with water in the presence of water to control the intelligent circuit board to be powered up and controls the intelligent circuit board to be disconnected from a power supply in the absence of water or in a state where the water tank is separated from the housing, so as to prevent dry grinding.

A closed ring used for storing a mixture of water and foodstuffs is arranged on an edge of the upper grinding disc, and an upper end surface of the upper grinding disc is a slope surface

sloping downward from outside to inside. It is ensured that materials and water concentrate to a center and slowly drop through the material-dropping hole on the upper grinding disc. In order to control a material dropping speed, a diameter of an upper end opening of the material-dropping hole of the upper grinding disc is smaller than a diameter of an outlet at a bottom, and the outlet at the bottom of the material-dropping hole intersects with a lower end surface of the upper grinding disc via a slope surface, so as to distribute the materials uniformly between the upper and lower grinding discs, which is beneficial to improving grinding efficiency and effects. The slope surface at the bottom of the upper grinding disc and the lower end surface of the upper grinding disc form an angle of 10 to 30 degrees, which is more beneficial to squeezing the foodstuffs into a position between the upper and lower grinding discs when the upper grinding disc rotates, and an oversized angle or an undersized angle is unfavorable for squeezing the foodstuffs.

The lower end surface of the storage bucket is parallel to the slope where the material-dropping hole on the upper grinding disc is located, which is beneficial to improving the material dropping efficiency. A liquid discharging nozzle is arranged on one side of the lower grinding disc, a cup body used for collecting pulp is arranged below the liquid discharging nozzle, a stirring rod is arranged inside the cup body, and the stirring rod is transmission-connected to a shaft end of the water pump or the upper grinding disc. A heating apparatus is arranged on one side of the housing, and the cup body is arranged above the heating apparatus. The stirring vane at a bottom of the stirring rod extends into the cup body to stir a mixed liquid in the cup body.

A pulp sweeping apparatus is arranged on an outer wall of the closed ring of the upper grinding disc and is driven by the upper grinding disc to do synchronously move in a circle. The upper grinding disc, both adjacent to an upper part thereof and at the bottom of the water tank, is provided with foodstuff pushers used for making foodstuffs even to push a mixture of the foodstuffs and water.

An anti-overflow signal probe and a temperature sensor are arranged on the cup body, are connected to the lower connector through the cup handle and upper connector, are connected to the intelligent circuit board, and are used for obtaining a signal for controlling the heating apparatus to work, an anti-overflow signal against liquid overflow, and a liquid temperature control signal. The water tank and the housing of the main body form a separable structure, and the water tank may be separated from the housing. The upper and lower grinding discs are provided with ribs, highest points of two ribs have a distance ranging from 2 to 12 mm therebetween, and a space between two ribs has a depth ranging from 1 to 5 mm. With regard to

the ribs of the upper and lower grinding discs, ribs inside grinding discs are large and ribs distributed uniformly outside are small, so as to achieve sufficient grinding.

The present invention has the following technical effects: (1) the present invention no longer employs conventional blades to crush foodstuffs, and instead, a grinding and squeezing technology is applied to the present invention; the intelligent circuit board is used to control the rotation speed of the low-speed motor according to a temperature of the upper and lower grinding discs detected by the temperature sensor, so as to prevent an over-high temperature from affecting quality of the foodstuffs and meanwhile, prevent various demerits caused by conventional high-speed foodstuff cutting; in addition, slow grinding, fine grinding, and refined grinding are achieved, and the produced foodstuffs are refined, are free of dregs, and have good tastes; during production, the motor of the present invention only rotates at a speed of 60 to 120 round/minute, so that foodstuffs are sufficiently ground, and soybean milk, bean curd, and other beverages with good tastes may really be produced; (2) the present invention solves the problem that loud noises are produced in a high-speed motor operation mode of conventional appliances, and may really achieve low vibration and low noise; (3) the present invention no longer employs conventional blades to crush foodstuffs, and instead, a grinding and squeezing technology is applied to the present invention, thereby preventing various demerits caused by conventional high-speed foodstuff cutting; in addition, slow grinding, fine grinding, and refined grinding are achieved, and the produced foodstuffs are refined, are free of dregs, and have good tastes; during production, the motor of the present invention only rotates at a speed of 40 to 80 round/minute, and is combined with upper and lower grinding discs, so that foodstuffs are sufficiently ground, and soybean milk and other beverages with good tastes may really be produced; (4) the present invention solves the problem that loud noises are produced in a high-speed motor operation mode of conventional appliances, and may really achieve low vibration and low noise; and (5) in the present invention, the water tank may be separated from the main body by means of a simple operation, and it is also easy to detach the upper grinding disc, so as to achieve the effect of easy cleaning, and solve the problem that cleaning a conventional soybean machine is difficult.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exposed view of parts according to Embodiment 1 of the present invention;

FIG. 2 is an assembly diagram according to the present invention;

FIG. 3 is a structural diagram of an outlet apparatus according to the present invention;

FIG. 4 is a diagram illustrating a combination of a filter screen and a grinding disc according to the present invention;

FIG. 5 and FIG. 6 are structural diagrams of an upper grinding disc according to the present invention;

FIG. 7 to FIG. 9 are structural diagrams of a lower grinding disc according to the present invention;

FIG. 10 is a structural diagram of a stirring vane according to the present invention;

FIG. 11 is a schematic diagram illustrating an end surface structure of the stirring vane in FIG. 10;

FIG. 12 is an exposed view of a fully automatic grinder according to Embodiment 2 of the present invention;

FIG. 13 is an assembly diagram of the fully automatic grinder according to Embodiment 2 of the present invention;

FIG. 14 is a structural diagram of an outlet apparatus according to Embodiment 2;

FIG. 15 is a structural diagram of a water level probe according to Embodiment 2;

FIG. 16 is a structural diagram of an upper grinding disc according to Embodiment 2;

FIG. 17 is a structural diagram of an A-A section of FIG. 16;

FIG. 18 is a structural diagram of a B-B section of FIG. 16;

FIG. 19 is a structural diagram of a section of the lower grinding disc according to Embodiment 2;

FIG. 20 is a structural diagram of a front surface of the lower grinding disc according to Embodiment 2;

FIG. 21 is a top view of a first type of storage bucket;

FIG. 22 is a top view of a second type of storage bucket;

FIG. 23 is a structural diagram of a section of the storage bucket in FIG. 21; and

FIG. 24 is a structural diagram of a section of the storage bucket in FIG. 22.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiment 1

A fully automatic grinder of the present embodiment includes a cup body component and a machine head component.

As shown in FIG. 1 to FIG. 11, the cup body component includes: a stainless-steel double-layer cup body 1, a heating element 2 arranged at a bottom of the stainless-steel double-layer cup body 1, a lower connector 19 arranged on a handle portion of the stainless-steel double-layer cup body 1, and a power socket 21 arranged on an outer side of a bottom of the stainless-steel double-layer cup body 1.

The machine head component includes: a motor base 9, a low-speed motor 8, an upper grinding disc 5, a lower grinding disc 4, a temperature sensor 18, an anti-overflow sensor 7, a foodstuff pusher 6, a water storage chute 10, a surface cover 11, a detachable water tank 12, a feeding chute 13, a transformer 14, an intelligent circuit board 15, an upper connector 16, a screw rod 17, a stirring vane 3, and a display panel key 20 on the surface cover 11. The machine head component and the cup body component constitute a complete circuit through the upper connector 16 on a machine head, the lower connector 19 on the handle portion of the cup body, and the power socket 21, and are connected to respective electrical devices in parallel or in series.

A material-dropping hole is arranged on the upper grinding disc 5. An outlet at a bottom of the material-dropping hole intersects with a lower end surface of the upper grinding disc. Grooves are distributed on end surfaces, opposite to each other, of the upper and lower grinding discs, and an end, distal to the material-dropping hole, of the slope surface intersects with grooves on the upper grinding disc 5.

An annular groove is arranged on an upper end surface of the upper grinding disc 5, and an axially placed trip lever 22 is arranged inside the annular groove. A bottom of the water storage chute 10 is in communication with a conduit 26, a knockout pin 23 is arranged inside the conduit 26, and a top of the knockout pin 23 extends from a top opening of the conduit 26 and is connected to a sealing gasket 25 used for sealing the top opening of the conduit 26. When the

upper grinding disc 5 rotates, the trip lever 22 is adapted to move a bottom of the knockout pin 23, push the knockout pin 23 upward to make water in the water storage chute 10 flow into the annular groove 5-1 via the conduit 26. The annular groove 5-1 is in communication with the material-dropping hole.

A spring 24 is sleeved on the knockout pin 23, and the spring 24 is elastically arranged between the bottom of the knockout pin 23 and an upper middle part of an inner wall of the conduit 26.

In order to push the knockout pin 23 upward, as a solution, the bottom of the knockout pin 23 and/or a top of the trip lever 22 are/is in a truncated cone shape. As another solution, a top of the trip lever 22 has a slope surface used for pushing the knockout pin 23 upward when the upper grinding disc 5 rotates.

The fully automatic grinder of the present embodiment includes the following working principles, as shown in FIG. 1 and FIG. 2:

a. a certain number of foodstuffs are measured, where the foodstuffs include beans, grains, rice, as well as some vegetables and fruits, and soybeans are used as an example therein, and fed through the feeding chute 13;

b. a certain volume of water is added into the detachable water tank 12, which is screwed into a water storage apparatus;

c. the grinder is powered up, a corresponding functional key is selected on the display panel key 20, and if a reservation-type working mode is selected, a reservation function may be used;

d. the low-speed motor 8 rotates to drive the upper grinding disc 5 and soybeans dropped through the feeding chute 13 to rotate together, the foodstuff pusher 6 mounted on the motor base 9 pushes the soybeans to enter the feeding hole of the upper grinding disc 5 and arrive at a lower surface of the upper grinding disc 5, which then, together with a static lower grinding disc 4,

squeezes and grinds the soybeans; meanwhile, when the upper grinding disc 5 rotates, a knockout pin apparatus thereon triggers a water outlet apparatus at a bottom of the water storage chute 10, so that the water automatically flows into the upper grinding disc to mix with the soybeans and flows into the cup body 1 while being ground; a structure of the water outlet apparatus is described in detail additionally;

e. the low-speed motor 8 continuously rotates until a certain amount of water in the detachable water tank 12 completely flows into the upper grinding disc 5 through the water storage chute 10 and mixes with the soybeans, after the grinding is completed, the water completely flows into the cup body 1, when there is no water in the water storage chute 10, the low-speed motor 8 immediately receives a signal sent by the intelligent circuit board 15 and stops rotating, a chip of the intelligent circuit board 15 sets a time period for the foregoing grinding process at the same time, and when a grinding time period reaches the set time period, the low-speed motor 8 also stops working;

f. a mixed liquid exists in the cup body 1, the heating element 2 on a lower part of the cup body 1 works to boil soybean milk, and during this process, the intelligent circuit board 15 controls the stirring vane 3, driven by the low-speed motor 8, to stir the mixed liquid, so as to prevent the foodstuffs from sticking to a bottom or being burnt; and

g. after being fully boiled, the soybean milk could be poured out and directly drunk.

The following drawing illustrates the water outlet apparatus in detail, as shown in FIG. 3.

When the low-speed motor 8 rotates, the trip lever 22 mounted on the upper grinding disc 5 rotates with the upper grinding disc 5, when rotating to a position of the knockout pin 23 on a lower part of a water outlet chute 10, the trip lever 22 is in contact with the knockout pin 23, the knockout pin 23 moves upward to push a sealing gasket 25 to move upward, water then flows onto a surface of the upper grinding disc 5 along the knockout pin 23, mixes with foodstuffs, and

enters the lower grinding disc to be ground, and when the trip lever 22 is not in contact with the knockout pin 23, the spring 24 returns the sealing gasket 25 to an original position to prevent water from leaking to the upper grinding disc. Each time the low-speed motor makes a full rotation, the trip lever 22 is in contact with the knockout pin 23 once, so a fixed amount of water flows into the upper grinding disc 5.

A mixture filtration process include is shown in FIG. 4: in FIG. 4, the low-speed motor 8 rotates to drive the upper grinding disc 5 to rotate, the soybeans and water drop through the material-dropping hole of the upper grinding disc 5 and are ground by the upper grinding disc 5 and the lower grinding disc 4, and then, the ground mixture flows, through an opening on the lower grinding disc 4, into a filter screen 26 to be subject to filtration, and then flows into the cup body 1.

As shown in FIG. 5, a first shape formed by grooves of the upper grinding disc 5 is circular, a thickness ranges from 10 mm to 30 mm, a material-dropping hole is arranged on the upper grinding disc and has a diameter of 5 to 30 mm, and a slope surface is arranged at an intersection between the hole and a grooved surface of the upper grinding disc and is beneficial to squeezing foodstuffs into a position between the upper and lower grinding discs when the upper grinding disc rotates. The grooves on the upper grinding disc have a length ranging from 5 to 50 mm, a width ranging from 1 to 10 mm, and a depth ranging from 0.2 to 3 mm; and an arrangement form includes uniformly arranging the grooves by length in descending order or ascending order in six same areas.

As shown in FIG. 6, a second shape formed by grooves of the upper grinding disc 5 is circular, a thickness ranges from 10 mm to 30 mm, a material-dropping hole is arranged on the upper grinding disc and has a diameter of 5 to 30 mm, and a slope surface is arranged at an intersection between the hole and a grooved surface of the upper grinding disc and is beneficial

to squeezing foodstuffs into a position between the upper and lower grinding discs when the upper grinding disc rotates. The grooves on the upper grinding disc are in an arc shape, have a length ranging from 5 to 50 mm, a width ranging from 1 to 10 mm, and a depth ranging from 0.2 to 3 mm; and an arrangement form includes uniformly arranging the grooves at equal intervals, where adjacent grooves are of different lengths.

As shown in FIG. 7, a first shape formed by grooves of the lower grinding disc 4 is circular, a thickness ranges from about 8 mm to 30 mm, and a through-hole is provided on the lower grinding disc to facilitate a mixture of water and foodstuffs flowing into the cup body. The grooves on the lower grinding disc have a length ranging from 5 to 50 mm, a width ranging from 1 to 10 mm, and a depth ranging from 0.2 to 3 mm; and an arrangement form includes uniformly arranging the grooves by length in descending order or ascending order in six same areas. As shown in FIG. 8, a second shape formed by grooves of the lower grinding disc 4 is circular, a thickness ranges from about 8 mm to 30 mm, and a through-hole is provided on the lower grinding disc to facilitate a mixture of water and foodstuffs flowing into the cup body. The grooves on the lower grinding disc have a length ranging from 5 to 50 mm, a width ranging from 1 to 10 mm, and a depth ranging from 0.2 to 3 mm; and an arrangement form includes uniformly arranging the grooves at equal intervals, where adjacent grooves are of different lengths. As shown in FIG. 9, a third shape formed by grooves of the lower grinding disc 4 is circular, a thickness ranges from about 8 mm to 30 mm, and a through-hole is provided on the lower grinding disc to facilitate a mixture of water and foodstuffs flowing into the cup body. The grooves on the lower grinding disc have a length ranging from 5 to 50 mm, a width ranging from 1 to 10 mm, and a depth ranging from 0.2 to 3 mm; and an arrangement form includes uniformly arranging the grooves by length in descending order or ascending order in six same areas. The most important feature of the groove shape of the lower grinding disc is that grooves in each area

are connected to each other to form a closed groove.

The foregoing two types of upper grinding discs may respectively match the three types of lower grinding discs to be assembled and used. A grinding disc *per se* may be made from metal, for example, SUS304, having a high frictional resistance on a surface to avoid incapability of grinding foodstuffs because of smoothness, and the grinding disc may also be made from rock, for example, granite.

As shown in FIG. 10 and FIG. 11, the stirring vane 3 is at angle α of 30° to a horizontal plane, has a width d of 30 mm and a thickness h of 3 mm, whereof a stirring piece has a length L of 60 mm, and is provided with two stirring blades.

Embodiment 2

A fully automatic grinder of the present embodiment includes a main body and a separable water tank component.

As shown in FIG. 12, the main body includes: a housing 31, circuit board components 33 and 36, a low-speed motor 8, a power connector 34, a transformer 35, an upper grinding disc 5, a lower grinding disc 4, a water level probe connector 39, a screw nut 40, a pulp sweeping apparatus 41, a lower connector for a water pump power supply 42, a stirring rod 43, a cup body 44, an anti-overflow signal probe 45, a cup handle 46, a temperature sensor 47, an upper connector 48, a lower connector 49, a heating apparatus 50, a base cover 51, and the like.

The separable water tank component includes: a water tank 52, a water level probe 53, a water tank cover 24, a storage bucket 55, a water outlet pipe 56, a water pump 57, an upper connector for a water pump power supply 58, and a foodstuff pusher 6.

The upper and lower grinding discs adapted to grind against each other and the low-speed motor driving the upper and lower grinding discs to rotate relative to each other are fixed to the housing 31, the upper grinding disc 5 is fixed inside a motor shaft by a screw nut to controlled to move vertically, and the low-speed motor is connected to an intelligent circuit board.

An annular closed ring is arranged on a periphery of the upper grinding disc 5, a surface intersecting with the closed ring is a slope surface sloping downward from outside to inside, and a material-dropping hole is arranged on the slope surface. The hole has a small top opening and a

large bottom, is conical, and has a cross section being circular or oval, and a bottom of the material-dropping hole intersects with a lower end surface of the upper grinding disc through a slope surface.

The slope surface is at an angle of 20 degrees to the lower end surface of the upper grinding disc, which is more beneficial to squeezing foodstuffs into a position between the upper and lower grinding discs when the upper grinding disc rotates, and either an oversized angle or an undersized angle is unfavorable for squeezing foodstuffs. A pulp sweeping apparatus 41 is arranged on an outer wall of the closed ring of the upper grinding disc 5 and is driven by the upper grinding disc to move in a circle for sweeping liquid exuded after grinding of the upper and lower grinding discs into the cup body 44 through a pulp outlet of the lower grinding disc.

Adjacent to an upper part of the upper grinding disc, the foodstuff pusher 6 used for making foodstuffs even is arranged on a bottom surface of the water tank for pushing a mixture of foodstuffs and water to enter the material-dropping hole of the upper grinding disc 5 and then arrive at a lower surface of the upper grinding disc 5, which then, together with the lower grinding disc 4, squeezes and grinds the mixture.

The stirring rod 43 is connected to a protruding end of a shaft of the water pump 57, which drives the stirring rod 43 to rotate. Another solution is a transition connection to the upper grinding disc to drive the stirring rod to rotate, and the stirring vane extends into the cup body 44 and stirs a mixed liquid inside the cup body to prevent foodstuffs from sticking to a bottom or being burnt.

The anti-overflow signal probe 45 and temperature sensor 47 are arranged on the cup body, are connected to the lower connector 49 through the cup handle 46 and upper connector 48 and connected to the intelligent circuit board 15, and used for obtaining a signal for controlling the heating apparatus 50 to work, an anti-overflow signal against liquid overflow, and a liquid temperature control signal.

The cup body and the heating apparatus are separable.

The water level probe 53 is arranged on the water tank and is connected to the water level

probe connector 39 fixed to the housing 31, and the water level probe connector is connected to the intelligent circuit board and forms a loop with water in the presence of water, so as to control a working state of the lower grinding disc in the absence of water or in a state where the water tank is separated from the main body.

The storage bucket 55 is arranged above the separable water tank of the grinder and isolated from water of the separable water tank and has through-holes arranged at a top and a bottom and a lower end surface parallel to the slope surface where the material-dropping hole of the upper grinding disc 5 is located and having a corresponding position above a motion track of the material-dropping hole of the upper grinding disc 5, where a lower end hole is larger than the material-dropping hole of the upper grinding disc 5 and is in a shape of a long partial arc formed by the motion track of the material-dropping hole.

A through-hole connected to an end of a water outlet pipe is arranged on the separable water tank, the other end of the water outlet pipe is connected to the water pump 57, and water flows through internal blades of the water pump and then flows out through another water outlet pipe 56, the other end of the water outlet pipe 56 is arranged above the storage bucket, the intelligent circuit board is connected to the water pump via the lower connector for a water pump power supply 42 fixed to the housing 31 and the upper connector for a water pump power supply 58 fixed to the water tank and used for controlling a working time of the water pump, so as to control an outlet amount of water flowing from the water tank through the storage bucket. The separable water tank and the housing 31 of the main body form a separable structure, the water tank, taken as a whole, may be separated from the housing 31, and a volume of a detachable water tank ranges from 500 ml to 2000 ml.

The fully automatic grinder is provided with a reservation function and a reservation time may be freely set to be 0.25 to 24 hours. The upper and lower grinding discs are provided with ribs, highest points of two ribs have a distance ranging from 2 to 12 mm therebetween, and a

space between two ribs has a depth ranging from 1 to 5 mm. With regard to the ribs of the upper and lower grinding discs, ribs inside grinding discs are large and ribs distributed uniformly outside are small, which is beneficial to sufficient grinding.

The fully automatic grinder of the present embodiment includes the following working principles, as shown in FIG. 12 and FIG. 13:

- a. the separable water tank component is fastened to the housing 31 of the main body, a certain number of foodstuffs are measured, where the foodstuffs include beans, peanuts, and the like, and soybeans are used as an example therein, and fed through an upper end of the storage bucket 55;
- b. a certain volume of water is added into the separable water tank 52, and a water tank cover 54 is placed on the water tank;
- c. the grinder is powered up, a corresponding functional key is selected on a circuit control board 33, and if a reservation-type working mode is selected, a reservation function may be used;
- d. after the grinder is powered up, the water level probe works, after a normal water level is detected, the low-speed motor 8 rotates to drive the upper grinding disc 5 to rotate, soybeans in the storage bucket pass through a lower end opening and drop through the material-dropping hole, and meanwhile, and the water pump controlled by the circuit board works to make water in the water tank flow into the storage bucket through a water outlet pipe and mix with the soybeans to enter the material-dropping hole; the foodstuff pusher 6 mounted on a bottom, adjacent to the upper grinding disc, of the water tank pushes a mixture of soybeans and water to enter the material-dropping hole of the upper grinding disc 5 and then arrive at a lower surface of the upper grinding disc 5, which then, together with the static lower grinding disc 4, squeezes and grinds the mixture; meanwhile, when the upper grinding disc 5 rotates, the upper grinding disc 5

drives a pulp pushing apparatus 41 thereon to rotate to push the soybean milk to enter the cup body 44 through an outlet of the lower grinding disc;

- e. the low-speed motor 8 continuously rotates for a certain time period until a water level in the separable water tank is lower than the water level probe, the intelligent circuit board sends a signal, the low-speed motor stops rotating, a chip of the intelligent circuit board 36 sets a time period for the foregoing grinding process at the same time, and when a grinding time period reaches the set time period, the low-speed motor 8 also stops working;
- f. a mixed liquid exists in the cup body 44, the heating apparatus 50 on a lower part works to boil soybean milk, during this process, the intelligent circuit board 36 controls the stirring vane 57, driven by the low-speed motor 8, to stir the mixed liquid, so as to prevent the foodstuffs from sticking to a bottom or being burnt, and at the same time, the temperature sensor and anti-overflow probe work; and
- g. after being fully boiled, the soybean milk could be poured out and directly drunk.

The following drawing illustrates the water outlet apparatus in detail, as shown in FIG. 14.

The separable water tank is provided with a through-hole connected to an end of a water outlet pipe, the other end of the water outlet pipe is connected to the water pump 57, water flows through an internal impeller of the water pump and then flows out through another water outlet pipe 56, the other end of the water outlet pipe 56 is arranged above the storage bucket, the water pump is connected to the intelligent circuit board, the circuit board sets a working time for the work pump, when the water pump works, water in the water tank passes through a motor impeller and the water outlet pipe to flow into the storage bucket, that is, mixing with the foodstuffs, entering the closed ring of the upper grinding disc, then flowing into the lower grinding disc through the material-dropping hole of the upper grinding disc, and finally, flowing

into the cup body through the outlet of the lower grinding disc.

The following describe designed structures of the upper grinding disc and lower grinding disc in details, as shown in FIG. 16 to FIG. 20:

As shown in FIG. 16 to FIG. 18, the upper grinding disc 5 is circular and is provided with a closed ring on a circumferential edge thereof for storing a mixture of water and foodstuffs. An inner surface, intersecting with the closed ring, of the upper grinding disc is a slope surface sloping downward from outside to inside, and is beneficial to concentrating the mixture of water and foodstuff to the material-dropping hole of the grinding disc. A hole for dropping foodstuffs is arranged on the slope surface, and the hole has a small top opening and a large bottom, is conical, and has a cross section being circular or oval, a size C ranges from 20 mm to 30 mm, and an outlet at the bottom of the material-dropping hole intersects with a lower end surface of the upper grinding disc through a slope surface. The slope surface is at an angle of 10 to 30 degrees to the lower end surface of the upper grinding disc, and a length B of the cross section of the slope surface ranges from 20 to 60 mm, which is beneficial to squeezing foodstuffs into a position between the upper and low grinding discs when the upper grinding disc rotates.

Ribs are distributed on the end surfaces, opposite to each other, of the upper and lower grinding discs and have a length ranging from 10 to 50 mm, a section of a rib is a triangle, the triangle is at angles E and F ranging 15 to 40 degrees to the end surfaces, distances D and G between highest points of the ribs range from 2 to 12 mm, and the triangular ribs are distributed on the lower grinding disc, where adjacent ribs are of different lengths.

As shown in FIG. 19 and FIG. 20, the lower grinding disc 4 is circular, a non-closed ring is arranged on a circumferential edge, and an opening is arranged to facilitate a mixture of foodstuffs and water after being ground flowing out of the lower grinding disc. The ribs of the lower grinding disc are designed to be consistent with those of the upper grinding disc.

The grinding discs *per se* may be made from metal, for example, SUS304, having a high frictional resistance on a surface to avoid incapability of grinding foodstuffs because of smoothness, and the grinding discs may also be made from rock and ceramics.

What is claimed is:

1. A fully automatic grinder, comprising: a machine head component, wherein: the machine head component comprises upper and lower grinding discs (5, 4) adapted to grind against each other and a low-speed motor (8) that drives the upper and lower grinding discs (5, 4) to rotate relative to each other; a temperature sensor (18) is arranged on one side of the upper and lower grinding discs (5, 4), and the temperature sensor (18) is connected to an intelligent circuit board (15) that controls a rotation speed of the low-speed motor (8) according to a temperature detected by the temperature sensor (18);

a water storage chute (10) used for storing and delivering water used for grinding and a feeding chute (13) used for storing and delivering foodstuffs to be ground are arranged above the upper grinding disc (5); an annular groove is arranged on the upper end surface of the upper grinding disc (5), and an axially distributed trip lever (22) is arranged inside the annular groove; a bottom of the water storage chute (10) is in communication with a conduit (26), a knockout pin (23) is arranged inside the conduit (26), and a top of the knockout pin (23) extends from a top opening of the conduit (26) and is connected to a sealing gasket (25) used for sealing the top opening of the conduit (26); when the upper grinding disc (5) rotates, the trip lever (22) is adapted to move to a bottom of the knockout pin (23) and push the knockout pin (23) upward to make water in the water storage chute (10) flow into the annular groove (5-1) via the conduit (26); and the annular groove (5-1) is in communication with a material-dropping hole on the upper grinding disc (5).

2. The fully automatic grinder according to claim 1, wherein: an anti-overflow sensor (7) used for detecting a liquid level on the upper grinding disc (5) is arranged adjacent to an upper end surface of the upper grinding disc (5), the anti-overflow sensor (7) is connected to the intelligent circuit board (15), and the intelligent circuit board (15) is connected to a control valve used for controlling a water outlet amount of the water storage chute (10) according to an output signal of the anti-overflow sensor (7) to prevent overflow; a foodstuff pusher (6) used for making foodstuffs even is arranged on the upper end surface of the upper grinding disc (5); a stirring vane (3) which rotates synchronously with the upper grinding disc (5) or the lower grinding disc (4) is arranged adjacent to a bottom of the lower grinding disc (4); a material-dropping hole is arranged on the upper grinding disc (5); an outlet at a bottom of the material-dropping hole intersects with a lower end surface of the upper grinding disc via a slope surface, and grooves are

distributed on end surfaces, opposite to each other, of the upper and lower grinding discs (5, 4), and an end, distal to the material-dropping hole, of the slope surface intersects with the grooves on the upper grinding disc (5).

3. The fully automatic grinder according to claim 1, wherein a spring (24) is sleeved on the knockout pin (23), and the spring (24) is elastically arranged between the bottom of the knockout pin (23) and an upper middle part of an inner wall of the conduit (26).

4. The fully automatic grinder according to claim 1, wherein: the bottom of the knockout pin (23) and/or a top of the trip lever (22) are/is in a truncated cone shape.

5. The fully automatic grinder according to claim 1, wherein the top of the trip lever (22) has a slope surface used for pushing the knockout pin (23) upward when the upper grinding disc (5) rotates.

6. The fully automatic grinder according to claim 1, wherein: the grinder further comprises a housing (31); the lower grinding disc (4) is fixed to an upper end of the housing (31), and the low-speed motor (8) is arranged inside the housing (31) and used for driving the upper grinding disc (5) to rotate; a separable water tank (52) is arranged a top of the housing (31), a storage bucket (55) capable of isolating water is arranged in the water tank (52), and a foodstuff outlet of the storage bucket (55) is arranged vertically opposite to a motion track or an inner portion of the motion track of a material-dropping hole on the upper grinding disc (5); and the low-speed motor (8) extends from a central through-hole of the upper grinding disc (5) and fits a screw nut in a threaded manner.

7. The fully automatic grinder according to claim 6, wherein: a water pump (57) is arranged on an outer side wall of the water tank (52), and the water pump (57) pumps water from the water tank (52) through a water outlet pipe (56) into an inlet at a top of the storage bucket (55).

8. The fully automatic grinder according to claim 6 or 7, wherein: a water level probe (53) is arranged on an inner wall at a bottom of the water tank (52), and the water level probe (53) is

connected to a water level probe connector (39) fixed inside the housing (31); and the water level probe connector (39) is connected to an intelligent circuit board and forms a loop together with water in the presence of water to control the intelligent circuit board to be powered up and controls the intelligent circuit board to be disconnected from a power supply in the absence of water or in a state where the water tank is separated from the housing (31).

9. The fully automatic grinder according to claim 6, wherein a closed ring used for storing a mixture of water and foodstuffs is arranged on an edge of the upper grinding disc (5), and an upper end surface of the upper grinding disc (5) is a slope surface sloping downward from outside to inside.

10. The fully automatic grinder according to claim 9, wherein a diameter of an upper end opening of the material-dropping hole of the upper grinding disc (5) is less than a diameter of an outlet at a bottom, and the outlet at the bottom of the material-dropping hole intersects with a lower end surface of the upper grinding disc via the slope surface; the slope surface at the bottom of the upper grinding disc (5) is at an angle of 10 to 30 degrees to the lower end surface of the upper grinding disc; and the lower end surface of the storage bucket (55) is parallel to the slope surface where the upper grinding disc is located.