Oct. 13, 1959 E. BRAUN 2,908,422

ATOMIZERS

Filed Dec. 1, 1954 2 Sheets-Sheet 1

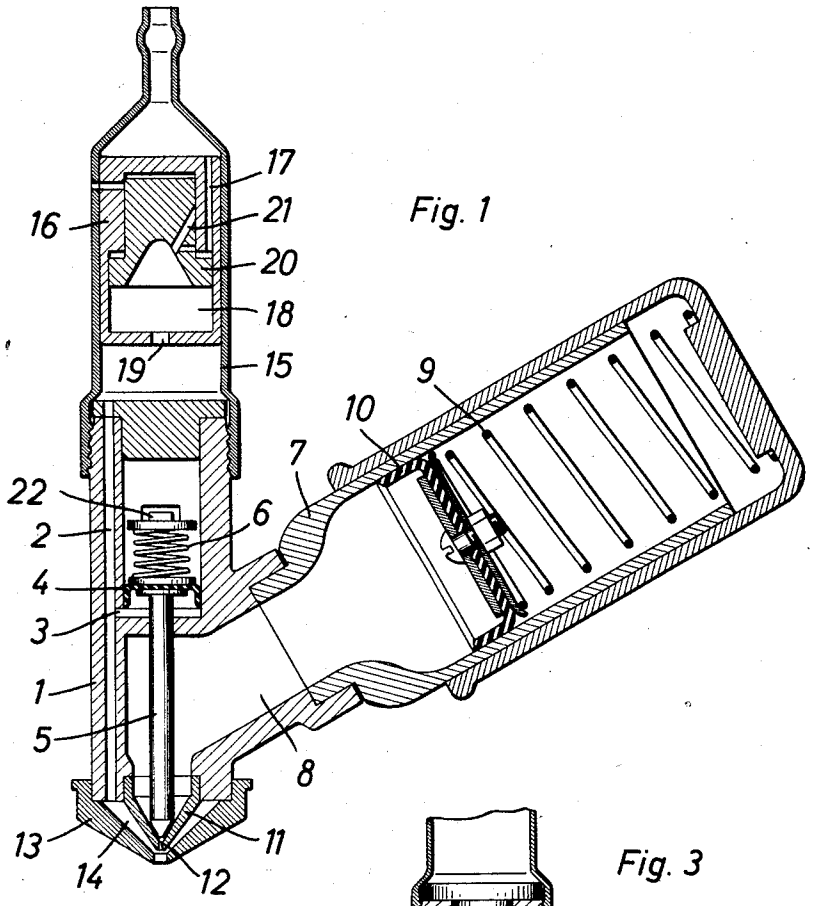


Fig. 1

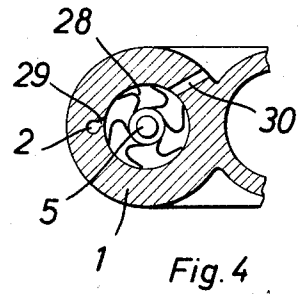


Fig. 4

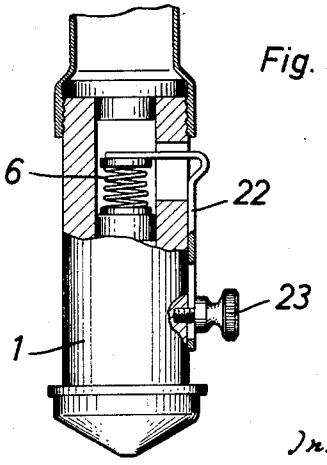


Fig. 3

Inventor:
Edigna Braun
by Michael S. Striker
Attorney

Oct. 13, 1959 E. BRAUN 2,908,422

ATOMIZERS

Filed Dec. 1, 1954 2 Sheets-Sheet 2

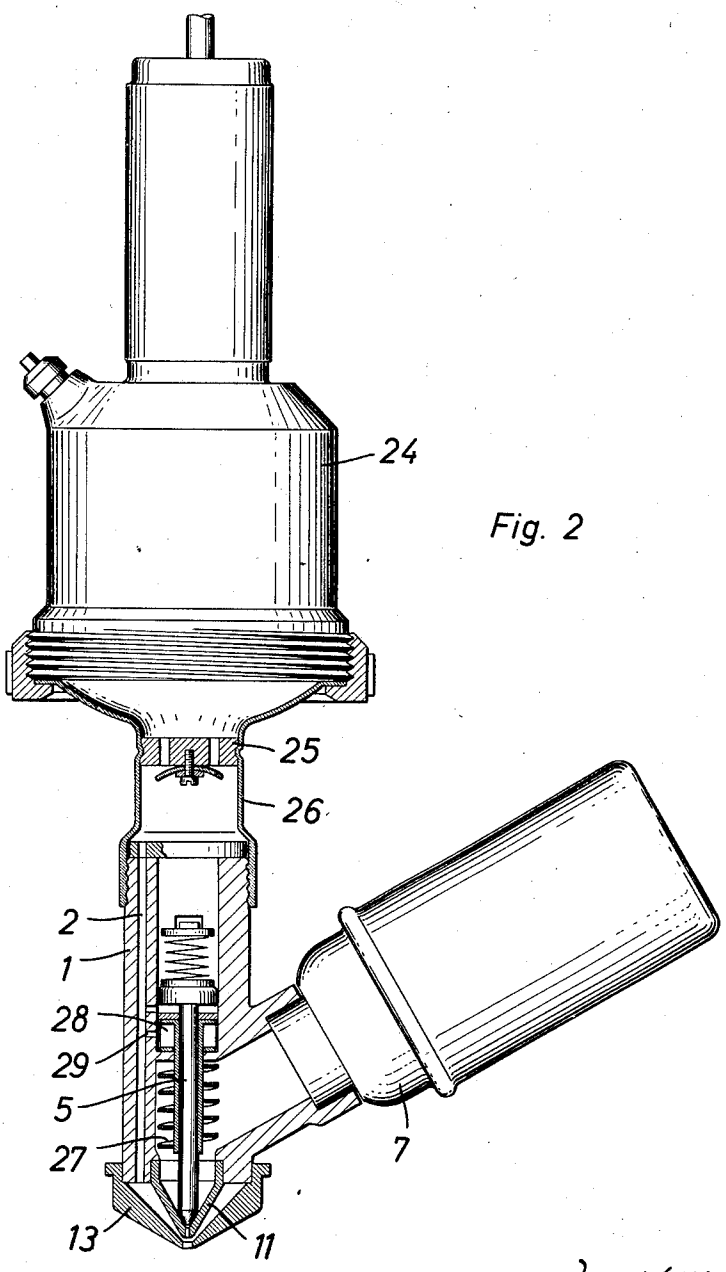


Fig. 2

Inventor:
Adigna Braun
by: Michael S. Striker
Attorney

United States Patent Office 2,908,422
Patented Oct. 13, 1959

2,908,422

ATOMIZERS

Edigna Braun, Weilheim, Upper Bavaria, Germany, assignor to Reischl & Co., K.G., Metallwarenfabrik, Weilheim, Oberbayern, Germany, a German firm

Application December 1, 1954, Serial No. 472,474

Claims priority, application Germany December 5, 1953

10 Claims. (Cl. 222—190)

The present invention relates to pneumatic atomizers or sprayers, and it is the primary object of the invention to devise an apparatus of this kind which is especially suited for the purpose of disintegrating and spraying materials which have a more solid consistency than liquid or pasty waxes, that is, for example, hard waxes and similar materials which, prior to the invention, had to be applied by hand at a great waste of time, material, and physical effort.

Another object of the invention consists in devising an atomizer provided with a very simple and effective mechanism for producing a pulsating air current, and a valve needle actuated by such pulsating current to carry out an oscillating movement of a constant frequency, whereby such valve needle exerts a distintegrating as well as a forwardly conveying action upon the material to be atomized which is then finely dispersed in and carried along by such air current then to be ejected from the valve nozzle as a spray or jet, the force and consistency of which may be regulated by simple means in accordance with the consistency of the material to be atomized and the desired thickness of the coating on the surface to be sprayed.

Another object of the invention resides in the provision of a very simple mechanical interrupter for producing the pulsating air current required for operating the new disintegrating and conveying valve.

Another object of the invention resides in the design of an electrically actuated diaphragm pump for producing the pulsating air current.

A further object of the invention resides in the provision of a screw conveyor operating in combination with the vibrating valve needle and driven by a turbine propelled by the air current used for operating the valve mechanism and propelling the jet of atomized material.

Another, and very important object of the invention resides in the provision of these various elements in a housing of very convenient size and shape, and a design easy to manipulate and operate.

Still further objects of the invention resides in the applicability of the new pneumatic atomizer to a large variety of sources of power for operating the same, and in the exchangeability of the unit for producing the pulsating air current required for operating the new atomizer so that it may be easily converted to be driven by whatever source of power may be available.

Still further objects, features, and advantages of the present invention will be apparent from the following detailed description thereof and the accompanying drawings, in which—

Fig. 1 shows a cross section through an atomizer according to the invention provided with a mechanical interrupter for producing a pulsating air current;

Fig. 2 shows the new atomizer in combination with an electrically operated diaphragm pump and provided with a screw conveyor operated by a turbine wheel;

Fig. 3 is a partial section through the device for adjusting the tension of the spring required for operating the needle valve; while

Fig. 4 is a cross section through the turbine for driving the screw conveyor.

Referring to the drawings, the inside of the housing **1** is provided with a channel **2** leading from one end of the housing to the other and having a branch **3** for passing the compressed air to a chamber below the piston **4** which then lifts the conical valve needle **5** against the action of a compression spring **6** from the conical valve seat of the nozzle **11** so as to free the valve opening **12** to the passage of the material, such as, for example, a relatively hard and solid wax or other material of a similar consistency, supplied to the nozzle **11** from the container **7** and forced through the channel **8** by a piston **10** by the action of a spring **9**. As clearly shown in the drawings, the valve itself consists of the conical inner nozzle **11** cooperating with the valve needle **5**, and an outer valve cap **13**, and an atomizing chamber **14** formed by the space intermediate the nozzle **11** and the inner wall of the valve cap **13**, and communicating with the air channel **2**. The upper end of the housing **1** has screwed thereon a tubular connecting member **15** containing the means for producing a pulsating air current of considerable pressure but substantially constant frequency which, in the embodiment of the invention shown in Fig. 1, is formed by a mechanical interrupter consisting of a cylinder **16** having therein a compressed-air supply channel **17**, and a freely moving piston **20** slidably mounted on the inner walls of cylinder **16**. The latter has channels **21** therein designed to cooperate with the air supply channel **17** and communicating with the cylinder chamber **18**.

The operation of an atomizer as shown in Fig. 1 actuated by a suitable supply of compressed air is as follows:

First, the compressed air flows through the tubular connecting member **15** and the channel **17**, whereupon the compressed air acts upon the annular surface of the piston **18** depressing the same until the channels **21** are open and the compressed air can fill the chamber **18** within the piston **20** as well as all the other free spaces down to the atomizer chamber **14**. At this point the tip of the nozzle **11** and the valve cap **13** form a constricted passage which increases the pressure of the atomizing air thereby forcing back the piston **20** to its original position, closing off the supply of compressed air. The pulsating air current thus formed by the successive reciprocatory movement of the piston **20** is transmitted through the branch channel **3** to act upon the piston **4** mounted on the valve needle **5**, giving the latter an oscillatory movement through the action of spring **6**. Such oscillatory movement of the conical tip of the valve needle **5** in cooperation with the conical inner wall of the nozzle **11** exerts a disintegrating action upon the wax or other material within the lower end of the channel **8**, as seen in Fig. 1, as well as a feeding action thereof toward and through the nozzle opening **12**.

In order to balance the initial tension of the spring **6** with the frequency of the pulsating air current, a rectangular control arm **22** is provided one end of which is acted upon by the spring **6**, while its other end is adjustably secured to the outside of the housing **1** by means of a setscrew **23** within an elongated slot in the arm **22**.

If instead of being connected to a source of compressed air the atomizer is to be connected to a source of electric power, the pulsating air current required for operating the atomizer may be produced directly by an electrically driven diaphragm pump **24** as shown in Fig. 2, the compression valve **25** of which is mounted within the tubular connecting member **26** which has a funnel-like upper end facing the diaphragm side of the pump **24**. The operation of the valve needle **5** is the same as above-described.

However, its disintegrating and feeding action may be amplified in either of the embodiments of the invention shown in the drawings by the provision of a screw conveyor 27 rotatably mounted on the valve needle 5 and driven by a turbine wheel 28 rigidly secured to the upper end of the conveyor screw 27. For rotating the turbine wheel 28 as well as the conveyor screw 27, the compressed air within the channel 2 passes through a duct 29 to the space within the turbine wheel 28 and, after propelling the latter, leaves the same through an outlet 30.

Although the new atomizer has been shown in the drawings as being operated either directly by an available source of compressed air or by an electric diaphragm pump, it is obvious that the air pressure required for operating the atomizer may be produced by any other means, and it is one of the features of the present invention that the new atomizer may be easily connected to such other source of power.

The entire apparatus has the great advantage over other atomizers of being of a very simple design and very reliable in its operation. The individual parts thereof are easily removable from each other for the purpose of cleaning the valve and refilling the container, as well as for connecting the atomizer proper to a different source of compressed air.

While the foregoing description sets forth in detail what I regard as the preferred embodiments of my invention, it is to be understood that numerous changes may be made therein without departing from the spirit and scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new is:

1. An atomizer for relatively solid materials such as hard wax and the like, comprising a housing, a container for said material on said housing, a source of compressed pulsating air of substantially constant frequency in communication with said housing, a conical valve nozzle having a valve opening near one end of said housing and communicating with said container, a cylinder within said housing communicating with said air connecting means, a valve needle within said housing having a conical tip at one end within said nozzle, a piston within said cylinder and mounted on the other end of said valve needle, resilient means acting upon said valve needle in the opposite direction to the action of the air pressure on said piston, and means for pressing said material from said container toward said valve needle, whereby under the action of said pulsating air pressure said valve needle performs a reciprocating motion relative to said valve nozzle thereby disintegrating said material and feeding the same toward and through said valve opening.

2. An atomizer for relatively solid materials such as hard wax and the like, comprising a housing, a container for said material on said housing, a source of compressed pulsating air of substantially constant frequency, connecting means at one end of said housing for placing the same in communication with said source, a conical valve having a chamber therein, and a valve opening in said chamber near the other end of said housing, resilient means within said container for feeding said material toward said valve chamber, a cylinder within said housing, a valve needle within said valve chamber having a conical tip at one end facing said valve opening, a piston within said cylinder and mounted on the other end of said valve needle, a channel connecting said cylinder with said connecting means so that said compressed pulsating air will act upon said piston to lift said valve needle from said valve opening, a compression spring mounted on said housing and acting upon said valve needle to lower said valve needle toward said valve opening, means for adjusting the tension of said spring, a valve cap at the other end of said housing and over said conical valve and having a nozzle opening coaxially with said valve opening, said valve cap being spaced from said conical valve so as to form an intermediate atomizing chamber having a cross section reducing toward said nozzle opening, and a channel connecting said atomizing chamber with said air pressure connecting means, whereby under the action of said pulsating air pressure said valve needle performs a reciprocating motion within said valve chamber relative to said valve opening for disintegrating said material and feeding the same toward and through said valve opening, then to be atomized by said compressed air and sprayed out of said nozzle opening.

3. An atomizer for relatively solid materials such as hard wax and the like, comprising a housing, a container for said material on said housing, a source of compressed air, connecting means at one end of said housing for placing the same in communication with said source, said connecting means including a tubular member, a mechanical interrupter within said member and comprising a cylinder, a piston freely slidable within said cylinder and having at least one control channel therein, said cylinder having at least one inlet passage and at least one outlet, said inlet passage connecting said compressed air source and said piston and adapted to communicate with said control channel when said piston is depressed by said compressed air, said piston being adapted to convert said compressed air into a pulsating air current of substantially constant frequency, a conical valve having a chamber therein, and a valve opening in said chamber near the other end of said housing, a valve cap at said other end of said housing and over said conical valve, and having a nozzle opening coaxially with said valve opening, said valve cap being spaced from said conical valve so as to form an intermediate atomizing chamber having a cross section reducing toward said nozzle opening, a pressure channel connecting said atomizing chamber with said outlet from said cylinder, resilient means within said container for feeding said material toward said valve chamber, a closed cylinder within said housing, a valve needle within said valve chamber having a conical tip at one end facing said valve opening, and slidably mounted in and extending through the wall of said cylinder, a piston within said cylinder and mounted on the other end of said valve needle, an inlet connecting said cylinder with said pressure channel so that said compressed pulsating air will act upon said piston to lift said valve needle from said valve opening, a compression spring mounted on said housing and acting upon said valve needle to lower said valve needle toward said valve opening, means for adjusting the tension of said spring, whereby under the action of said pulsating air pressure said valve needle performs a reciprocating motion within said valve chamber relative to said valve opening for disintegrating said material and feeding the same toward and through said valve opening, then to be atomized by said compressed air and sprayed out of said nozzle opening.

4. An atomizer for relatively solid materials such as hard wax and the like comprising a diaphragm pump for producing a pulsating air current of substantially constant frequency, electrical means for operating said pump, a housing, a container for said material on said housing, means for connecting said housing to said diaphragm pump, a conical valve nozzle having a valve opening near one end of said housing and communicating with said container, a cylinder within said housing communicating with said air connecting means, a valve needle within said housing having a conical tip at one end within said nozzle, a piston within said cylinder and mounted on the other end of said valve needle, resilient means acting upon said valve needle in the opposite direction to the action of the air pressure on said piston, and means for pressing said material from said container toward said valve needle, whereby under the action of said pulsating air pressure said valve needle performs a reciprocating motion relative to said valve nozzle, thereby disintegrating said material and feeding the same toward and through said valve opening.

5. An atomizer as defined in claim 2, further comprising a conveyor screw rotatably mounted on said valve needle, a turbine wheel secured to said conveyor screw for driving the same, and an inlet and an outlet connecting said turbine wheel with one of said channels, said conveyor cooperating with the reciprocating action of said valve needle to feed said material toward said valve opening.

6. An atomizer comprising, in combination, a housing having an atomizing outlet nozzle; substance supplying means arranged at least partly within said housing and being adapted to receive a substance capable of being comminuted and atomized, said supplying means having outlet means in registration with said outlet nozzle and said housing and said supplying means being so arranged as to form an atomizing space between themselves in the region of said outlet means and said outlet nozzle; combined conveying and comminuting means within said supplying means and mounted for rotation and for reciprocating movement relative thereto toward and away from said outlet means thereof, said combined conveying and comminuting means having a screw conveyor portion adapted to move a substance within said supplying means into the region of said outlet means thereof during rotation of said combined conveying and comminuting means in a predetermined direction, said combined conveying and comminuting means being adapted to cooperate with said outlet means in such manner that a substance in said supplying means in the region of said outlet means thereof is comminuted and moved toward said outlet means during movement of said combined conveying and comminuting means toward said outlet means; a first operating means for rotating said combined conveying and comminuting means in said predetermined direction; second operating means connected to said combined conveying and comminuting means for continuously reciprocating the same toward and away from said outlet means; and means communicating with said atomizing space for moving a stream of air through said outlet nozzle of said housing, whereby a substance received in said supplying means is moved into said region of said outlet means thereof, is comminuted and moved toward said outlet means, and is thereafter drawn therethrough and atomized through said outlet nozzle.

7. An atomizer as defined in claim 6 wherein said first operating means includes a turbine wheel rotatable with said combined conveying and comminuting means, and means for directing a stream of air under pressure thereagainst, thereby rotating said turbine wheel together with said combined conveying and comminuting means and said screw conveyor portion thereof.

8. An atomizer as defined in claim 6 wherein said first operating means and said second operating means each are air-pressure actuated and wherein said first operating means, said second operating means and said means for moving the stream of air through said outlet nozzle each include a common pulp.

9. An atomizer as defined in claim 8 wherein said pump is a diaphragm pump and includes electric motor means therefor.

10. An atomizer as defined in claim 8 wherein said pump delivers air under pressure at a substantially constant frequency.

References Cited in the file of this patent

UNITED STATES PATENTS

1,939,302	Heaney	Dec. 12, 1933
2,187,376	Guibert	Jan. 16, 1940
2,259,857	Ostendorf	Oct. 21, 1941

FOREIGN PATENTS

324,839	Great Britain	Feb. 6, 1930
297,113	Switzerland	May 17, 1954