May 23, 1972 A. J. DEVINE 3,664,786

APPARATUS FOR ENCAPSULATION UNDER VACUUM

Filed April 15, 1970 2 Sheets-Sheet 1

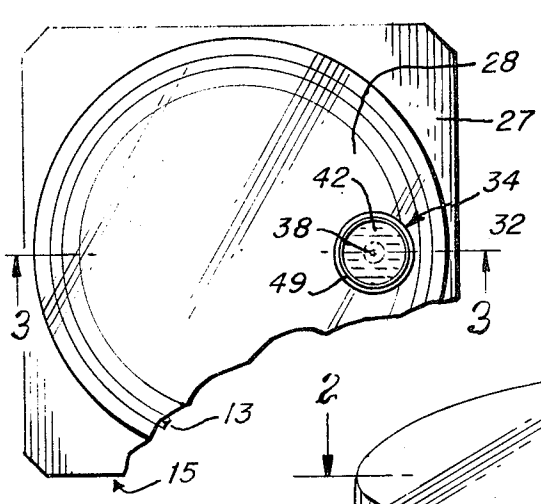

Fig.2.

Fig.1.

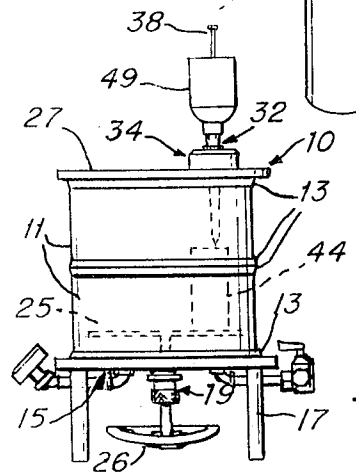

Fig.6.

INVENTOR.

Arthur J. Devine

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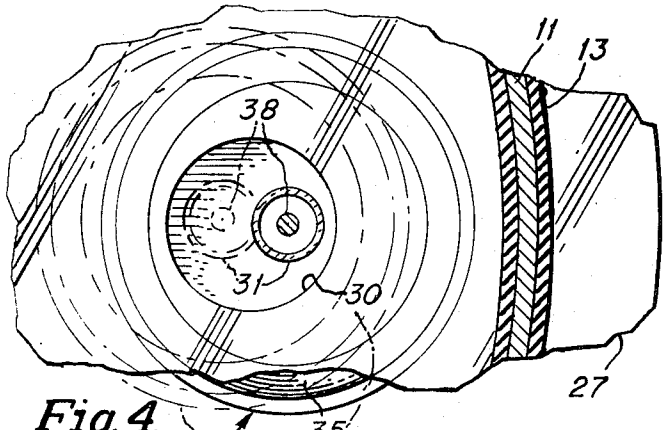

Fig. 4.

Fig. 3.

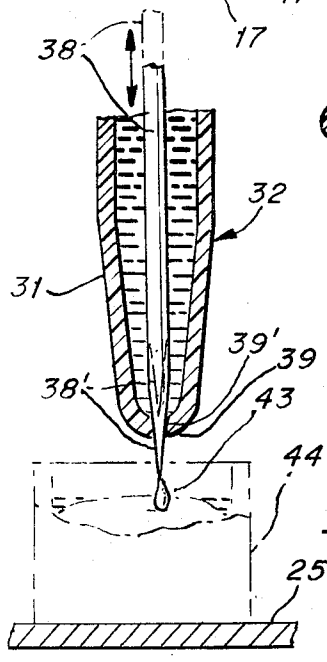

Fig. 5.

INVENTOR.

Arthur J. Devine

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APPARATUS FOR ENCAPSULATION UNDER VACUUM

Arthur J. Devine, 1310 Industrial Ave., Escondido, Calif. 92025

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ABSTRACT OF THE DISCLOSURE

A vacuum chamber is formed by means of a side wall portion and base and cover portions which are fitted to the side wall portion in vacuum tight relationship. The cover portion is transparent to permit viewing of the contents of the chamber and has an access opening in which a dispenser device is supported. A turntable is supported in the base portion, this turntable being manually rotatable from outside of the chamber. With articles to be encapsulated or impregnated placed in the chamber on the turntable, the chamber is evacuated and encapsulating material dispensed thereon from the dispenser device. The turntable is rotatable and the dispenser device manipulable to facilitate application of the encapsulating material to the articles.

My invention relates to an encapsulating apparatus comprising a turntable within a vacuum chamber and improved means for applying viscous material on components to be encapsulated, and specifically with the intended purpose of eliminating air pockets.

In this apparatus troublesome bubbles become thoroughly eliminated by vacuum means while permitting parts to be degassed and therefore free of moisture and other detrimental volatiles before delivering viscous material to components for encapsulation.

In this apparatus such slender parts and coils can also be total impregnated without additional follow up of refinishing by hand operations.

Other features of this invention are a single three-way valve control and rapid alignment of nozzle with molds on a turntable within a vacuum chamber for pinpointing flow of viscous material to components.

Much emphasis is also placed on the plain view of my invention and quick adjustment of all parts for operation as well as for dismantling of apparatus for cleaning purposes.

Other objects, the nature, and advantages of this invention will be apparent from the following description taken in conjunction with the accompanying drawing.

FIG. 1 is a perspective view of my invention with a section cut away to show the vacuum chamber interior.

FIG. 2 is a partial top view taken on line 2—2 of FIG. 1.

FIG. 3 is a cross section taken on line 3—3 of FIG. 2.

FIG. 4 is an enlarged fragmentary view taken on line 4—4 of FIG. 3.

FIG. 5 is an enlarged view taken on line 5—5 of FIG. 3 showing the valve pin manipulation.

FIG. 6 shows how the cylinders can be stacked to increase height of vacuum chamber.

My invention is generally designated **10** and consists of one or more open tubular cylinders **11** formed of a strong, light weight, material such as aluminum, the edges **12** of which are encased by flexible seal rings **13** by means of seal ring channels **14** as shown in FIG. 3. The seal ring **13** on the lower edge of cylinder **11** rests on the surface **16** of a base plate means **15** which is provided with suitable legs or supports **17**, baseplate **15** is formed of a rigid material, preferably metal, which can be machined to a

smooth surface **16** and be of sufficient thickness to prevent warping or bucking and to allow ample threading surface for a pipethreaded opening **18** centrally located therein.

Opening **18** in baseplate **15** supports a fitting assembly **19** which is provided with an internal bushing means **20** which together with a tapered (rubber) bushing **21** and a threaded cap **22** sreves to give frictional support and vacuum sealing for a turntable support shaft **23**. A manual shaft positioning wheel **26** is attached on the lower end of shaft **23**. A turntable **24** which may support a replaceable disc **25** is secured to the upper end of shaft **23** inside vacuum chamber **9** which is formed by cylinder **11**, base plate surface **16** and the surface **28** of a transparent plate glass cover **27** of sufficient thickness to withstand atmospheric pressure and permit a clear view of the chamber **9** interior.

Cover **27** is provided with an opening **30** near its periphery of substantially greater diameter than the tube portion **31** of a dispensing cartridge **32**. Said cartridge **32** is mounted in a said tapered opening **33** of a puck **34** having a greater diameter than that of said opening **30** in plate cover **27**. A tapered compressible bushing **37** in opening **33** provides air tight sealing means between cartridge **32** and puck **34**. Vacuum sealing between puck **34** and surface **28** of cover **27** is achieved by a rubber O-ring **35** which is held in place on the under-side of puck **34** by groove **36** therein. This arrangement allows puck **34** with dispensing cartridge **32** to be manually shifted or orientated within the confines of plate opening **30** to assure most accurate placement of the viscous material **42** to the components or molds **44**, even when chamber **9** is under vacuum, see FIGS. 3 and 4.

An elongated valve rod **38** being substantially longer than cartridge **32** extends there-through and has at its lower end a pointed tip **38'** forming a simple valve **41** in conjunction with a reduced opening **39** in cartridge tip **39**. Thus manual manipulation of valve shaft **38**, see FIG. 1, will permit drop by drop **43** to full flow application of material **42** on or into the molds **44** positioned on disc **25** in vacuum chamber **9**. The upper end of cartridge **32** may be threaded as at **48** to receive a container means **49** which may be supplied in different sizes and may be discarded with cartridge **32** as a time saving alternative to cleaning when the encapsulation operation is completed. Molded plastic cartridges are commercially available and are used for other applications.

A most important feature of my invention is the extreme simplicity of its operation. Components or molds **44** are placed around the periphery of disc **25**, cylinder **11** is positioned on baseplate surface **16** and topped by coverplate **27**. The tube portion of cartridge **32** is inserted through puck means **34** into vacuum chamber **9** through opening **30**. By virtue of the above described vacuum seal means chamber **9** is made air-tight and is ready to be evacuated by vacuum pump through vent **45** in baseplate **15** and three-way valve **46**. While hand A, see FIG. 1, manipulates valve stem **38** hand B on wheel **26** can rotate, elevate or retract turntable **24** to position each mold **44** under cartridge tip **39** for filling. More accurate means for positioning of said cartridge **32** are here-before described. When the molds **44** are all filled vacuum valve **46** is opened filling chamber **9** with air and permitting cover assembly **27** to be removed so that disc **25** with molds may be lifted out for placing in a curing oven or other process.

A vacuum indicating gauge **50** may be mounted on baseplate **15** and connected to chamber **9** by suitable vent means **47**. It may be pointed out that two or more of the cylinders **11** may be stacked as shown in FIG. 6 if the height of the mold so warrants.

Although I have herein described the nature and use of my invention so that persons skilled in the art will have no difficulty in understanding its contents and insomuch as the disclosure is susceptible of various modifications and improvements, I hereby reserve the right to all modifications and improvements falling within the scope and spirit of my invention as well as any modifications that are suggested in the accompanying drawings and any that may come within the purview of the foregoing description; my invention to be limited only by the appended claims.

Having thus disclosed and revealed my invention, what I claim as new and desire to secure by Letters Patent is:

1. Apparatus for impregnating articles with a vicous material comprising:
- a vacuum chamber,
- a turntable rotatably mounted within said chamber, said articles being supported on said turntable,
- means extending to the outside of said chamber for rotatably positioning said turntable,
- dispenser means for dispensing said material onto said articles,
- said chamber having an opening formed therein,
- means for supporting said dispenser means in said opening for movement axially and radially relative to said turntable, said supporting means including sealing means for airtightly fitting said dispenser means through said opening,
- said dispenser means including valve means manipulable from outside of said chamber for controlling the rate of dispensing of said material.

2. The apparatus of claim **1** wherein said supporting means for the dispenser comprises a puck having an opening therein through which the dispenser is fitted in airtight relationship, said chamber having a top cover in which the chamber opening is formed, said puck resting on said cover over said cover opening.

3. The apparatus of claim **2** wherein said sealing means includes an O-ring seal fitted in said puck between said puck and said cover.

4. The apparatus of claim **2** wherein said dispenser means further comprises a dispenser cartridge having a container for said viscous material positioned outside of said chamber and a tube extending from said container through said puck member opening into said chamber, said tube having a nozzle for dispensing the material.

5. The apparatus of claim **4** wherein said valve means comprises a rod having one end thereof extending out from the top end of said container and the other end extending out from the bottom end of the container to said nozzle, said rod being positionable relative to the nozzle to control the rate of flow of the material therethrough.

6. The apparatus of claim **1** wherein said turntable is slidably supported in said chamber for movement along the rotation axis thereof.

7. In combination,
- a vacuum chamber having a transparent cover,
- a turntable mounted within said chamber,
- a shaft attached to said turntable,
- a gland member threadably attached to the base of said chamber through which said shaft enters said chamber,
- a sleeve bearing mounted in said gland member for rotatably supporting said shaft,
- a handwheel attached to said shaft and external of said chamber,
- a dispensing cartridge supported in said cover, said cartridge including a nozzle for dispensing material into said chamber, and
- a valve rod positioned in said nozzle for controlling the flow of material therefrom.

8. In combination:
- a vacuum chamber with a cover plate having an opening therein,
- a turntable mounted in said chamber for axial and rotatable movement,
- a plurality of molds positioned on said turntable,
- a movable puck supported on said cover plate over said opening to provide a seal over said opening,
- a dispensing cartridge having a nozzle for dispensing fluid material into said molds,
- said puck having a tapered bore,
- a compressible bushing mounted in said bore for engaging said nozzle, said bushing permitting axial movement of the nozzle, and
- a pointed rod member fitted in said nozzle for valving the dispensing action of said nozzle.

9. The apparatus of claim **2** wherein said top cover is transparent to permit viewing of the inside of said chamber.

10. The apparatus of claim **1** wherein said chamber is modularly constructed from a plurality of similar sidewall sections stacked on top of each other with a baseplate member forming the bottom of the chamber and a transparent plate forming a top cover therefor.

11. In apparatus for impregnataing articles with a viscous material, said apparatus including a vacuum chamber in which said articles are contained, the improvement comprising means for dispensing said material onto said articles through an opening in said chamber, said means including:
- a puck member placed over said chamber opening and having sealing means thereon to provide an airtight seal, said puck member having an opening formed therein,
- a dispenser cartridge fitted through said puck member opening in airtight relationship with said puck member, and including a container for said viscous material positioned outside of said chamber and a dispenser tube extending from said container through the opening in said puck member into said chamber, said puck member being mounted for radial positioning in said opening, said tube member having a dispensing nozzle thereon and being mounted for axial positioning, and
- a valve rod slidably mounted in said tube member with one end thereof in said nozzle and the other end thereof extending through said container for manual manipulation, said valve rod being manipulable to control the flow rate of said viscous material through said nozzle.

12. The apparatus of claim **11** wherein said chamber includes a transparent cover, said opening being formed in said cover.

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ROBERT L. SPICER, JR., Primary Examiner

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264—101, Dig. 37; 425—261, 173, 117, 182, 449