

About the pattern width of conformal film coating

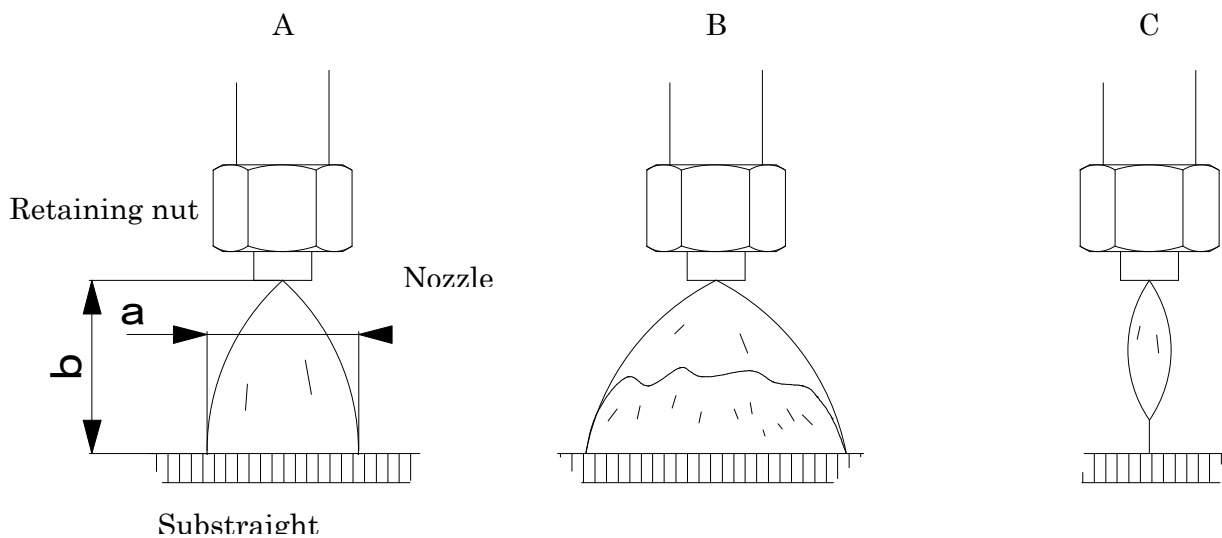
Shimada Appli G.K.

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The optimum pattern width used by the Shimada Application* is explained below.

* Shimada Application is Appl. No.: 07/206,199 (Method for applying a moisture proof insulated coating to printed circuit boards using triangular or dovetail shaped liquid films emitted from a flat-pattern nozzle.) developed as a selective coating 30 years ago.

Fig.1 The example of coating pattern



When coating liquid material with film coating application, it becomes three forms as shown in the above figure. It becomes relevant conditions that an upper portion touches a coated object from the nozzle location of max wide pattern width by A or C.

As for B, film formation is made by the nozzle peripheral part. After that, thread or scattering is seen in the shape of a particle. When it applies in the part by which film formation is carried out, a good film plane is not obtained.

In the liquid distribution in a pattern, liquid concentration starts this at the end, and the pattern central part becomes a fluid volume fall.

The state where distribution of the film in a film plane has the thin central part, and an end is deep remains.

Moreover, it is easy to come also out of scattering when coating liquid hits a coated object. (It influences with an angle with the coated object of a coating pattern end)

Since A becomes a proper coating condition as pattern formation, it needs to carry out a condition setup so that it may be set to A.

C state conditions have high viscosity, or are the result of producing, when what has the

narrow type with few amounts of discharge or application width of a nozzle is selected. Although the application can do C, film thickness is thick, does not have linearity and tends to produce that a bubble is moreover generated etc.

B is when application liquid has low viscosity and high fluid pressure.

Pattern width can be changed with a nozzle kind, nozzle distance, and liquid viscosity.

As standard effective application width:

a: Size (pattern width) 4-16 mm

b: Size (nozzle distance) It is 6- 20 mm.

Appendix: The start of film coating technique

Film coating technique is based on application of the airless spray which is 1 fluid spray.

An airless spray mechanism is used for the point of the watering machine for lawns, or the hose for firefighting.

Although those use nozzles are the spray patterns of a cone and a whirling pattern, another spraying also has an even sector spray pattern.

Respectively, many amounts of discharge flow come out, and their spraying particles are also coarse. There are some elements which improve micro atomization of an airless spray and influence atomization.

The biggest element in it is a nozzle.

In order to obtain good atomization, paint viscosity and the thixotropic nature of a coating material are also influenced.

The difference in nozzle dimensions etc. also influences atomization.

The foundations of the heiress nozzle which forms a sector pattern leave a collision of fluid which is shown in Fig. 2.

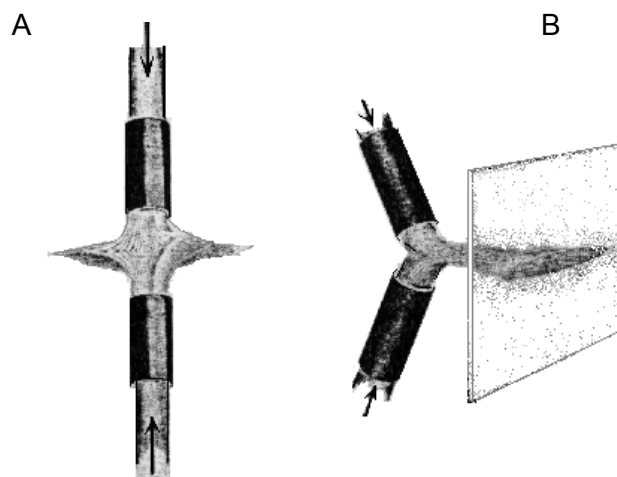


Fig. 2 The atomization method by

When the fluid which runs in a pipe comes out of the cage festival of the can point, a collision of fluid cuts in cage festival this side. According to pipe internal pressure, fluid is emitted with sufficient vigor from a cage festival exit. It decomposes rapidly from a liquid membrane and the jet shifts to a glob. In that case, it is easy to become は and "edge-like injection" (tail-like injection) with the nozzle of a common sector pattern. Therefore, a tail is canceled by applying high pressure. Fig. 3 expressed the process of the atomization. If the thin film liquid membrane which fully had speed flies the inside of the air in the free direction, the liquid will be disassembled from a thin thread liquid without unstable raw and a ball to particles. It calculates theoretically that a liquid finally becomes small particles.

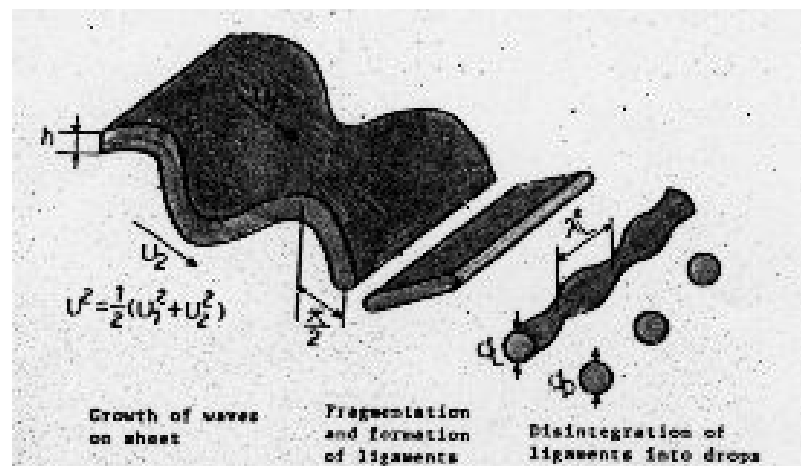
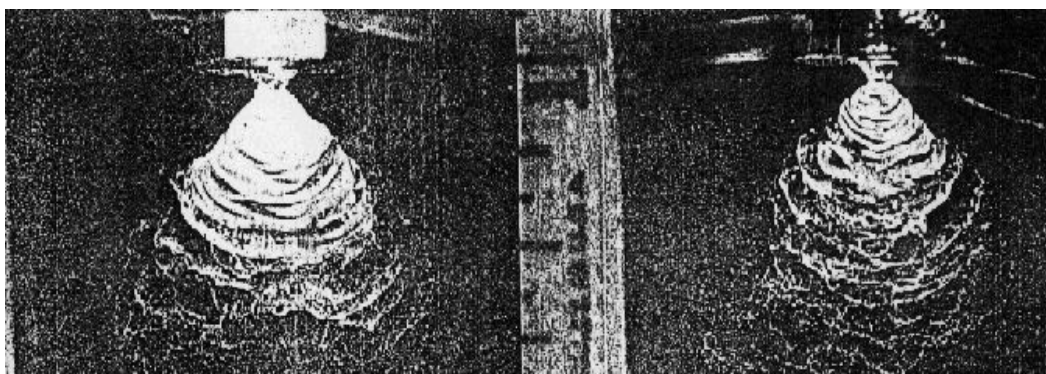


Fig. 3 The situation of the atomization morphisms

It is the high-speed photography of the process which a short disturbance style sheet or an oscillating film is formed from a nozzle, and a lower photograph becomes thread, and it distributes to a glob rapidly.(Shutter speed 1/2,000,000)

Coating condition: Liquid temperature: 54°C. Liquid pressure of viscosity 0.56Mp of 40 centipoises. Its attention was paid to the film coat at the film layer formed in this nozzle apical portion. Even when it lowered to below the domain that atomizes fluid pressure, it left from the ability of film pattern formation to be performed.



Film Coating Nozzle:

A nozzle is not a dome nozzle but a rectangle form nozzle.

V cut of is done, and from the contrary, it cuts into 90-degree cross state, and forms a cage festival in one side of a pillar chip.

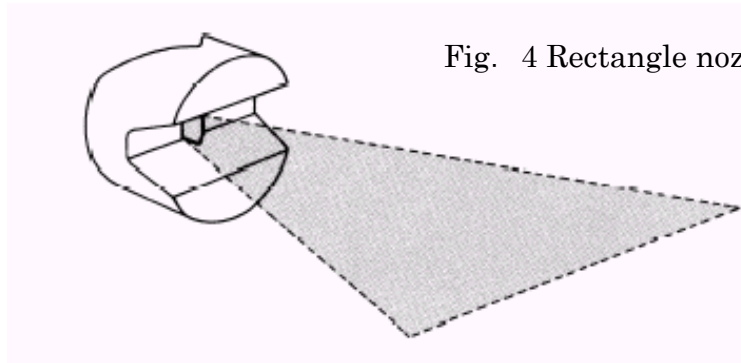


Fig. 4 Rectangle nozzle

Proper film coating

The important conditions of a film coat are the speed of a liquid, pressure, a nozzle, and liquid temperature. Especially fluid pressure is a main factor for pattern formation in it. Although fixed liquid pressure leads to good pattern formation, the flow velocity of a liquid is too quick, and becomes an imperfect film, and high fluid pressure causes scattering. Moreover, another element which influences a pattern is heat. It warms within a circulation system and lowers viscosity. This carries out pattern formation to stability. Another advantage of heat is steam pressure. The liquid breathed out from the nozzle promotes dissolution of a bubble by a vapor pressure. In use of heat, it is careful of the conformity to the heat of a liquid.

The important factor of a film coating

Factor	Effect (tendency)				
	Pattern width	Coating surface	Flow late	Splashing	Liquid speed
Liquid Pressure UP	It becomes wide.	Depend on condition	Increase	It increases from a certain place.	Increase
Liquid Viscosity UP	It becomes narrow.	Bad	Down	Down	Down
Liquid heating	It becomes wide.	Good	Increase	Down	Increase
Nozzle distance Shortening	Narrow	(Good)	UP at unit area	Down	Increase

Performance comparison with the nozzle size

① The nozzle discharge quantity

Nozzle size	Flow rate (cc/min)
No4	3 6
No5	4 6
No6	5 6
No9	8 1
No14	1 2 8
No20	1 8 0

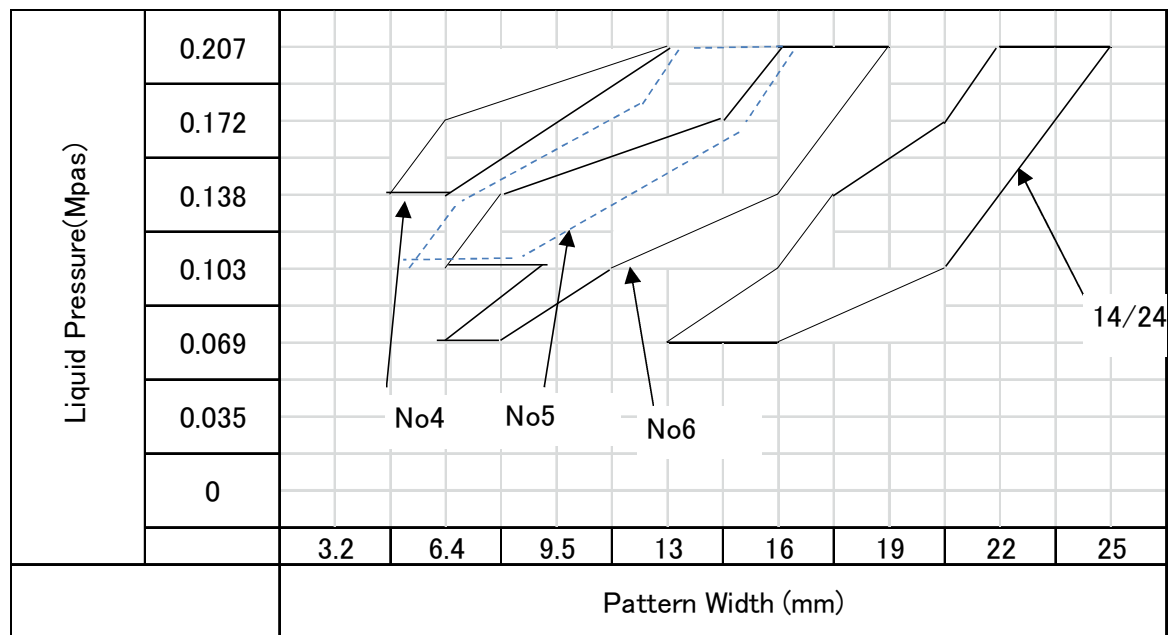
Material: Water
Liquid Pressure'@0.2Mpas

② Relation between pattern width & liquid pressure

The fixed condition

Material:Humiseal 1B66 viscosity: 30cps '@ 20°C, Coating speed: 350mm/sec

Micro adjust: Full open, Nozzle height :10mm H



The film thickness comparison which made nozzle No6 is " 1"

Nozzle N o		4	5	6	14
Speed	200mm/s	0.84	0.92	1	1.65
	400mm/s	0.56	0.75	1	1.28
	600mm/s	0.8	0.75	1	1.78
	800mm/s	0.88	0.94	1	1.65
Ave.		0.77	0.84	1	1.59