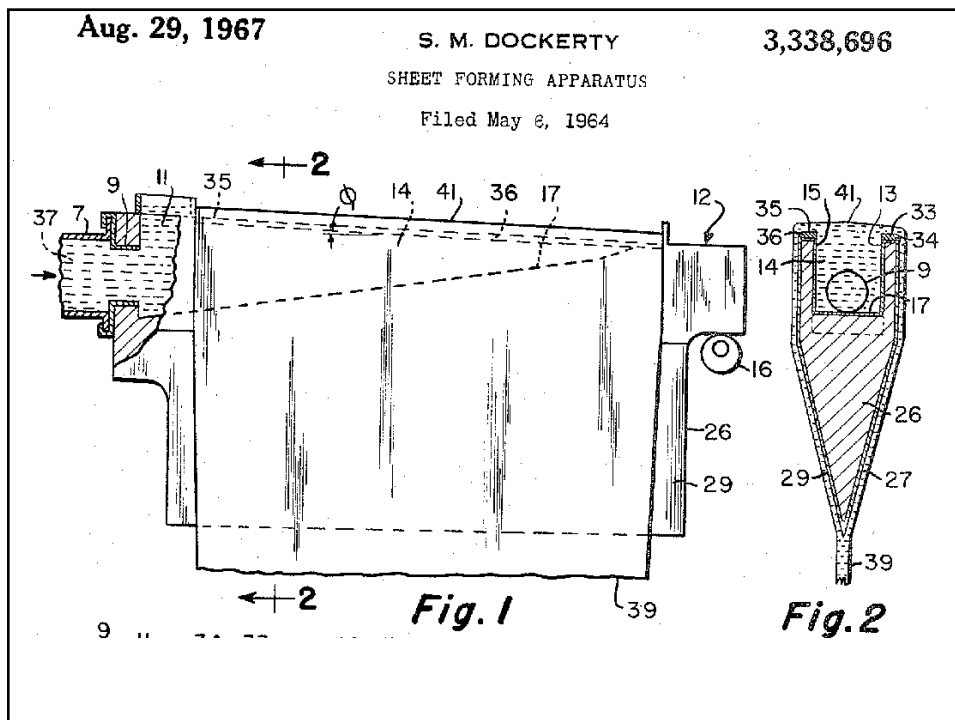
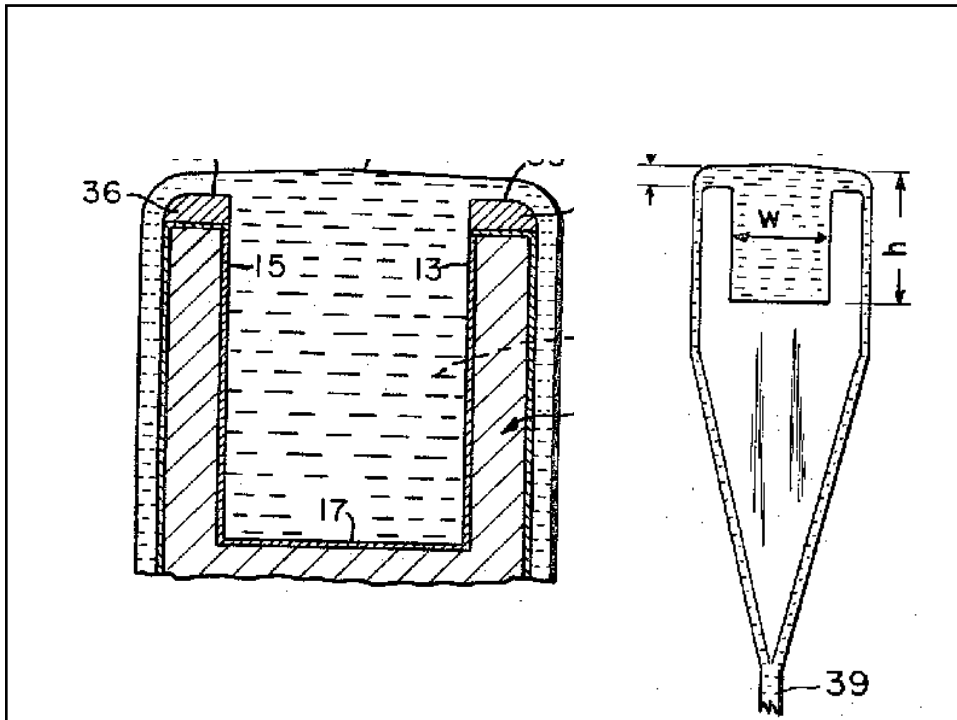


# The Overflow Downdraw Process

- First patented in 1967 [Dougherty 3,338,696]
- Overflow process assures outside surfaces are virgin
- No distortion due to hydrostatic or feeding pressures, glass feed pressure is low.
- Overflow trough is a metering weir that assures uniform glass thickness
  - Tapered trough bottom

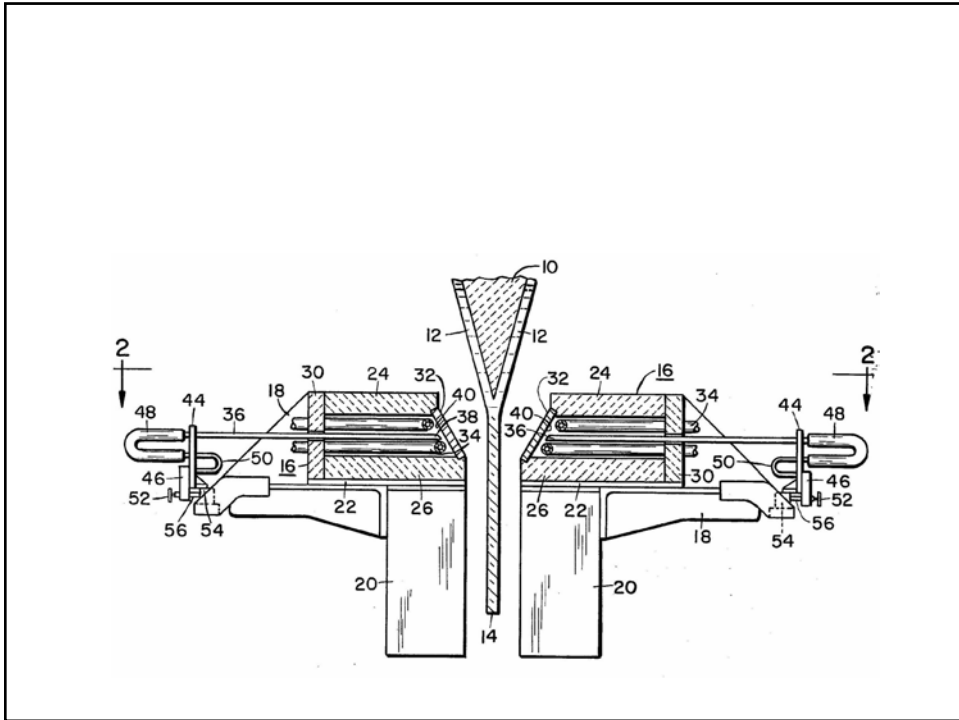
$$\frac{Q \eta}{\tan \phi} = K$$





## Controlling Glass Thickness

- Temperature control key to thickness control
- Many air jets control temperature to maintain thickness
  - Opposing jets are staggered to provide best coverage
  - Jets can heat or cool glass to make glass thicker or thinner
- Key process element is feedback loop between measurement and air flow rates and temperature
  - Laser micrometers measure thickness
  - Feedback loop using PID controllers



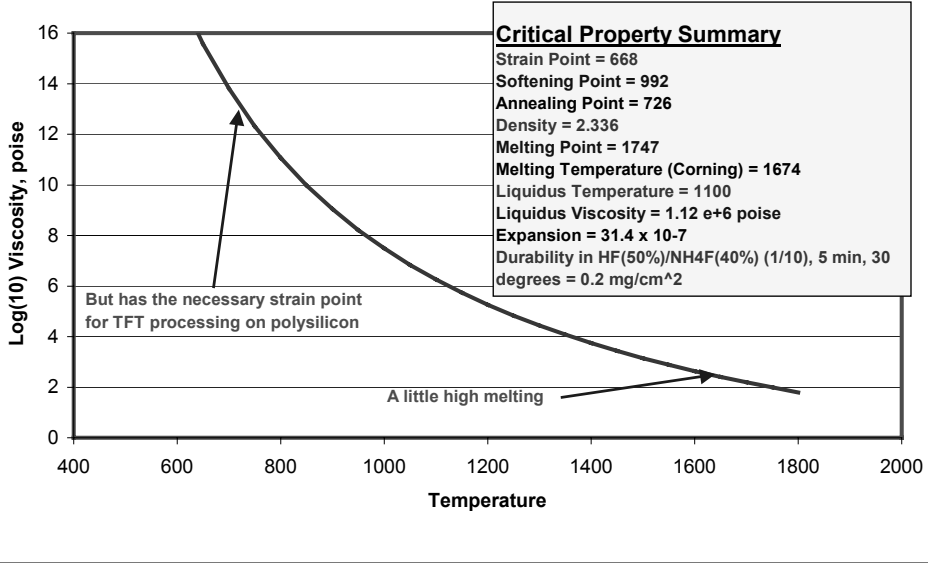
## Flat Panel Compositions

Glass	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	B <sub>2</sub> O <sub>3</sub>	MgO	CaO	SrO	As <sub>2</sub> O <sub>3</sub>	BaO
Low Density	69.3	10.6	9.97	0.18	9.58	0	0.37	
1992-87	64	9	4		13	3		7
1992-88	63	9	5	18				
1994-95	67	11	8	2	8	2		2
7059 Supra	50	10	15					24

TiO<sub>2</sub>  
Ta<sub>2</sub>O<sub>5</sub>  
Nb<sub>2</sub>O<sub>5</sub>

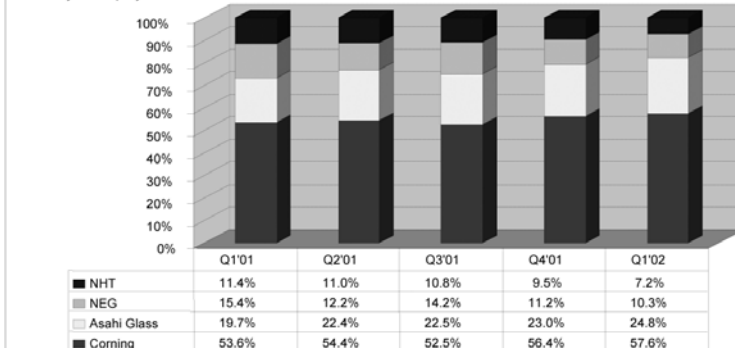
## Complete Viscosity Curve and Critical Properties of of Corning Active Matrix Overflow Downdraw Glass

[Low Density, Silicon Matched Expansion]



### AMLCD GLASS SHARE (Area Basis) Q1'01 - Q1'02

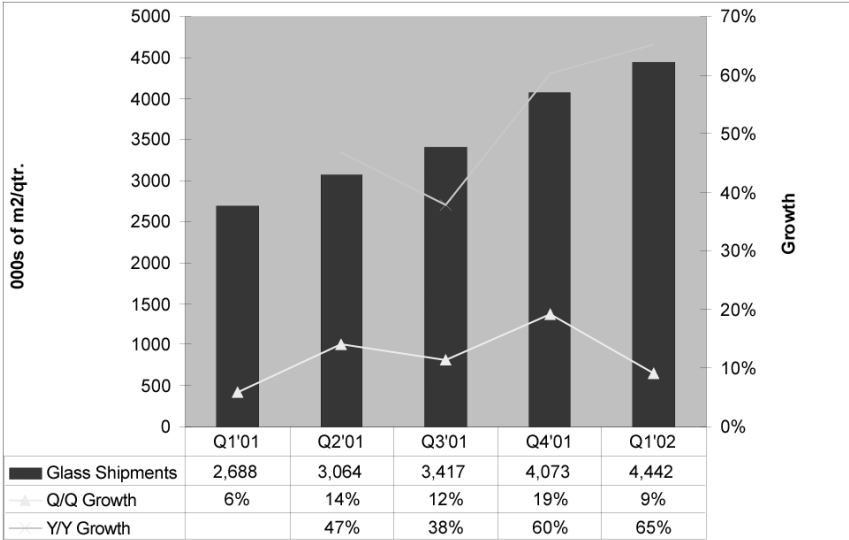
Courtesy of DisplaySearch Inc.



Corning and Asahi Glass gained ground due to NHT's fab closures and NEG's loss of share.  
 [July '02 DisplaySearch Inc.]

Courtesy of DisplaySearch Inc.

### Glass Substrate Shipments



Glass substrate shipments rose 65% Y/Y and 9% Q/Q to 4.4 million square meters