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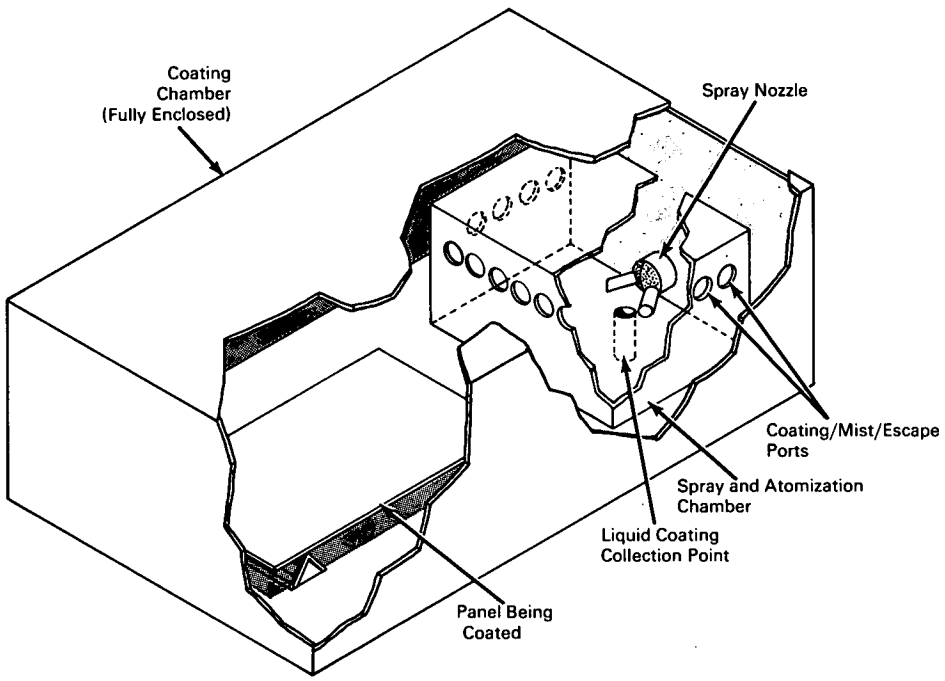
Fogging Technique Used to Coat Magnesium with Plastic



The problem:

A plastic coating was required to provide a smooth and protective surface to magnesium plates, which usually have many minute surface imperfections. The coating must also serve as a base for an aluminum film to be applied later by a vapor deposition process. Also needed were (1) a means of chemically cleaning the magnesium plates so that a plastic film with good wetting and bonding characteristics could be applied; and (2) a technique for applying an extremely thin film of epoxy which would be free of sag, or overlapping spray patterns. Small particles of dust, lint, or other foreign matter in or on the coating could not be tolerated because they would provide distortions and imperfections on the surface which would reduce the geometric accuracy of the surface.

The solution:

The development of: (1) A cleaning process which removes general organic and inorganic surface impurities, oils and greases, and oxides and carbonates which form on the magnesium surfaces; and (2) a fogging technique which produces a thin-filmlike coating in a "clean room" atmosphere.

(continued overleaf)

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How it's done:

The magnesium surfaces are prepared for plastic film application by the following seven-step process:

1. *Vapor degrease:* immerse in missile grade trichloroethylene for 8 minutes.
2. *Alkaline clean:* immerse in alkaline cleaner at 155–165°F.
3. *Hot water spray:* rinse at 165°F for 5 minutes.
4. *Cold water spray:* rinse at 60–75°F for 5 minutes.
5. *Acid clean:* immerse in a cold (60–70°F) solution of chromic acid–sodium nitrate (pH 0.5–1.5) for 6 to 8 minutes.
6. *Cold water spray:* rinse at 60–75°F for 8 to 10 minutes.
7. *Air dry:* one hour at 135–145°F.

This cleaning process removes contaminants and applies a thin chromium conversion coating which functions as a protective coating and acts as a good base for the plastic film application.

After the magnesium parts are cleaned, they are immediately placed in a closed container which has a spray gun mounted at one end. An epoxy is prepared with the necessary thinner and hardener and "fog sprayed" into the chamber. This fogging technique of applying the epoxy permits the mistlike droplets to float onto the components in an even and thin coat. The "fog" also tends to wrap around the part in an even distribution.

Notes:

1. The clean environment and the misted coating enable a thin mirrorlike finish to be achieved. The magnesium plates were approximately 6-inches wide and 12-inches long. This technique can be also used for applying other plastics where a thin, clean coating is required.
2. The following procedure was used to determine the adhesion of the epoxy to the magnesium surfaces. Test panels were immersed in liquid nitrogen and then in boiling water. After one cycle, some samples were bent so that the epoxy was in compression and some were bent so that the epoxy was in tension. These samples were again immersed in liquid nitrogen and then in boiling water, bent at a greater angle and recycled through the liquid nitrogen and hot water ten times until they were finally bent 105°. In each case, the epoxy was visually examined to determine if any cracking or flaking had occurred. There was no evidence of deterioration of the epoxy or the bond.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B67-10584

Patent status:

No patent action is contemplated by NASA.

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