RFQ VANE

Drawing 029-100LM2

I. BASIC CONCEPT

I.1 The material of the vane is mild steel plate (0,25%C, 0,1%P and 0,063%S), copper plated after machining.

I.2 Thickness of copper plating (50 ± 10)µm , (0.002 ± 0.0004) inches.

I.3 The vane is fixed inside the tank with 3 bolts (M6, 880mm and 60mm apart), one key and one pin.

I.4 The end tuning blocks are tightened via 4 x M6 bolts on the vertical surfaces of the rectangular cut-outs both for RF and thermal contact. Contact strips are used for the RF seal on the 50 x 20 mm surface.

I.5 The vanes are cooled by heat conduction through the copper strips which are brazed to the vane and the tank wall. Only the tank is water cooled.

I.6 The final alignement of vanes inside the tank is made after the brazing of the strips and during the RF tuning.

II. PRODUCTION TECHNOLOGY

The order of the vane production operations :

II.1 Ultrasonic inspection of the steel plate ;

II.2 Rough machining to within 5mm of final shape (drawing 029-100LM2) ;

II.3 Stress-relief by heat treatment ;

II.4 Second rough machining to within 0,5 mm of final shape.

II.5 Second stress-relief ;

II.6 Finish machining as on drawing 029-100LM2 ;

II.7 Dimensional inspection ;

II.8 Machining of RFQ profile by LANL ;

II.9 Inspection and repair of scratches, etc., hand-polish if needed (made in CERN) ;

II.10 Electron-beam welding of steel + copper strips to the vane sides ;

II.11 Electrochemical cleaning ;

II.12 Electrolytic copper plating of the vane.

No machining after operation II.8 is permitted. The repair of scratches or similar damages and possible polishing will be done by hand without power tools to avoid deformations.

III. DRAWING "VANE RFQ" 029-100LM2

The drawing represents the vane ready to be shipped to Los Alamos for "RFQ profile" machining.

III.1 The cross-section of the vane is based on RFQ geometry as shown in Fig. 1.

III.2 There is a series of M6 threaded holes machines in the base of the vane (top of the drawing). All of them may be used to clamp the vane to the milling machine. Only three of them, shown in Coupe AA and CC, will be needed to bolt the vane to the RFQ tank. These holes are "vented" to avoid degassing pockets in vacuum.

III.3 The two surfaces at each side (parallel and inclined to the plane of symmetry) are separated by a groove (detail on the far left) for ease of machining. The angle and position of the inclined surface is measured by a cylinder 24(h7)mm diameter as shown in section CC.

IV. SHIPPING OF THE VANES

The vanes are shipped to Los Alamos by air freight, each vane in its own wooden crate as shown in Fig. 2.

The philosophy here is that the vane is not bolted to the crate so that the threaded holes cannot be damaged. Also, there are no lifting adaptors provided. If handled by crane, the ropes should be wrapped around the "nose" at each end. In any case, the vane (60 kilograms) can be handled easily by two men.

The crates should be, in principle, used for shipping the vanes back to Geneva, merely a packing piece should be added to compensate for the diminished height of the vane.

V. MACHINING IN LANL

V.1 The reference faces for the RFQ profile machining are :

a) the front face (low energy end) nearest to the two bolt + dowel-pin set (coupe AA) and marked in the left upper corner (drawing 029-100LM2) "reference" ;

b) the face parallel to the axis of symmetry marked N6 and "reference" in the - Coupe AA - of the drawing.

c) the wall of the 3 x 1,25 mm groove which is nearest the vane tip. To avoid confusion during the machining of the vane body, there are two such grooves per vane, but only the groove at the left-hand side looking at the low energy end of the vane will be used for reference.

V.2 The vane is clamped to the milling machine table via 6 blocks (drawing 029-104LM4) which are bolted to the vane base. The three spring washers per bolt guarantee a bolting force of about 1800N after 0.1mm settling. The clamping arrangement is made for a horizontal machining force of about 200N.

The clamping to the machine table is schematically shown in Fig. 3. One starts by posing and clamping the vane at three points, and proceeds by shimming and clamping all other points so that the dial gage shows almost no deformation (<0,02 mm) of the vane both in vertical, measured at the tip, and horizontal sense measured at the reference face close to the tip.

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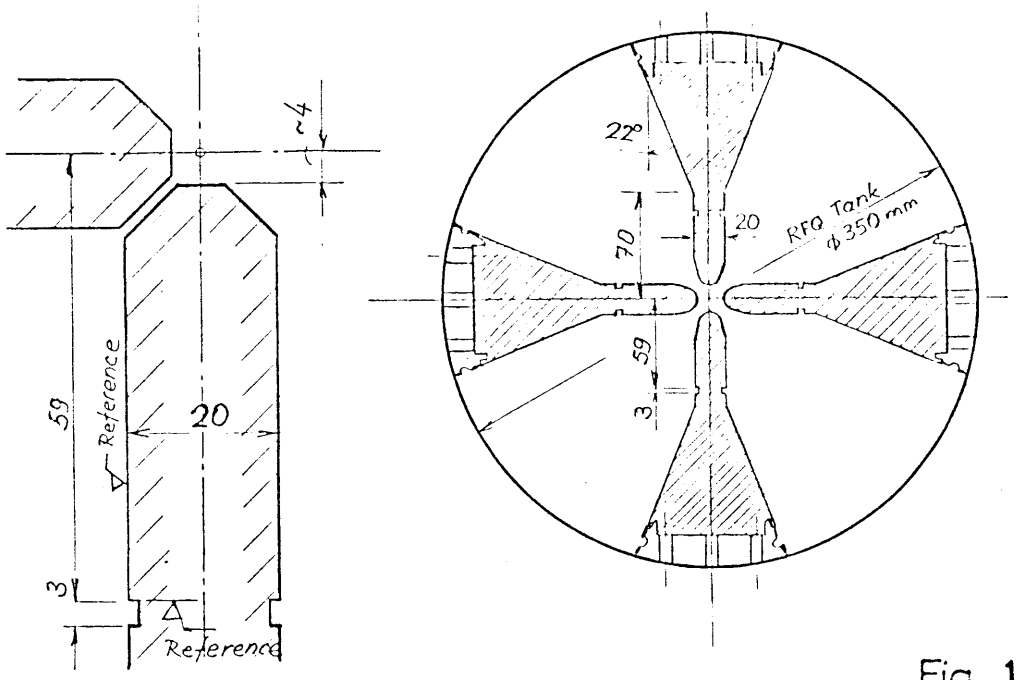

Fig. 1

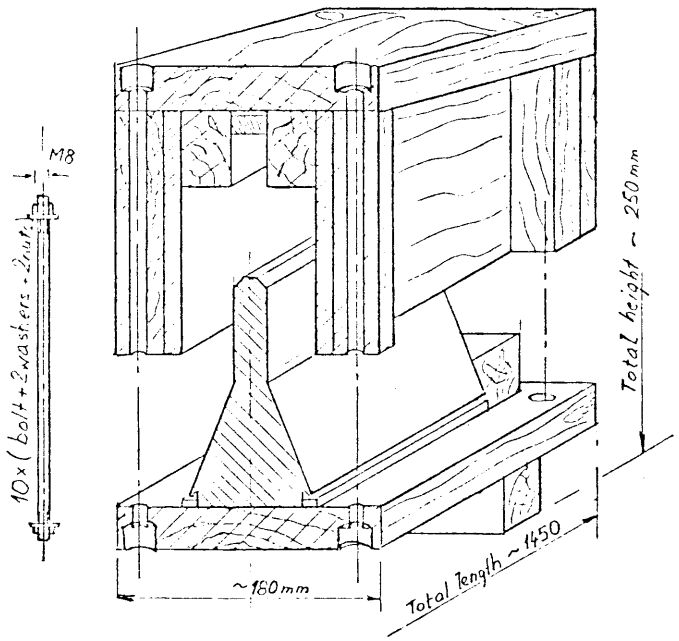

Fig. 2

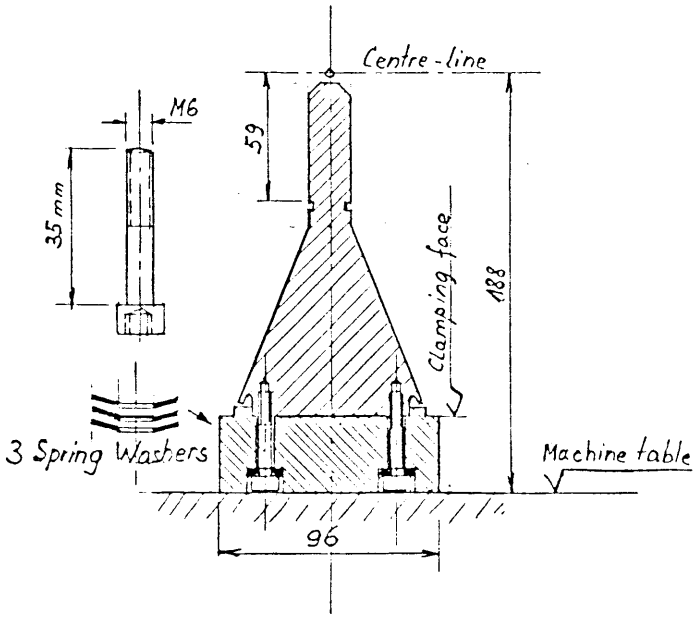

Fig. 3