Title

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ABSTRACT

A new tilting stage has been developed for the Hitachi 650 kV electron microscope. The design allows specimen tilting of $\pm 30^\circ$ in any direction and can be inserted with no modifications to the microscope.

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The design of the apparatus is based upon that of the tilting cold stage for the AEI EM 802.[1] It consists essentially of a translation stage A, a specimen cartridge B and of two moving cones for specimen tilting C and D. Its simplicity makes it reliable, accurate and easy to manufacture.

The cross section of the assembly is shown schematically in Fig. 1. The circled region in Fig. 1a is enlarged in b and c in order to show two angular positions of the specimen sphere. In the zero (0°) tilt position, the translation stage A and the tilting cone C are concentric. The tilting cone is retained against the stage by three adjustable vertical tension springs E. The tilting is controlled by the lateral movement of the tilting cone C on a teflon surface F. The lateral movement is converted in a smooth tilting of the specimen sphere G by the edge contact between the large tilting cone C and the smaller inverted specimen cone D. The circles in Fig. 1b and 1c show the tilting mechanism in the zero (0°) and the maximum 30° tilt position respectively.

The large tilting cone is laterally spring loaded against two spherical nylon pads terminating the leading screws H. The pads slide along two orthogonal flat surfaces on the cone piece, thus providing the two orthogonal movements of the cone. The leading screws are fixed to the usual connector rods inside the microscope and activated by a modified hand operated drive mechanism at the operator level.

The specimen is inserted in the non magnetic stainless steel sphere G (0.125 in. diam.) and retained by a wire circlip. Its position near the center of the tilting sphere allows tilting with easy tracking of the area of interest at magnification up to 50,000 X. The specimen sphere is in light pressure against the copper-beryllium bearing surface of the cartridge. The cartridge is inserted in the microscope using the usual entry mechanism of the microscope.

The tilting angle determined using diffraction patterns was found to be $\pm$ 30° tilt in any direction.

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1. P. R. Swann and G. R. Swann, Proceedings 28th annual E.M.S.A. Conf., Ed., C. J. Arceneaux, Claitor's Publ. Company, (Baton Rouge, La.) 1970.

FIGURE CAPTIONS

Fig. 1. a) Schematic cross section of the tilting stage.

b) Magnified portion of the tilting mechanism showing the sphere in the zero (0°) tilt position.

c) Magnified portion of the tilting mechanism showing the sphere in the maximum 30° tilt position.

Fig. 2. A view of the top of tilting stage showing the leading screws H and connector rods. The cartridge B is shown here with the sphere G in the maximum tilt position.

Fig. 3. A view of the under side of the stage showing the tilting cone C, the height adjustment ring J, and the leading screws H.

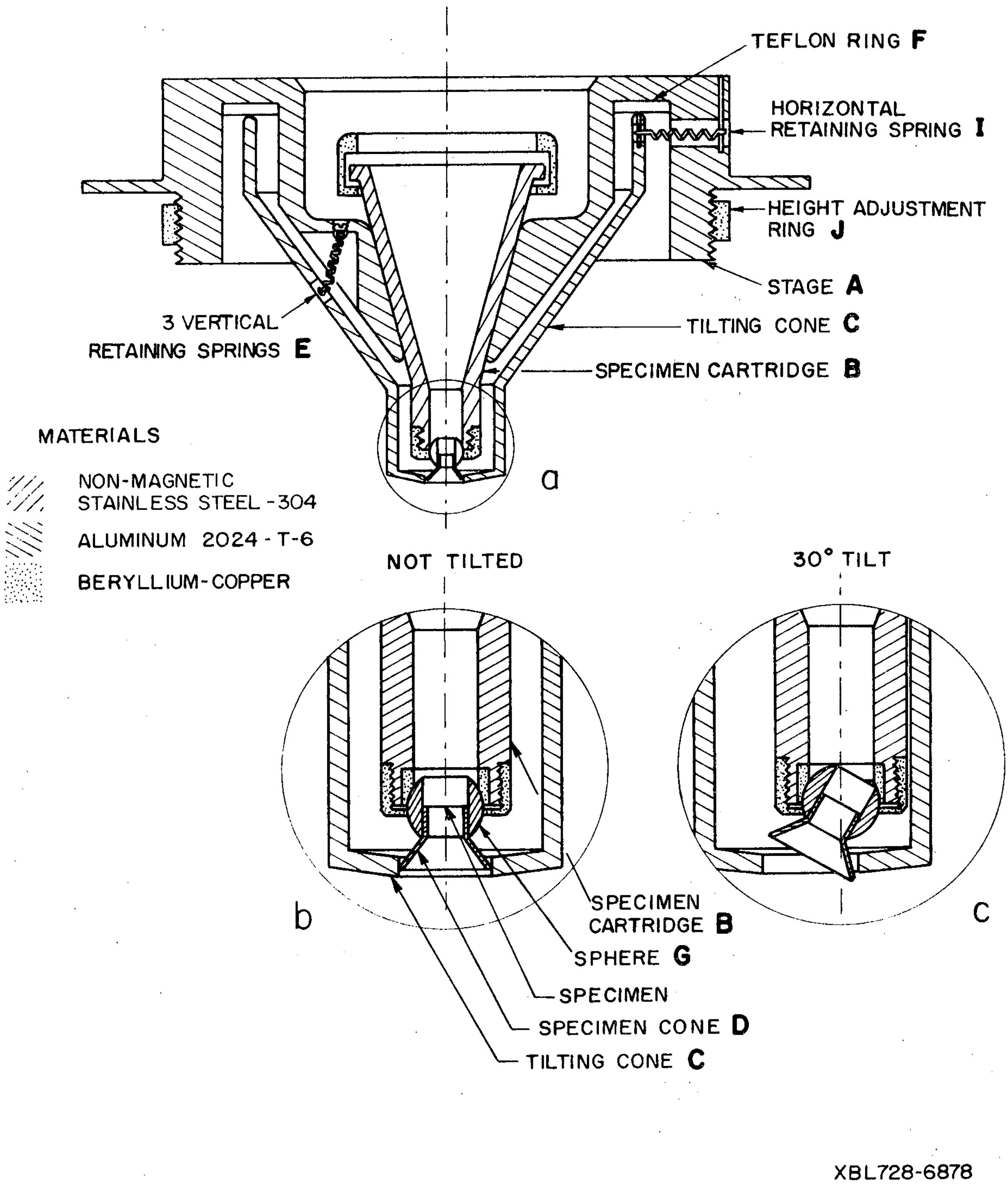
TEFLON RING F
HORIZONTAL RETAINING SPRING I
HEIGHT ADJUSTMENT RING J
STAGE A
TILTING CONE C
SPECIMEN CARTRIDGE B
3 VERTICAL RETAINING SPRINGS E
MATERIALS
NON-MAGNETIC STAINLESS STEEL -304
ALUMINUM 2024 - T-6
BERYLLIUM-COPPER
a
NOT TILTED
30° TILT
b
c
SPECIMEN CARTRIDGE B
SPHERE G
SPECIMEN
SPECIMEN CONE D
TILTING CONE C
XBL728-6878

Fig. 1

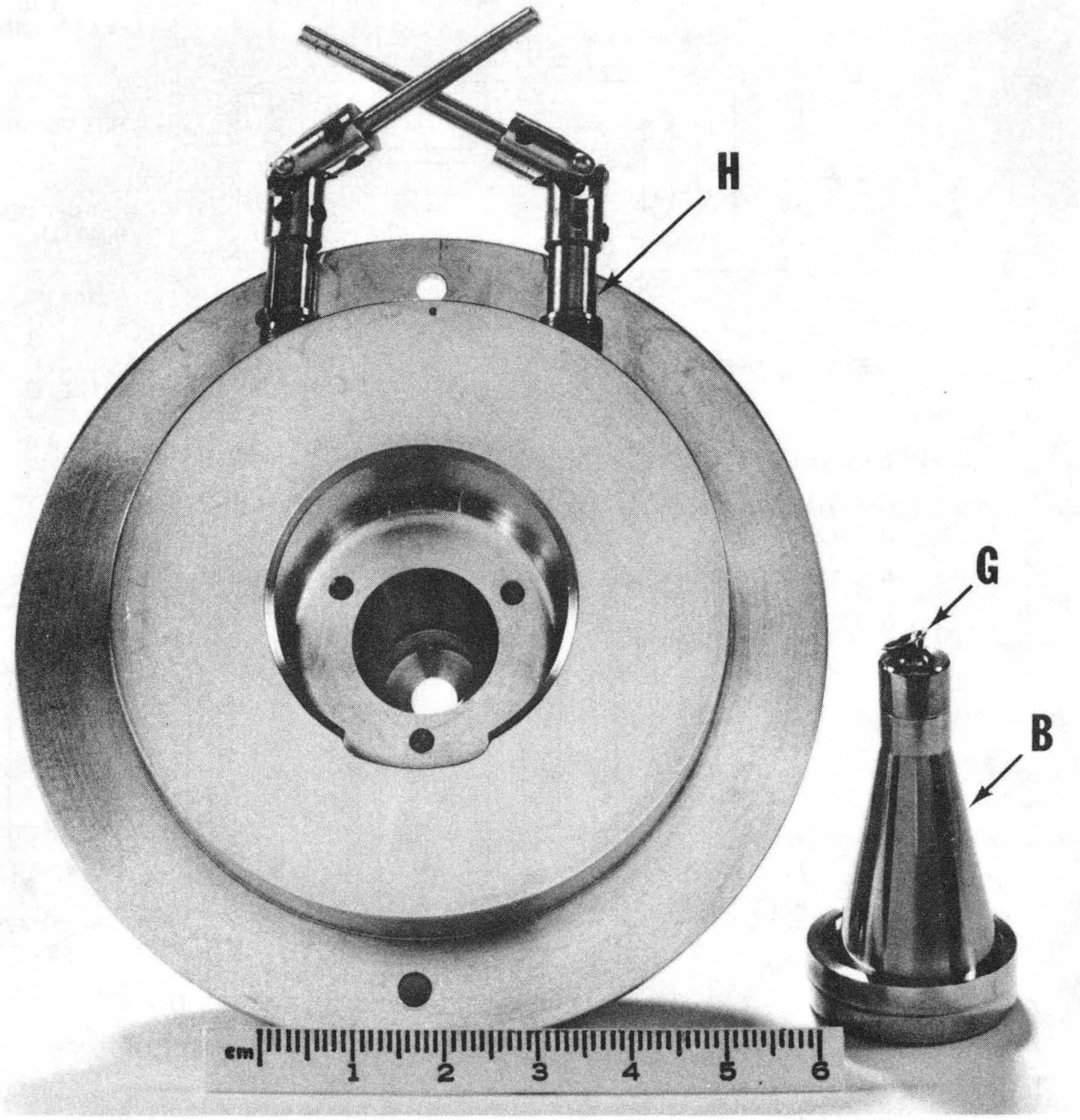

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Fig. 2

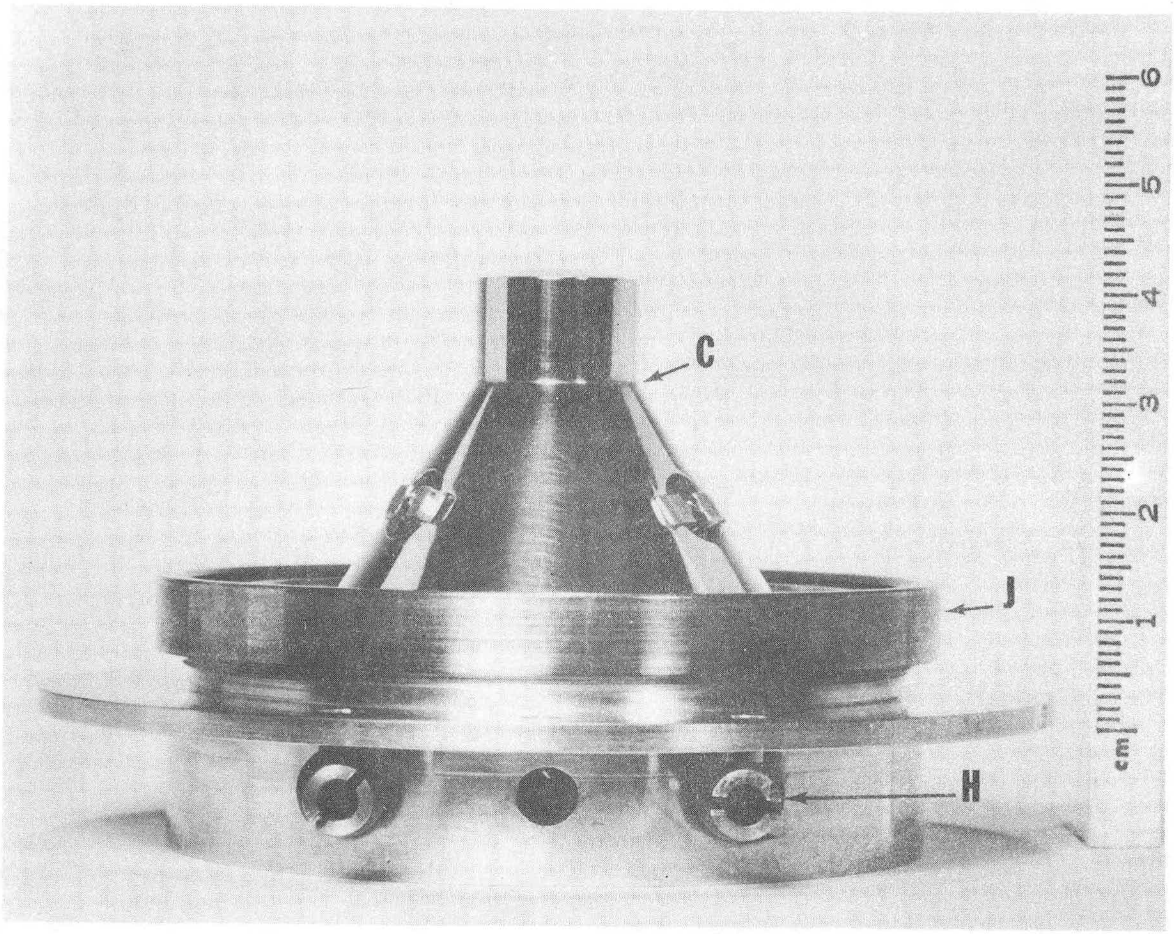

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Fig. 3

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