ICOM
COMMITTEE FOR CONSERVATION
Working Group n° 10
Conservation of Leathercraft and Related Objects

Interim Meeting

on the Treatment of and Research into Leather, in Particular of Ethnographic Objects

at the Central Research Laboratory for Objects of Art and Science
Amsterdam
5 - 8 April 1995

Postprints of the fourth Interim Meeting of the ICOM Committee for Conservation Working Group 10, Conservation of Leathercraft and Related Objects, 5-8 April 1995 in Amsterdam.

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The illustrations were provided by the authors.
Digital scans of photographs were made through the kind co-operation of Bas van Velzen, Amsterdam.

Tensioning Gilded and Painted Leather: a Research Project

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Leather is a material that responds to its surrounding environment, varying its dimensions in accordance with the variation of thermohygrometric parameters. Mounting leather artefacts - in particular Decorative furnishings such as wall hangings, altar frontals, paintings, etc. - on a fixed support structure, frame or rigid panel, generally turns into a hindrance, a constraint of the natural movements with evident results. Over a period of time, in fact, various changes can become evident such as deformation of the structure of the material, lesions of the grain layer, detachment or tearing where the skins have been joined.

Only rarely has conservation considered support structures that adjust automatically tensioning of the leather artefact (see the system created by A. Schulze for the Moritzburg Castle wall hangings*).

The study of controlled tensioning structures has been included among the ICR research subjects since the early 1950’s, with the planning and construction of stretchers to be used primarily for paintings on canvas and that could maintain by themselves the flatness of the painting over a period of time. These stretchers were based on two different systems. In both systems, the tensioning is controlled by helical springs which ought to compensate automatically for the changes caused in the dimensions of the paintings by variations of thermohygrometric parameters and by the constant weight factor of the painting itself. In the first kind of supporting frame - originally used in the fifties for two paintings by Caravaggio kept in Malta (St. Jerome and The Beheading of St. John the Baptist) - the helical springs are coupled, by turnbuckles, to the canvas lining on one side and to the fixed frame to the other (Fig. 1).

The system requires folding the canvas lining, longer and wider than the original painting, over the edges of the frame, edges that are rounded in order to lessen, almost eliminating, the slide-friction between canvas and frame (Fig. 2). The canvas can thus slide over the edges of the fixed frame, expending and contracting in both directions, width and length. The second type of frame was designed and first used in the sixties for the three paintings by Caravaggio in the Church of San Luigi dei Francesi in Rome. In this case, the springs are located inside a metallic stretcher, built to expand and to contract according to the variations of the dimensions of the painting. The canvas is fixed to the stretcher by a serrated flange instead of being nailed down; this facilitates attaching or removing the painting from the stretcher as needed (Fig. 3).

Since it was apparent that both systems had achieved in maintaining the flatness of the paintings over a considerable length of time and without subjecting them to over-tensioning, the Leather Department of the ICR decided to study an adaptation useful for gilded and painted leather.

Cooperation was obtained from the Department of Mechanical and Aeronautical Engineering of the University of Rome in order to study and experiment the little-known mechanical behaviour of antique decorated leather and to define the tensioning values of this material. Using samples of old decorated leather, two different kinds of tests will be run from this viewpoint:

- long term iso-stress creep tests under controlled thermohygrometric conditions, within a reasonably extensive interval of values; the samples will bear a constant weight and the variations of their length over a given time will be measured by a differential transformer;
- tensile tests on samples with defects whose shapes and dimensions are known. These tests are meant to describe the concentration of forces borne by the leather artefact in a given average applied stress situation by correlating the defects of the samples and those of the altar-frontal that is going to act as a model in the final stage of the project (as described below).

*From a conversation with A. Schulze in 1994.
The purpose of the tests is first to evaluate the forces leather could bear without risk of structural damage and, consequently, to determine the mechanical characteristics of the springs to be used in the tensioning system.

The collaboration with the Department of Engineering includes as well the characterization of the type of adhesion established between leather and fabrics employed as connecting bands, by adhesives specifically identified for leather and indicated in the relevant literature. In particular, the tests to be carried out will describe traction breakage, peeling and creep using old decorated leather glued to various selected fabrics.

The final stage of the project is the construction of an experimental supporting structure to be used for an 18th-century Altar frontal from the Convent of San Francesco in Assisi. This artefact will prove interesting to test the tensioning system because of its size (92 x 310 cm), its composition (6 skins glued together overlapping along the margins) and for the kind of damages it shows. It was previously mounted on a fixed frame, nailed along the edges. This had caused a series of deformations (like ripples) generally parallel to the shorter sides, considerable lesions of the grain layer and partial detachment of the glued edges of the skins.

At this time, it would seem that the system to be chosen is the first described, that is the fixed frame on which the artefact is mounted, free to slide as its dimensions vary. Moreover this structure is found preferable because of:
- its relatively simpler construction;
- the fact that the tensioning elements (springs and turnbuckles) are located externally, facilitating the calibration, the setting up and the maintenance of the stretching system, particularly considering that it is still an experimental structure subject to constant checking.

Fig. 1. Automatic tensioning system of the painting by Caravaggio of St. Jerome (Malta)
Once the initial tensioning conditions are defined, the leather-stretcher system will be subject to continuous monitoring in order to check the distribution of tensions on the artefact over a period of time and thus to evaluate the efficiency of the system itself.

Fig. 2. Cross-section of the lower part of the fixed frame showing the tensioning system of the canvas.
Fig. 3. Section of the stretcher, used for Caravaggio’s paintings in the Church of San Luigi dei Francesi (Roma), showing the second type of automatic tensioning system.