from the microscopic porosity of the wax to the outside of the layer in large accumulation sites. At the onset of shortening, many microscopic dilatant veins filled with the liquid open in the horizontal foliation. These veins are long (40–50 mm) and thin (<1 mm). This development is favoured by the mechanical anisotropy of wax.

During the development of the fold, the veins acquire a sigmoidal shape which results from their rotation and shearing in the limbs. This process involves deformation of the solid wax around and between nearby veins. The liquid segregates from these deforming areas into the opening veins because the liquid flows down the pressure gradients. The veins are concentrated in the concave side of the fold and in the limbs. The enlargement of the veins implies an increasing heterogeneity. When the shortening is higher than 25 %, the fold becomes asymmetric. One of the limbs thus defines a reverse shear zone in which the veins are deformed. According to their position and orientation with respect to the shear planes, their aperture increases or decreases. The closing veins expel the melt toward the sides of the model, perpendicularly to the shortening direction. These veins are therefore obliterated. Next, a shear band may develop when the vein density is locally around 15 %. Finally, our experiments show that during the main part of the shortening, an important horizontal melt migration occurs through interconnected veins toward the lowest pressure vertical sides of the model. The flow of melt is guided by the mechanical anisotropy. On the other hand, upward melt migration occurs through the shear band only after 30 % of shortening. Melt segregation and migration are highly strain-dependent mechanisms since the stress field within the folded layer is heterogeneous and changes during the progressive deformation.

A series of friction new bearings for seismic insulation

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The study describes in detail the composition and operating principle of six movable bearings for seismic insulation and also emphasises the most important characteristics of the respective systems; for example, the economical competitiveness with all other existing conventional or base insulation systems, the considerable decrease in the absorbed seismic energy and in the psycho-physical discomfort of the inhabitants of the building during an earthquake and the ease of maintenance.

The main principles of seismic insulation systems when using the proposed movable bearings are:

1. interruption of the solidarity between the building and the foundation-soil complex;
2. laying of movable bearings with sliding or rolling friction.

As regards their composition and the operating principle, the bearings may be classified as follows:

- mechanical
- natural
- mixed.

The centring and locking of the building after an earthquake, when using the first type of bearings, are not automatic because they occur by means of the activation of special electronically powered devices. The natural bearings are suitable for carrying out the self-centring of the building and, finally, the mixed ones are suitable for both centring the building automatically and also for mechanically safeguarding it against the danger of resonance.

Self-centring aseismic system with double natural frequency

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The proposed system is based on the following operations:

1. interruption of the solidarity between the building and the foundation-soil complex;
2. laying of multidirectional movable elastic bearings with sliding or rolling friction.

This application confers the building with the main properties of centring after an earthquake and of doubling the natural frequency of vibration during an earthquake.

The centring is automatic and it takes place because of the presence of a sliding spherical bowl in each bearing.

In the presence of an earthquake, this bowl also permits the immobility of the building with respect to the horizontal translation of the foundation-soil complex, because its thickness variation is perfectly balanced by the corresponding elastic deformation of the main springs at every instant and for any value of the horizontal displacement.

The horizontal inertial force in the building does not modify its static equilibrium, because it is minor when using bearings with sliding friction and negligible when using bearings with rolling friction.

The variation of the natural frequency of the building takes place during the vertical motion of the soil only during an emergency, characterised by an interval seismic frequencies including the resonance one. In fact, the presence in each bearing of a system of auxiliary springs, automatically started in this situation, permits the action of the main springs to be strengthened with a consequent increase in the natural frequency of the building and a drastic decrease in the vertical displacements of the building to values compatible with its safety characteristics.

Aseismic system with magnetic insulators

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The system proposed is based on the following operations:

1. interruption of the solidarity between the building and the foundation-soil complex;
2. use of magnetic insulators.

Each bearing consists of two fast electromagnets at direct current, reciprocally faced with the same polarity. One of them is connected with the building, the other with the foundation. At the beginning of an earthquake the start of the electromagnets occurs by means of a devices system constituted of:

- an accelerometer or a seismograph;
- a current generator;
- an electronic control station.

During an earthquake the magnetic flux between the two electromagnets is able to lift the building, separating it from the foundation-soil complex. The thin air stratum formed between the electromagnets makes it possible the rigid translation of the foundation-soil complex with respect to the building, which remains motionless. Appropriate devices, laterally placed, prevent that the variation of the magnetic flux, due to the soil motion, induces the translation and the rotation of the building. At the end of the earthquake, the magnetic flux stops and the building, by means of hydraulic dampers, vertically placed, gradually returns to the initial position of rest, after that an eventual small horizontal displacement of it has been annulled by a device with the function of the building centring.

The undoubted advantage of the proposed complex system, compared to all aseismic systems, is the total reduction of the seismic energy in the building.

Foredeep basins: An introduction to models and real world situation

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In foredeep basins, the accommodation space is created by vertical forces, usually a combination of the load of orogenic wedges and of "hidden loads" applied to the plate margin. Consequently, the system foredeep is subdivided in three domains where different phenomena take place. In the foreland bulge the basin substratum is elevated and might experience erosion. In the basin domain, the substratum subsides thereby allowing for the accumulation of the basin fill. The load is the site where the shortening and thickening takes place.

During shortening and subduction, lithospheric regions move through these domains and single segments successively undergo uplift with possible erosion, subsidence and eventually