The Fennoscandian Shield has a complex structure consisting of blocks and inclined belts that were juxtaposed in arc accretion, thrusting and following extension. We image the structure in its central parts using 3D seismic tomography method. The crustal travel time data set include 19,180 P- and 15,146 S-wave arrivals from refraction and reflection surveys, from a passive seismic experiment, and from chemical explosions registered at permanent seismic stations. Inversion of the data resulted in smooth P- and S-wave velocity models imaging the crust to the depth of 40 km with 50-km lateral resolution. The velocities and Vp/Vs distribution vary throughout the crust depicting a complex mosaic of alternating minima and maxima. In the upper crust the boundary between the Archean and the Paleoproterozoic terranes is distinguished as a velocity zone minimum. Other schist belts are also associated with velocity minima. Velocity maxima below granitoid complexes suggest hidden mafic source rocks in the lower crust. A study of vertical velocity gradients reveals blocks with alternating minima and maxima. Both P- and S-waves display laterally continuous areas of maximum gradient. We interpret the maximum gradients to illuminate crustal layer boundaries with pronounced velocity contrasts. The 3D surfaces of these maximum gradient values are visualized as block diagrams. In summary, the tomographic velocity images corroborate the idea of Paleoproterozoic terrane accretion modified by extensional spreading processes.