MAGNETIC TUNNEL JUNCTION DEVICE WITH IMPROVED FIXED AND FREE FERROMAGNETIC LAYERS

ABSTRACT

An improved magnetic tunnel junction (MTJ) device (100) for use in a magnetic recording read head or in a magnetic memory storage cell is comprised of two ferromagnetic layers (118, 132), a "hard" or "fixed" ferromagnetic layer (118) and a sensing or "free" ferromagnetic layer (132), which are separated by a thin insulating tunneling layer. Each of the ferromagnetic layers (118, 132) is a multilayer formed from two thinner ferromagnetic films (118, 132) coupled antiferromagnetically to one another across a thin antiferromagnetically coupling film (116). The antiferromagnetically coupling film (116) is chosen, with regard to material composition and thickness, so that it causes the two ferromagnetic films (118, 132) which sandwich it to have their magnetic moments arranged antiparallel to one other in the absence of external magnetic fields. The magnetic moments of the fixed ferromagnetic multilayer (118) and free ferromagnetic layer (132) can be chosen to be arbitrarily small by making the two ferromagnetic films (118, 132) comprising them to have substantially the same magnetic moment.

Fig. 4A