Electroencephalogram (EEG) is a common tool in sleep medicine, but it is often compromised by non-neural artifacts. Excluding visually identified artifacts is time-consuming and removes relevant EEG information. Blind source separation (BSS) techniques, on the other hand, are capable of separating "brain" from "artifact source components". Existing algorithms for automated component labeling require either a priori morphological information or adaptation to individual recordings. We present a method for the automated identification of artifact components based on their autocorrelation and spectral properties. It requires no tuning for individual recordings. The method was tested on 100 one-minute EEG segments during rapid eye movement sleep. EEG source components were estimated by second order blind source identification and, as reference, manually labeled as "brain" or "artifact component". The algorithm identified electrocardiogram components by autocorrelation peaks between 0.5–1.5 seconds and -oculogram components by linear discriminant analysis of spectral band-power. Using 5-fold cross-validation, we observed 97% accuracy (95% sensitivity, 98% specificity), as well as minimized correlation of artifacts and the EEG. The approach has demonstrated its potential as promising tool for a broad range of sleep medical applications.