Claims

What is claimed is:

1. An air purifier, comprising a purifier main body and a filter cartridge detachably mounted thereto; wherein the purifier main body is provided with a master control and identifying chip; an information chip is fixed to the filter cartridge and records usage days and/residual life of the filter cartridge; the information chip and the master control and identifying chip intercommunicate with each other via wireless communication or wired communication, and a data communication interval between the information chip and the master control and identifying chip is 2-300 seconds per transmission; the air purifier is further provided with a life prompt module and a timing apparatus intercommunicating with the master control and identifying chip; the master control and identifying chip controls the life prompt module to respond and sets a terminating index prompt threshold for a factory-set life of the filter cartridge, the terminating index prompt threshold being prior to an actual life terminating index threshold of the filter cartridge; when the filter cartridge reaches the terminating index prompt threshold, the filter cartridge is eligible for scrap disposition; when the filter cartridge reaches the actual life terminating index threshold, the filter cartridge enters a fully scrapped state and cannot be used; the life prompt module operates as follows:

S1: when the life of the filter cartridge reaches the terminating index prompt threshold for the factory-set life, the life prompt module enters a first response status, and the master control and identifying chip records the filter cartridge life in a countdown manner;

S2: after continuously operation for a fixed duration T_c, the purifier enters a performance protection status and the life prompt module enters a second response status, wherein in the performance protection status, an operating speed of a purifier unit is less than 600 r/m;

S3: after continuous operation for a fixed duration T_d following the end of duration T_c, the filter cartridge enters a scrapped status, and the life prompt module enters a third response status.

2. The air purifier according to claim 1, wherein the life prompt module comprises one or more of an indicator light, a loudspeaker alarm, an external display screen of the purifier, and an app mini program.

3. The air purifier according to claim 1, wherein the information chip further stores a genuine product identification number for verifying whether the filter cartridge is genuine; if the master control and identifying chip cannot read or verify the genuine product identification number from the information chip, the purifier refuses to operate.

4. A method for calculating remaining life of a used filter cartridge of an air purifier, applicable to the air purifier according to any one of claims 1 to 3, comprising the following steps:

S4: setting a reference value a_r of particulate matter concentration passing through the purifier per unit time, defining a maximum adsorbable particulate matter quantity Q to determine a usable duration of the filter cartridge under concentration a_r; setting this duration as a standard total duration T; calculation a residual usable duration of the filter cartridge as $T_v=T-T_r$, where T_r is the duration already consumed by the filter cartridge at the reference concentration a_r; defining T_r as a reference duration and T_v as the residual usable duration;

S5: defining multiple particulate concentration ranges a_1, $a_2..a_n$ establishing a relationship between filter cartridge service life and concentration, such that for a concentration a_i, the service life calculated by $T_1=W_i*T_r$, wherein T_1 is consumed duration at concentration a_i, W_i is a weight coefficient corresponding to concentration a_i relative to the reference concentration a_r, and the coefficients W_1, W_2, $W_3..W_n$ correspond one-to-one to the ranges a_1, $a_2…a_n$;

S6: acquiring a particulate matter concentration C_{sn} at an air inlet before purification in the current operating environment; determining which concentration range a_i C_{sn} falls into; and calculating the standard total duration consumed in the current environment per unit time using the corresponding weight coefficient W_i.

5. The method for calculating the life of a filter cartridge of an air purifier according to claim 4, wherein a PM2.5 sensor is arranged at the air inlet of the purifier, and is connected to the master control and identifying chip via wireless communication.

6. The method for calculating the life of a filter cartridge of an air purifier according to claim 5, wherein the remaining life recorded in the information chip is the sum of the residual usable duration T_v of the filter cartridge, or the total remaining standard duration of the filter cartridge.

7. The method for calculating the life of a filter cartridge of an air purifier according to claim 5, when the remaining life of the filter cartridge has not reached the terminating index prompt threshold for the factory-set life, the master control and identifying chip performs one or more of identification, or data transmission for the filter cartridge life through steps S4-S6.

8. The method for calculating the life of a filter cartridge of an air purifier according to claim 7, wherein the terminating index prompt threshold for the factory-set life, the continuous operating duration T_c, and the continuous operating duration T_d are defined by double criteria: actual usage days and consumed standard total duration; the usage days are counted from the date the filter cartridge is installed; both criteria have set prompt values at three time nodes: the terminating index prompt threshold, the end of duration T_c, and the end of duration T_d; the purifier switches operating status at each node when either criterion is satisfied.

9. An anti-counterfeiting method for a filter cartridge of an air purifier, applicable to the air purifier according to claim 3, comprising one of the following methods:

Method I:

SA01: writing a unique dedicated ID into the information chip during factory production, such that each information chip has a fixed dedicated ID;

SA02: when the filter cartridge is installed, the master control and identifying chip reads and verifies the dedicated ID from the information chip; if the ID matches the authorized record, the purifier operates normally; if the ID does not match, the purifier refuses to operate.

Method II:

SB01: writing a unique dedicated ID into the information chip during factory production;

SB02: when a new filter cartridge is first installed, the master control and identifying chip verifies the dedicated ID; if the ID is valid and no encrypted verification value exists, the

system generates a special encrypted verification value, which is written separately to the non-volatile storage of the information chip and the master control and identifying chip, the purifier then operates and reads data from the information chip;

when the filter cartridge is used subsequently, the master control and identifying chip verifies both the dedicated ID and the encrypted verification value; if both are valid and consistent, the purifier operates normally; if either is invalid and inconsistent, the purifier refuses to operate.

Method III:

SC01: writing a unique dedicated ID into the information chip during factory production;

SC02: when a new filter cartridge is first installed, the master control and identifying chip verifies the dedicated ID; if the ID is valid and no encrypted verification value exists, the system generates a special encrypted verification value, which is written separately to the non-volatile storage of the information chip and the master control and identifying chip; the purifier then operates and reads data from the information chip;

when the filter cartridge is used subsequently, the master control and identifying chip verifies both the dedicated ID and the encrypted verification value; if both are valid and consistent, the purifier operates normally; if both is invalid and inconsistent, the purifier refuses to operate.