CLAIMS

1. A data storage device, comprising:

a data storage medium having a plurality of data blocks;

a cache having a plurality of cache blocks, wherein each cache block is identified by a cache block address; and

a cache control memory comprising a plurality of memory elements for the data blocks, respectively,

wherein each of the memory elements is configured to store the cache block address of one of the cache blocks in which data of a corresponding one of the data blocks is written and not store a data block address of the corresponding one of the data blocks.

2. The data storage device of claim 1, wherein each of the memory elements is further configured to store a status of the one of the cache blocks in which data of the corresponding one of the data blocks is written.

3. The data storage device of claim 2, wherein each of the memory elements is further configured to store the cache block address and a status of the one of the cache blocks in the cache.

4. The data storage device of claim 1, wherein the cache control memory comprises a further memory element for the cache configured to store statuses of the plurality of cache blocks.

5. The data storage device of claim 4, wherein the further memory element is configured to store the status of the plurality of cache blocks in a memory cell or in the cache.

6. The data storage device of claim 2, wherein the status is selected from a group consisting of dirty, free and clean.

7. The data storage device of claim 1, wherein the cache control memory is configured to write data of each one of the data blocks in a corresponding one of the cache blocks.

8. The data storage device of claim 7, wherein the cache control memory is configured to determine if any one of the cache blocks is allocated for one of the data blocks before writing the data of the one of the data blocks.

9. The data storage device of claim 8, wherein the cache control memory is configured to write the data of the one of the data blocks in an allocated one of the cache blocks and update the status of the allocated one of the cache blocks if it is determined that the allocated one of the cache block is allocated for the data block.

10. The data storage device of claim 8, wherein if it is determined that none of the cache blocks are allocated for the one of the data blocks, the cache control memory is configured to search for a free cache block, allocate the free cache block to the one of the data blocks, and determine if the allocation of the free cache block to the one of the data blocks is successful.

11. The data storage device of claim 10, wherein the cache control memory is configured to write the data of the one of the data blocks in the allocated cache block and to update the status of the allocated cache block if it is determined that the allocation of the free cache block to the one of the data blocks is successful.

12. The data storage device of claim 10, wherein if it is determined that the allocation of the free cache block to the one of the data blocks is unsuccessful, the cache control memory is configured to remove some data in the cache, search for a free cache block, allocate the free cache block to the one of the data blocks, and determine if the allocation of the free cache block to the one of the data blocks is successful.

13. The data storage device of claim 12, wherein the cache control memory is configured to remove data of each cache block and update the status of each cache block after the data is removed.

14. The data storage device of claim 8, wherein the cache control memory is configured to write the data of the one of the data blocks in the data storage medium if it is determined that none of the cache blocks are allocated for the one of the data blocks.

15. The data storage device of claim 1, wherein the cache control memory is configured to read data of each data block.

16. The data storage device of claim 15, wherein the cache control memory is configured to determine if the data of one of the data blocks is written in a cache block of the cache.

17. The data storage device of claim 16, wherein the cache control memory is configured to determine the cache block address of the cache block in which the data of the one of the data blocks is written and read the data from the one of the cache blocks if it is determined that the data of the one of the data blocks is stored in the one of the cache blocks of the cache.

18. The data storage device of claim 16, wherein the cache control memory is configured to read the data of the one of the data blocks from the data storage medium if it is determined that the data of the one of the data blocks is not stored in the cache block of the cache.

19. A method of managing a cache in a data storage device, the data storage device comprising a data storage medium having a plurality of data blocks, the cache having a plurality of cache blocks and each cache block being identified by a cache block address, the method comprising:

in respective memory elements for the data blocks, storing the cache block address of one of the cache blocks in which data of the respective data blocks is written and not storing data block addresses of the respective data blocks.

20. The method of claim 19, further comprising, storing in the respective memory elements for the data blocks, a status of the one of the cache blocks in which data of the respective data blocks is written.

CLAIMS

1. A data storage device, comprising:

a data storage medium having a plurality of data blocks;

a cache having a plurality of cache blocks, wherein each cache block is identified by a cache block address; and

a cache control memory comprising a metadata table, the metadata table having a plurality of table entries for the data blocks, respectively,

wherein each of the table entries is configured to store the cache block address of one of the cache blocks in which data of a corresponding one of the data blocks is written and not store a data block address of the corresponding one of the data blocks.

2. The data storage device of claim 1, wherein each of the table entries is further configured to store a status of one of the cache blocks in which data of corresponding one of the data blocks is written.

3. The data storage device of claim 2, wherein each of the table entries is further configured to store the cache block address and a status of the one of cache blocks in the cache.

4. The data storage device of claim 2, wherein the status is selected from a group consisting of dirty, free and clean.

5. The data storage device of claim 1, wherein the cache control memory comprises a memory element for the cache configured to store statuses of the plurality of cache blocks.

6. The data storage device of claim 5, wherein the memory element is configured to store the status of the plurality of cache blocks in a memory cell or in the cache.

7. The data storage device of claim 1, wherein the cache control memory is configured to write data of each one of the data blocks in a corresponding one of the cache blocks.

8. The data storage device of claim 7, wherein the cache control memory is configured to determine if any one of the cache blocks is allocated for one of the data blocks before writing the data of the one of the data blocks.

9. The data storage device of claim 8, wherein the cache control memory is configured to write the data of the one of the data blocks in an allocated one of the cache blocks and update the status of the allocated one of the cache blocks if it is determined that the allocated one of the cache block is allocated for the one of the data blocks.

10. The data storage device of claim 8, wherein if it is determined that none of the cache blocks are allocated for the one of the data blocks, the cache control memory is configured to search for a free cache block, allocate the free cache block to the one of the data blocks, and determine if the allocation of the free cache block to the one of the data blocks is successful.

11. The data storage device of claim 10, wherein the cache control memory is configured to write the data of the one of the data blocks in the allocated free cache block and to update the status of the allocated free cache block if it is determined that the allocation of the free cache block to the one of the data blocks is successful.

12. The data storage device of claim 10, wherein if it is determined that the allocation of the free cache block to the one of the data blocks is unsuccessful, the cache control memory is configured to remove some data in the cache, search for another free cache block, allocate the other free cache block to the one of the data blocks, and determine if the allocation of the other free cache block to the one of the data blocks is successful.

13. The data storage device of claim 12, wherein the cache control memory is configured to remove data of each cache block and update the status of each cache block after the data is removed.

14. The data storage device of claim 8, wherein the cache control memory is configured to write the data of the one of the data blocks in the data storage medium if it is determined that none of the cache blocks are allocated for the one of the data blocks.

15. The data storage device of claim 1, wherein the cache control memory is configured to read data of each data block.

16. The data storage device of claim 15, wherein the cache control memory is configured to determine if data of one of the data blocks is written in a cache block of the cache.

17. The data storage device of claim 16, wherein the cache control memory is configured to determine the cache block address of the one of the cache blocks in which the data of the one of the data blocks is written and read the data from the one of the cache blocks if it is determined that the data of the one of the data blocks is stored in the one of the cache blocks of the cache.

18. The data storage device of claim 16, wherein the cache control memory is configured to read the data of the one of the data blocks from the data storage medium if it is determined that the data of the one of the data blocks is not stored in the cache block of the cache.

19. A method of managing a cache in a data storage device, the data storage device comprising a data storage medium having a plurality of data blocks, the cache having a plurality of cache blocks and each cache block being identified by a cache block address, the method comprising:

in respective table entries for the data blocks, storing the cache block address of one of the cache blocks in which data of the respective data blocks is written and not storing data block addresses of the respective data blocks.

20. The method of claim 19, further comprising, storing in the respective table entries for the data blocks, a status of the one of the cache blocks in which data of the respective data blocks is written.