



1a

, , DLC ,

1a 1c , 1a  
가

2 (a) (e)

3 (a) (d)

4 가

5 (a), (b) 1

6 (a) (c) 2 , 3 , 4

7

8

9 (a), (b) , 「  
」

10

11

12

<

10A, 100A :

11, 111 :

12, 112 :

13, 113 :

14, 114A :

18, 118 :

20A, 100B :

30 : DLC

114B :

153A :

155 :

200 :

215 :

216 :

(Hard Disk Drive)

100 Gbps [가 / ( )<sup>2</sup>]가 가 ( ) 가 40

(Ku) (V) 가 (V) Ku 가

Ku 가

Ku 가

12 (100B)가 (200) (100) A) (216) (100A) (111), (112), (113), (200) (114A)

, (100B) (111), (112), (113), (200)  
 (216) , (114B)

B) (100A) (113) (S) (S) (100)  
 (113)

, (200) (118) DLC(Diamond Like Carbon) (117)

(100A) (114A) (112) (215)  
 , (111) (200) (218) (200)

, 12 (100B) (114B)

(100A) (111) (112) (112) (111) (111)  
 가 (200) (112) 가 (200) 가  
 가 , (111) , 가  
 ) ( ) (112) (200) ( ) L  
 가

(113) 가

, (111) 가  
 , (111) 가 , (112) (111)  
 가 가 (200) , (114A) (113) (215)  
 (111)

4A) (111) (200) (112), (113), (11)  
 (100B) 가 가

, 12 (100A, 100B)

, (100A)

, (S) (113), (114A), (111), (112)  
 , , DLC (117) (100A)가 가 (118)



가

0.01  $\mu\text{m}$

GMR/TMR

DLC

가

DLC

가

DLC

가

FIB(Focused Ion Beam Etching) EB(Electron Beam)

가

DLC

1/10000

FIB(Focused Ion Beam Etching) EB(Electron Beam)

가

1a

(10A)

(20A)가 (200)

(218)

(216)

(215)

(200)

(218) PtMn,

(216) NiFe,

CoCrPt

(11), (10A) (30) (11 14) (216),  
 (12), (13) (200) (14)  
 (32)

(30) (200) (18) (18) ,  
 (30) , (18) DLC(Diamond Like Carbon)  
 (11 14) (200)  
 (11 14) DLC (30) [ (30H)가  
 (18) ] , DLC (30) (30H)가 ,  
 (11) (10T) (30H) , (30)  
 (10T) (12) (30H) (10T) , (30)  
 (10T) DLC (30) ( 0.1 μm )  
 (12) (10T) (30)

(12), (13) (14) DLC(Diamond Like Carbon)  
 (30) , (200) DLC (30)

(10A) 가 (200)  
 (12) , (13) DLC (30)  
 (14) 0.01 μm 가  
 (12), (13), (14) 가 , 가

(12) (13) (E) (E) 가  
 가

1b 1a  
 (10T) (A) (W1) (W2)

(155) (10) (158) 1c ( (200) (A) (15  
 가 (T) , , (200) , (2  
 8) (10) , (200) . 1c , (1  
 (T10) , 1c , (2  
 00) (10T) , 가 (1  
 0T) , (Br) ( ) )

(10T) , (10T) ( ) 가 , 가  
 (10T) 1c Te (10T) (Tw)  
 (10T) (Tw)  
 가 , (T10) (W1) (W1) (W2) 1/10  
 , (20A) , (21), (22),  
 (23), (24) (216) GMR(Giant Magneto Resistive) TMR(Tunneling Magneto Resistive)  
 (23) (23) (5)  
 0, 50)가 ,  
 (30H) (20) (21) (20T) DLC (30) ( )  
 22) (30H) (30) (20T) , (30) , ,  
 (22) (24) (30) , , (20  
 T) (30) , (22)  
 (24) (30) (10A)  
 , (10A, 20A)  
 2 (a) 3 (d)  
 , 2 (a) (Si) (41) (Cu)  
 (42) , DLC (30)  
 , 2 (b) DLC (30) (30H) , FIB(Focused Ion Bea  
 m Etching) EB(Electron Beam)  
 , 0.15 μm × 0.15 μm (30H)  
 , 2 (c) , FeCo, NiFe  
 (11, 21) (30H)  
 , 2 (d) DLC (30) NiFe  
 (12), (13), (22, 24) , Cu  
 (14)  
 , 2 (e) AlOx( ) (32A) , CMP(Chemo Mechani  
 cal Polishing)  
 , 3 (a) (10) (12) (13)  
 , NiFe

, 3 (b) (20A) (23) AlOx (32B) AlOx GMR  
 (32B) TMR CMP (23)

P , 3 (c) , AlOx (32C) CM  
 , 3 (e) Cu (42)  
 (41) (10A, 20A)

(11), (12), (13)  
 가

(13) (10A) (12), (14),  
 DLC (30) (0.1 μm )  
 (20A) (22, 24), GMR/TMR (23) (41)

, 1a (10A, 20A) (10T), (20T) DLC (30)  
 (30) (10T), (20T)

4 (10T) , (10T)  
 (30a) (10T)

(10T) , 2 (b) DLC (30) (30H)  
 (42) (30)

, 3 (d) (41) DLC (30a) (10T), (20T) 4 (30)  
 a) DLC (30b) DLC (30b) (相性)

, 가 DLC (30)

5 (a), (b) 1 1a 4

5 (a) (10B) (14) (12) (13)  
 (10T) (14) (200) 가

, DLC (30) (off - set) ,  
가 .

5 (b)

, (10C) 4 (30a 30d) (10T) (  
30b 30d) (14) (30c, 30d) ,  
(13) (30d) (12) (30d) ,  
(30a)

, (10C) (30a 30d) ,  
(18)

, 가 .

, 5 (b) , (30a 30d)  
(30a) DLC  
(30b 30d) ,

2 (a) 3 (d) 가 , (30b 30d)  
(11) , (30b)  
(30c, 30d) 가  
(14) (30b 30d) 가  
가 .

, (30c) 가 (30d) 가 (30d)  
(13) .

, 가 , 5 (b)

6 (a) 2 . 1a 5 (b)  
(20B) (20T) (26, 26) (26, 26)

, (20T) (20T)  
(26, 26) (30) , (20T)

가 .

6 (b) 3 . 1a 6 (a)

. (G) (20C) (22, 24)가 (G) (23),  
(24) , (23) (22), (23),

6 (c) 4 . 1a 6 (b)

(24) (G) (20D) (22, 24)가 (G) (23),

(23) (23) (50, 50)가 (23) 가

가

7 (150)

(200) (200) (152)

(153) (154)

(153)

(200)가 (153) (ABS) (200)

(154) (155) (155) (155) (156)가

(156) (155) (155)

(155) (157)

(156)

8 (155)

(160) (155)

(155) (154)

(154) (154) (164) (164) (153)가 (153)

(164) 165 (160)

(153) (ABS) (200)

9 (a) (153) (200) (153) (200) (10)

(153) (200)

가 , (200) 가 ,

가 , 1 30 G( 가) (200) 가 (10) (200)

(10) (200)

9 (b) 「 DLC 」 (153) (200) , 9 (b) 「 」

가

10 (153) (10) (153) (153A) (T)( ) (L)( ) (153A)

(41) (153A) , 2 (a) (e)

11 (41) (41) (41) (153S) (153S) (153i)가 (10S) ,

(41) (41) 2 (a) 3 (d) (41) 3 (c) (63) (153) (153A) , 3 (d) 가 가 가 가

, 1/3

가

가 가 「 (removable) 」 가

가 가 ,

(57)

1.

2.

가 ,

3.

2 ,

4.

3 ,

5.

3 ,

6.

5 ,

7.

3 ,

2

8.

9.

가

1

1

10.

9 ,

11.

10 ,

1

2 ,

1 2

2

12.

10 ,

1

2 ,

1 2

2

13.

12 , 1 2

14.

10 , 2

15.

16.

17.

18.

17 ,

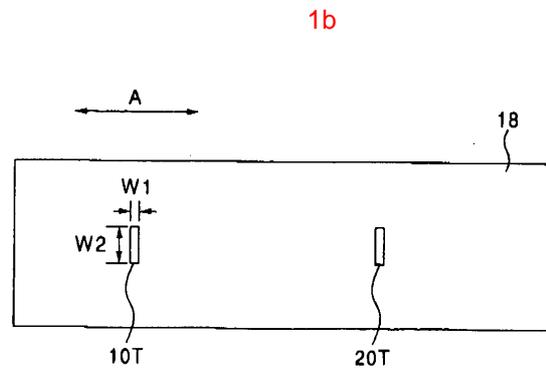
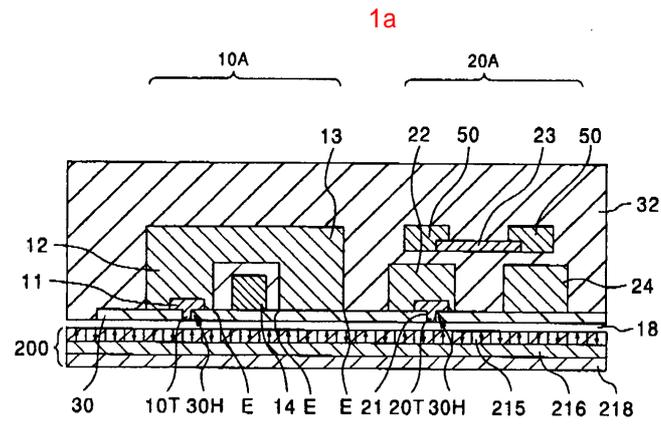
19.

17 , 1 ,

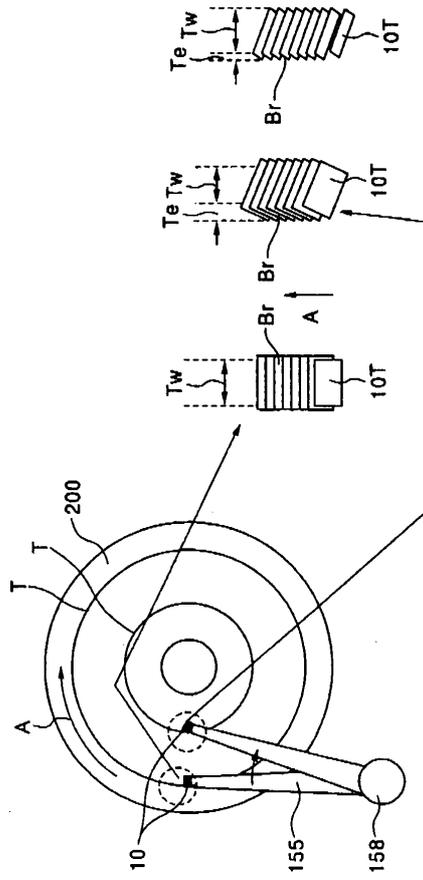
2

20.

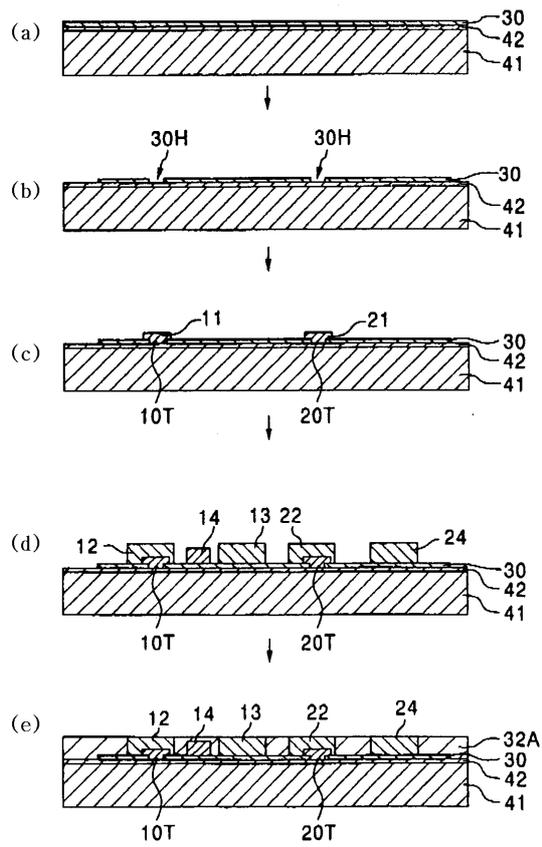
17 ,



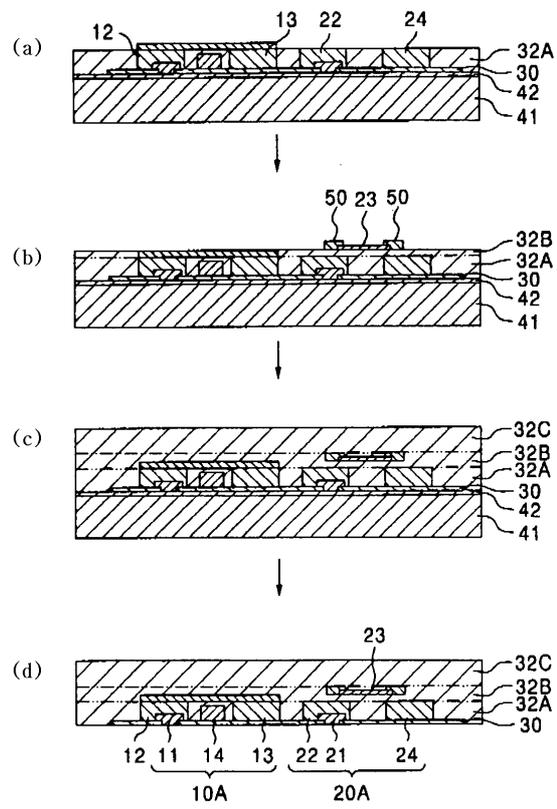
1c



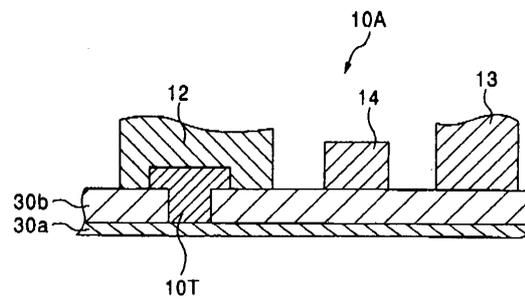
2



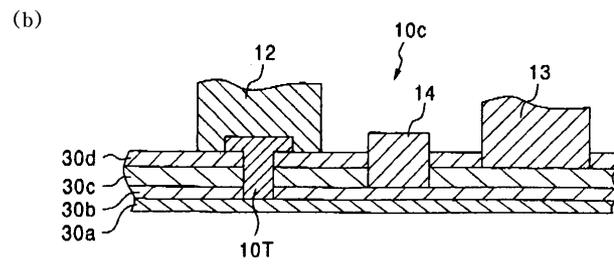
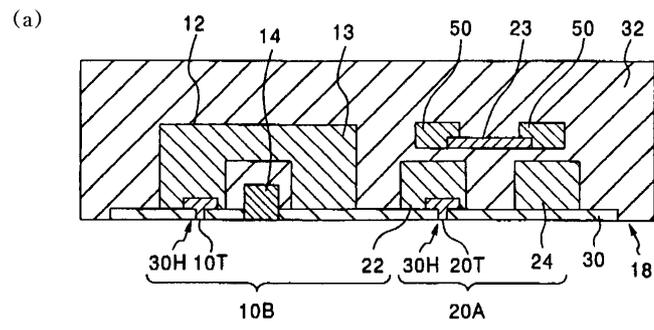
3



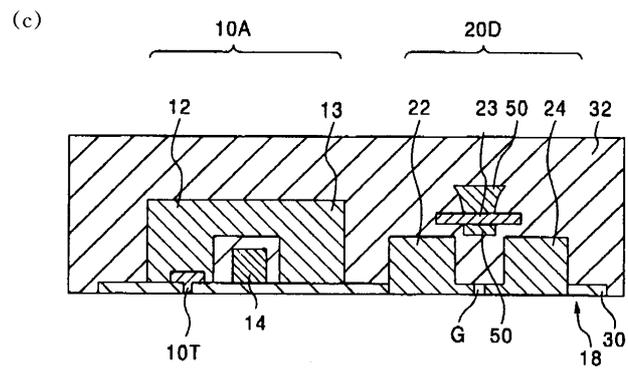
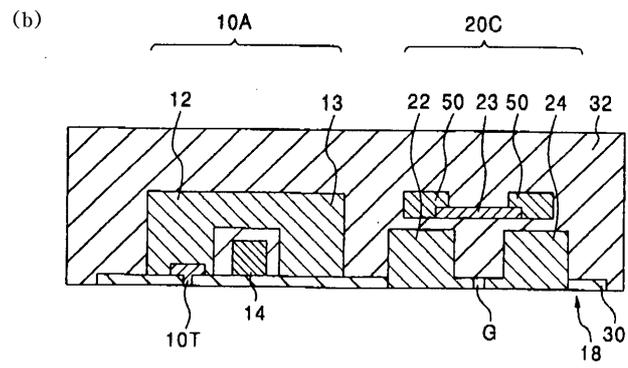
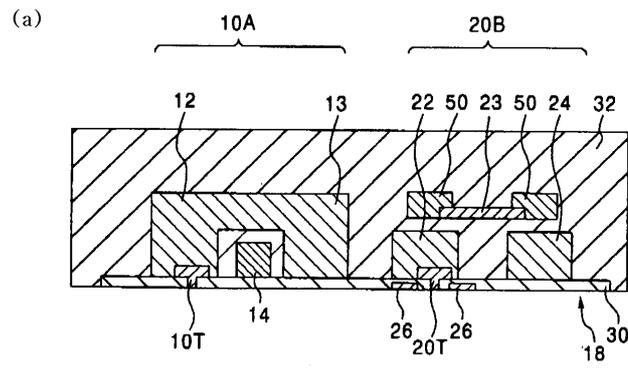
4



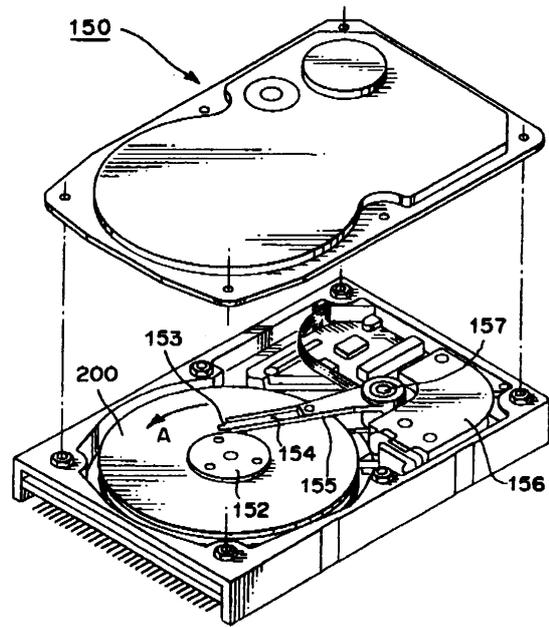
5



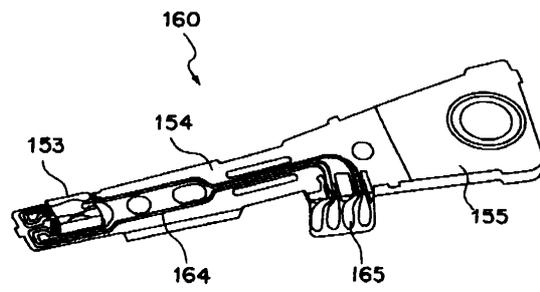
6



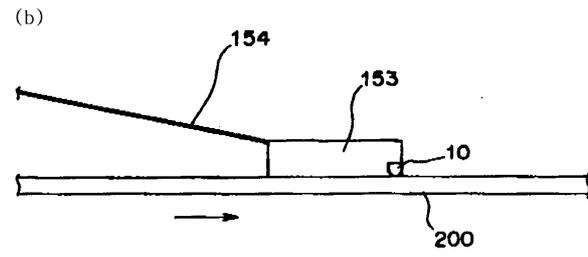
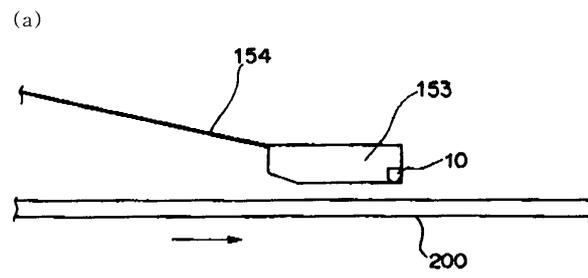
7



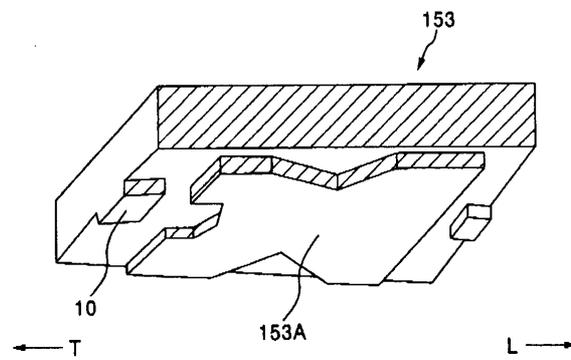
8



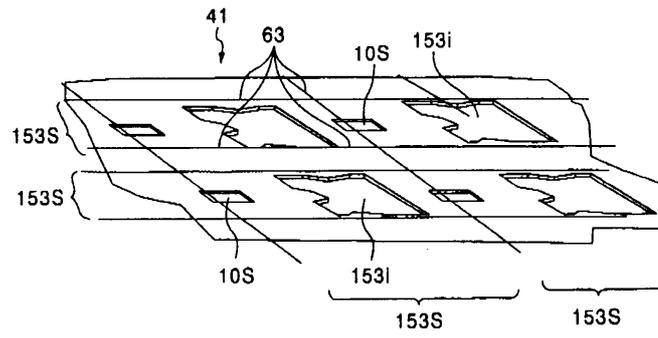
9



10



11



12

