Investigation Report on US Patents regarding Multi-Touch Control Technologies

BEIJING HEADSTAY INTELLECTUAL PROPERTY AGENCY

Abstract

This report mainly analyzes US patents and published patent applications regarding multi-Touch control technologies. US patents and patent applications related to the technologies are searched with specified keywords. This report mainly includes four parts:

Part I: Introduction to multi-Touch control technologies;

Part II: Analysis on Patents from Mainstream Companies Regarding multi-Touch control technologies;

Part III: Analysis on Patents of the Same Family Regarding multi-Touch control technologies; and

Part IV: Patent Infringement Litigations in the area of multi-Touch control

This report covers totally 433 searched US patents (54 patents/376 published patent applications).

It should be noted that in this report:

1. The US published patent applications refer to patent applications that are published 18 months since the filing dates (or priority date) but are not granted with patent rights; and the US patents refer to patents that are substantively examined and granted with the patent rights, that is, the allowed patents.

2. Since the US patent system stipulates that a patent applicant is the inventor who makes the invention involved, at the publication stage, it is possible that the applicants of some patent applications are the inventors and these patent applications are not accurately retrieved.

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Part I: Introduction to Multi-Touch Control Technologies

The multi-touch control technologies originated from 70's of 20th century, and are applied to industrial control computers, POS machine terminals and the like industrial or commercial devices at the early stage. In 2007, the release of iPhones gave birth to a man-machine interface engineering revolution, which was a milestone in the development course of the touch industry.

Since multi-Touch control may be practiced, capacitive touch screens are under spotlight of researches. As shown in Figure 1-1, the working principle of the capacitive touch screen is as follows. The human body is used as an electrode of a capacitor component. When a conductor approaches, the conductor couples the working surface of the conductive layer in the sensor to cause the capacitance to change, and hence the touch screen implements position identification or gesture identification according to the change of the capacitance. Multi-touch control means that the touch panel is capable of simultaneously sensing two or more touch positions, and identifying gesture or position or the like based on tracking or identification of the touch position.

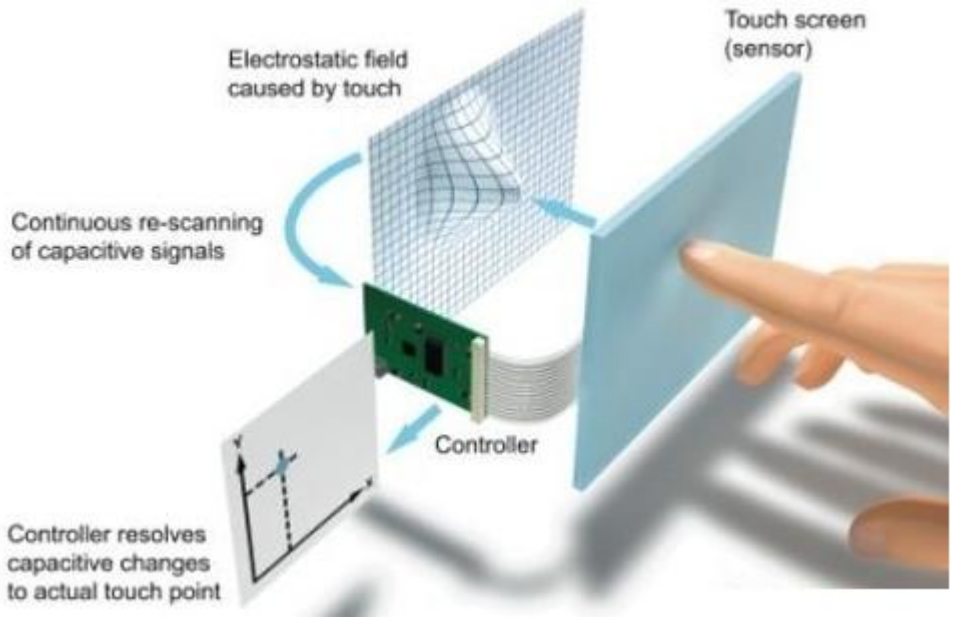


Figure 1-1

1.1 Classification of US Patents and published patent applications Regarding Multi-Touch Control Technologies

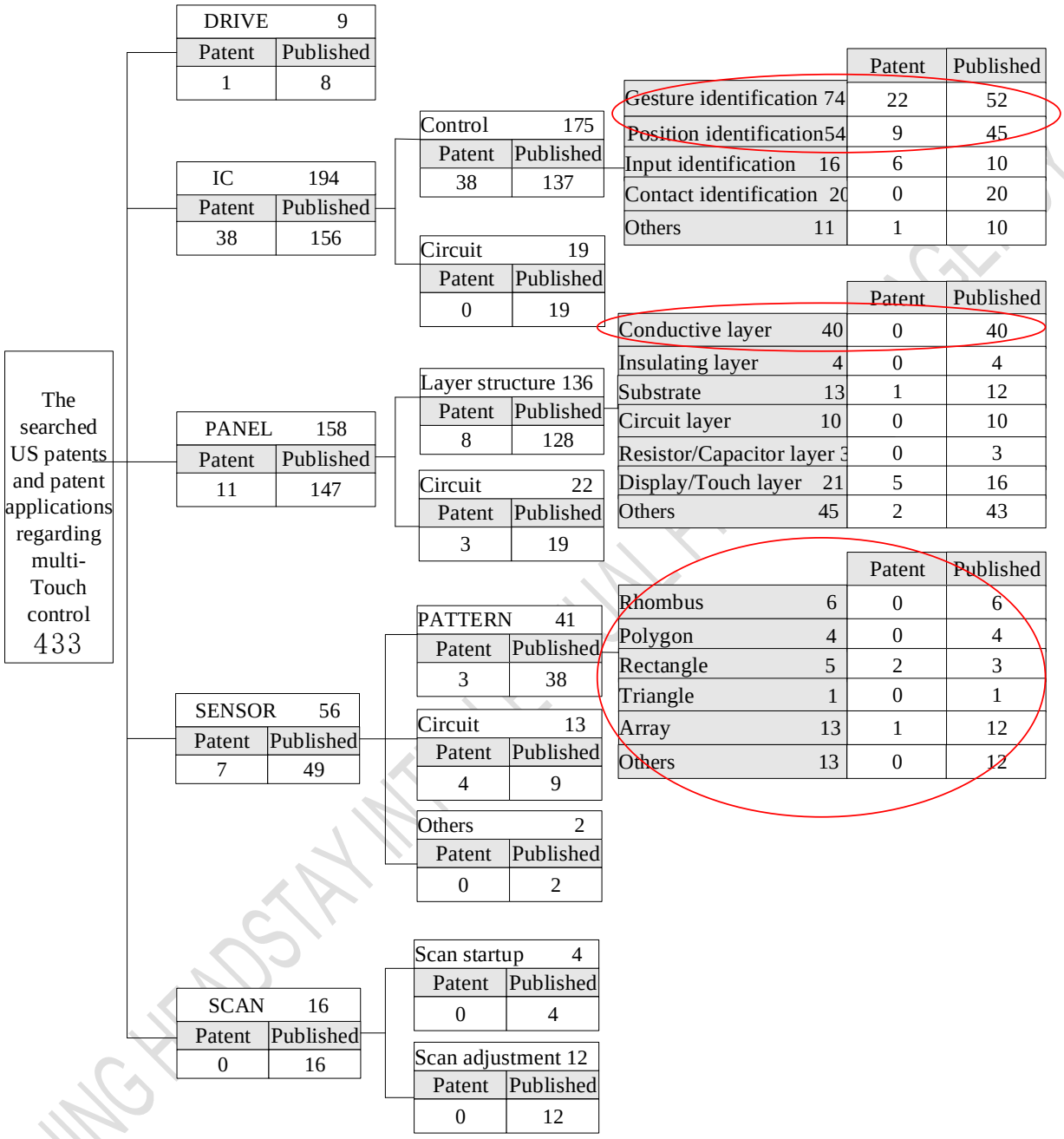


Figure 1-2 Classification of US patents and published patent applications regarding the multi-Touch control technologies

Referring to Figure 1-2,the searched US patents and patent applications regarding multi-Touch control mainly fall into the following classifications:

1. Drive (1 patent/9 published patent applications), which mainly refers to the technology of controlling the frequency, phase and amplitude of the stimulation signal, the driver technology of sharing the display mode and the touch mode, and the like.

2. IC (38 patents/156 published patent applications), which mainly includes IC control (38 patents/137 published patent applications) and IC circuit (0 patent/19 published patent applications). The IC control mainly refers to software, and relates to gesture identification (22 patents/52 published patent applications), position identification (9 patents/45 published patent applications), touch identification (0 patent/20 published patent applications), input identification (6 patents/10 published patent applications) and the like. The gesture identification may be directed to Tap, Copy, Cut, Push, Drag and the like. These gestures may be applied to unlock/lock switching, picture adjustment, object control and the like. The position identification may be contact area division, ghost exclusion, palm contact judgment, edge detection, position detection in case of low drive voltage and the like. The contact identification may be judgment of contact on the touch pane, identification of multi-user touch, identification and gradation of contact and the like. The input identification may be differentiation of different input modes, identification of input content, and the like

3. Panel (11 patents/147 published patent applications), which mainly includes the layer structure (8 patents/128 published patent applications) and circuit structure (3 patents/19 published patent applications) of the panel. The layer structure may cover the conductive layer (0 patent/40published patent applications), the insulating layer (0 patent/4 published patent applications), the substrate (1 patent/12 published patent applications)), the circuit layer (0 patent/10 published patent applications), the resistor/capacitor layer (0 patent/3 published patent applications), the display/touch layer (5 patents/16 published patent applications) and the like. The circuit structure refers to the construction relationship between the sensing unit and the controller in the panel, which is intended to reduce the volume and thickness of the panel and to improve the light transmittance and the like.

4 Sensor (7 patents/49 published patent applications), which mainly includes the pattern (3 patents/38 published patent applications), the circuit structure (4 patents/9 published patent applications) and the like. The pattern may include electrodes of rhombus (0 patent/6 published patent applications), polygon (hexagon, honeycomb shape and mesh shape) (0 patent/4 published patent applications), rectangle (2 patents/3 published patent applications), triangle (0 patent/1 published patent), array (1 patent/12 published patent applications) formed by these electrodes, and the like.

5. Scan (0 patent/16 published patent applications), which mainly includes scan startup (0 patent/4 published patent applications) and scan adjustment (0 patent/12 published patent applications). The scan startup may be how to prevent mis-scanning, how to perform primary and secondary scanning and the like. The scan adjustment may be time-division scanning,

multi-IC scanning and the like.

As known from the above classifications, the US patents regarding multi-Touch control are mainly concentrated in classifications of the IC and the panel; and some patent applications are relevant to the sensor. The classifications of the drive and the scan include only a few of patents. In the classification of IC, the patents relevant to control are obviously more than the patents relevant to circuit, and the patents relevant to control are mostly concentrated in identification of gesture and position and are obviously more than the patents relevant to input identification and touch identification. In the classification of Panel, the patents relevant to layer structure are obviously more than the patents relevant to circuit, and the patents relevant to layer structure are mainly concentrated in the conductive layer and are obviously more than the patents relevant to insulating layer, substrate and the like.

Therefore, as seen from the number of patents in the classifications of the US patents regarding multi-Touch control, in the classification of IC, the gesture identification and the position identification in the IC control may become a hotspot of this technology; and in the classification of panel, the conductive layer of the layer structure may also become a hotspot of this technology. These two categories of patents are worthy of concerns. Further, the pattern in the classification of sensor is the technology that is much concerned by the attorney. Hereinafter, a detailed analysis is given.

In addition, a further analysis is conducted hereinafter with reference to the filing dates of the patents.

1.2 Curve Trend-Based Analysis on US Patents and Published Patent Applications Regarding Multi-Touch Control Technologies

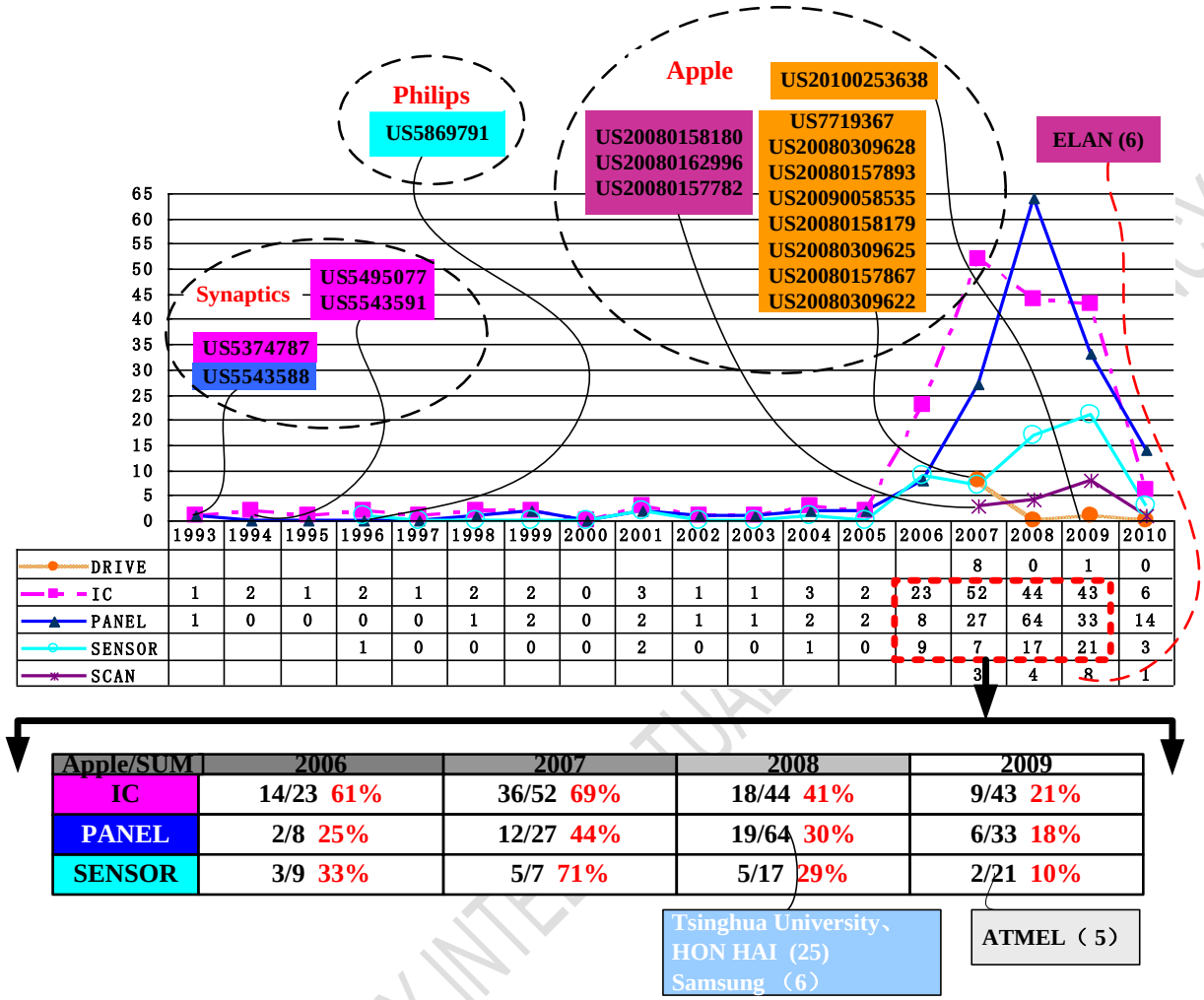


Figure 1-3 Curve Trends of patent applications regarding multi-touch control technologies from 1993 to 2010

Referring to Figure 1-3, the earliest patent applications multi-touch control technologies were dated back to 1993 and 1994. The first patent application No. US5374787 regarding IC was filed in 1993, and the patent applications No. US5495077 and No. US554359 filed in 1994 are also relevant to IC control. These three patents were all filed by Synaptics. Patents No. US5374787 and No. US5495077 are relevant to position identification in IC control; patent No. US5543591 is relevant to gesture identification in IC control, which is also the first patent in the field of IC control relevant to tap gesture (Tap). In addition, Synaptics was constantly filing patent applications regarding this technology in the following years. Afterwards, except the year of 2000, patent applications regarding IC were filed each year, but the number of applications was not large. However, in 2006, the number of patent applications regarding this technology was drastically increased, and came to a peak (totally 52 applications) in 2007. A large number of patent applications were also filed in 2008 and 2009. In addition, many of the patent applications filed in 2006 to 2009 were from Apple. However, from 2007 to 2009, the proportion of the patent applications filed by Apple in the total number of patent applications gradually decreased. Therefore, it is known that rising of this technology may be related to

the research and development made by Apple on this technology. However, with the development of this technology, other companies led by Microsoft are also devoted to the research and development of this technology.

The first patent application regarding Panel was also filed in 1993. Patent application No. US5543588 relates to the layer structure of the touchable LCD in the Panel, which was also filed by Synaptics. However, Synaptics did not file any other applications later regarding this technology. In 2001, Synaptics filed another patent application regarding this technology. Afterwards, Synaptics filed fewer patent applications regarding this technology. However, in 2006, the number of patent applications regarding this technology increased to some extent, significantly increased in 2007, and came to a peak in 2008. In addition, in 2009 and 2010, a large number of such patent applications were also filed. In addition, in the patent applications filed from 2006 to 2009, some were filed by Apple. However, the number of patent applications filed by Apple regarding this technology was far less than the number of their patent applications regarding IC, and the proportion of the patent applications filed by Apple regarding this technology from 2007 to 2009 in the total number of patent applications regarding this technology gradually decreased. Therefore, Apple has fewer technical advantages in the technical field of Panel over the IC field. Further, among the 64 patents filed in 2008, in addition to 19 patents filed by Apple, [redacted].

The first patent application regarding Sensor was filed in 1996. Patent application No. US5869791 was filed by Philips. However, Philips did not file any applications regarding this technology later. In addition, among the patent applications filed from 2006 to 2009, some were filed by Apple. However, the number of patent applications filed by Apple regarding this technology was far less than the number of their patent applications regarding IC, and the proportion of the patent applications filed by Apple regarding this technology from 2007 to 2009 in the total number of patent applications regarding this technology gradually decreased. It should be noted that in the 21 patents filed in 2009, 5 patents were filed by ATMEL. ATMEL has some technical competence in this field.

The earliest patent applications regarding Driver were filed in 2007. The 8 patent applications were all filed by Apple. Later, in 2009, another application document regarding this technology was also filed by Apple. In other words, all the patent applications regarding Driver were filed by Apple. Therefore, Apple has profound research and development competence in this field.

The earliest patent applications regarding Scan were filed in 2007. The 3 patent applications regarding this technology were all filed by Apple. However, only a few of patent applications regarding this field were filed later. Among the 16 patent applications regarding

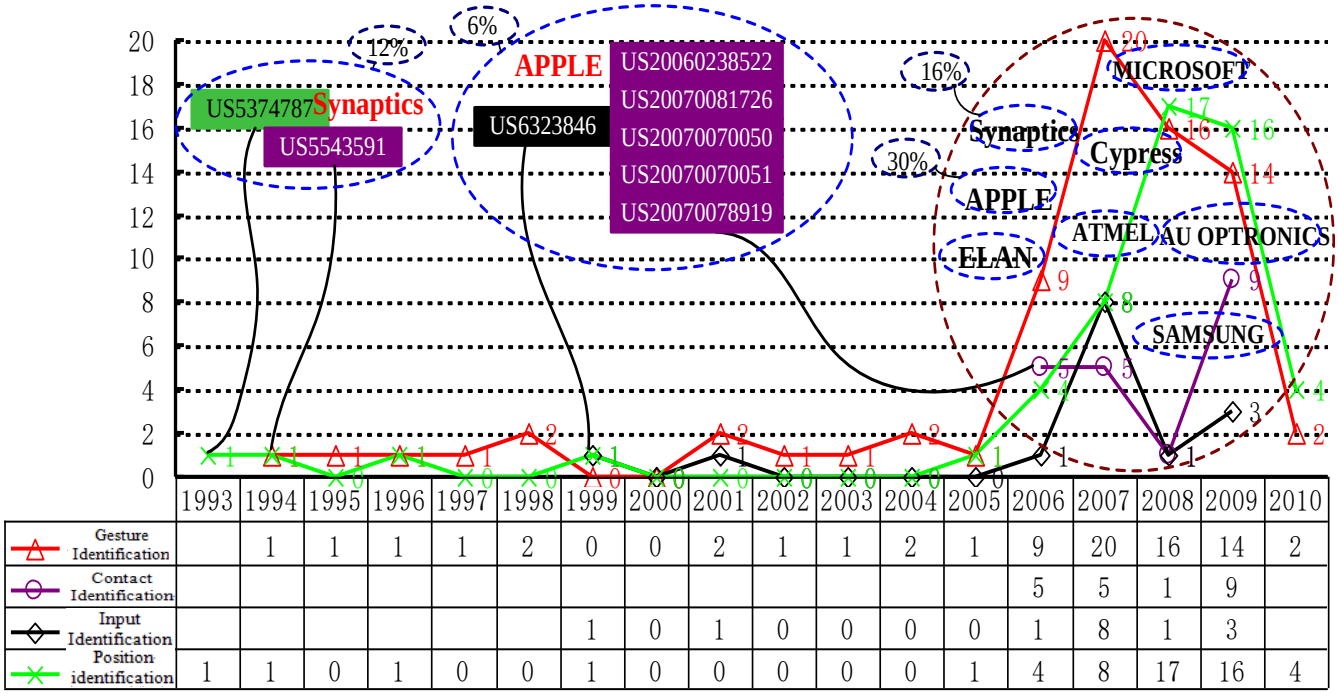
this field, Apple filed totally 6 patent applications, and ELAN filed totally 6 patent applications. The patent applications from Apple were mainly filed in 2007 and 2008, and the patent applications from ELAN were mainly filed in 2009. Therefore, in this technical field, Apple placed research and development earlier than ELAN. The later increase of the number of patent applications regarding this technology may possibly related to cooperation between these two companies.

In addition, it should be noted that a smaller number of patent applications regarding this technology were filed in 2010 because full statistical collection failed due to the US examination system.

The IC Control technology, the layer structure in the Panel technology, and the pattern in the Sensor technology are particularly analyzed hereinafter.

1.3 Analysis on Key Technologies

In this report, the critical technologies include the IC control technology, the layer structure in the Panel technology, and the pattern in the Sensor technology, which are analyzed one by one hereinafter.



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Gesture Identification		1	1	1	1	2	0	0	2	1	1	2	1	9	20	16	14	2
Contact Identification														5	5	1	9	
Input Identification							1	0	1	0	0	0	0	1	8	1	3	
Position identification	1	1	0	1	0	0	1	0	0	0	0	0	1	4	8	17	16	4

Figure 1-4 Trends of patent applications regarding IC control

Referring to Figure 1-4, regarding IC control, the first position identification patent No. US5374787 was filed in 1993, and the first gesture identification patent No. US5543951 was filed in 1994; whereas the first input identification patent No. US6323846 was filed in 1999, and the contact identification patent applications were mostly filed in 2006. Therefore, it is possible that the gesture identification and position identification technologies are developed earlier than the input identification and the contact identification. In addition, from the perspective of the absolute quantity, the number of patent applications regarding gesture identification is the greatest (totally 74 patent applications), and thus the gesture identification may be possibly a hotspot in the IC technical field.

From emergence of the gesture identification patents in 1994 to 2005, several patent applications regarding gesture identification were filed each year. In addition, these patent identification patents were filed by either Apple or Synaptics. In the subsequent years, patent applications regarding gesture identification were filed each year (except for 1999 and 2000), and totally 20 patent applications regarding gesture identification were filed in 2007. In 2008 and 2009, still a large number of patent applications regarding this technology were filed. However, the applications were not only filed by Synaptics and Apple. Microsoft filed 9 patent

applications, Samsung filed 3 patent applications, ELAN filed 1 patent application, AU Optronics filed 3 patent applications, Cypress filed 3 patent applications and ATMEL filed 2 patent applications. From the total application trend of the patent applications regarding gesture identification, the gesture identification is substantially the same as the IC technology, which may be related to the fact that the gesture identification is a hotspot in the IC control technology. In the patent applications relevant to gesture identification, with elapse of time, the proportion of patent applications filed by the earliest applicants Synaptics and Apple owning the most patent applications significantly changed. From 1994 to 2005, Synaptics filed patent applications regarding gesture identification each year, with the total number of patent applications being greater than that of patent applications from Apple. During this period, Synaptics and Apple respectively accounted for 12% and 5% of the total patent applications regarding this technology, and were obviously competitive in the field of gesture identification. On the contrary, from 2006 to 2010, the number of patent applications regarding gesture identification filed by Synaptics was in decrease, whereas the number of patent applications regarding gesture identification filed by Apple was in increase. During this period, Synaptics and Apple respectively accounted for 16% and 30% in the total patent applications regarding this technology, and Apple started leading Synaptics in the technical field of gesture identification. This was possibly because, in one aspect, Apple constantly increases its investment on the gesture identification technology, and in another aspect, more companies participated in the competition regarding this technology.

In 2006, 5 patent applications regarding contact identification were filed whereas no patent application regarding this technology was filed before. These 5 patent applications were all filed by Apple, and 4 patent applications were filed on the same filing date (November 14, 2006). In the subsequent years of 2007 to 2009, Apple constantly filed patent applications regarding this technology. During this period, ELAN and AU Optronics both filed 1 patent application regarding position identification, but the absolute quantity is far less than Apple (owning 17 patent applications).

Patent applications regarding input identification were filed later, and the annual total number of such patent applications was relatively small. Only several patent applications regarding this technology were filed each year. This indicates that this technology is not very hot in the IC control field. However, Apple still filed the most patent applications regarding input identification, and filed patent applications each year from 2006 to 2009.

From 1993 to 1996, all the patent applications regarding position identification were filed by Synaptics (3 patent applications), and thus Synaptics had absolute competence in this

technical field. However, since 1999, other companies filed relevant patent applications. For example, Apple filed 13 patent applications, Touchable AB field 2 patent applications, and LG filed 1 patent application. The first position identification patent from Apple was filed in 2006, and in the subsequent years, Apple constantly increased the number of filed patent applications in this technical field, with the total quantity exceeding that of Synaptics.

Please note that the layer structure in the Panel technology and the pattern in the Sensor technology are not analyzed in this report.

1.4 Industrial Chain analysis on the Multi-Touch Control Technologies

The industrial chain of the multi-touch control technologies may include: upstream components and raw materials and processing, midstream manufacture of touch screens and panels, and downstream system integration and terminal manufacturers.

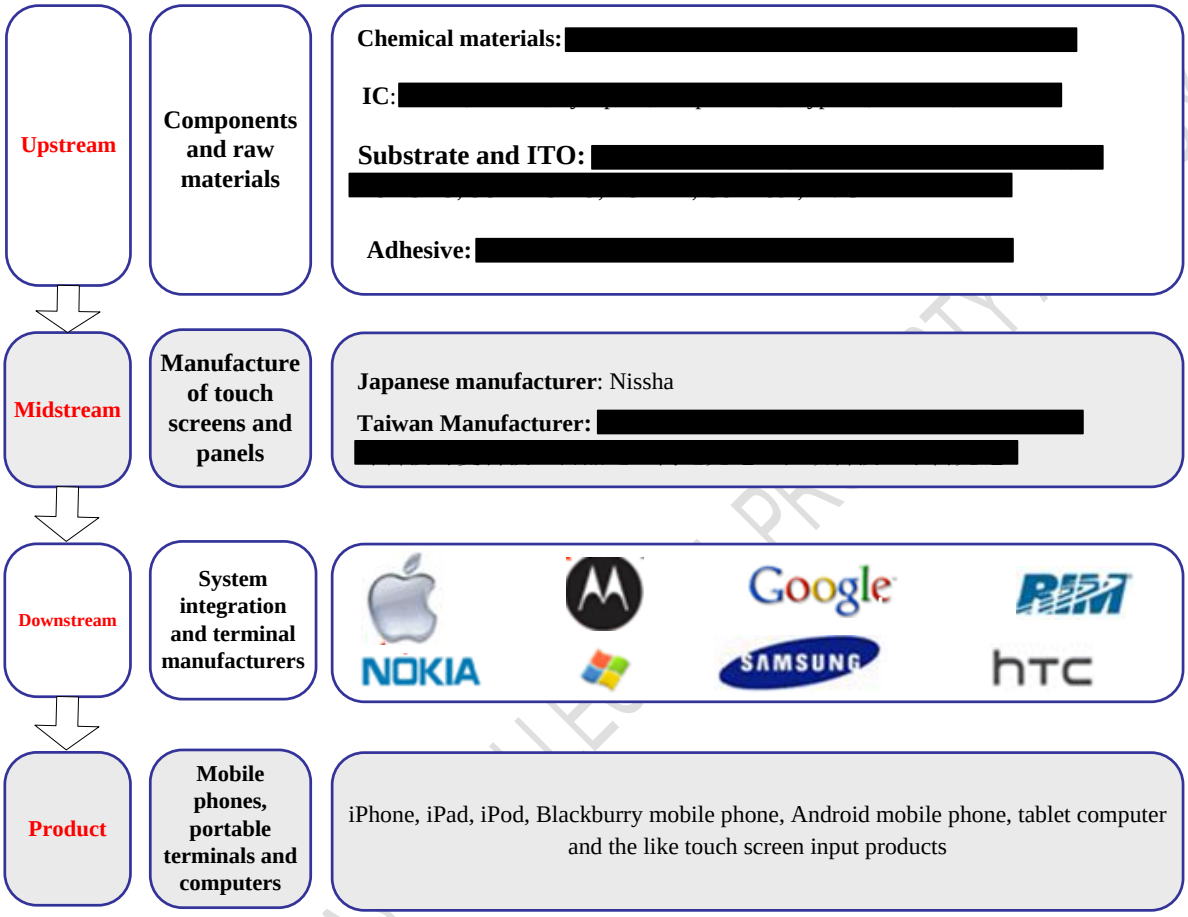


Figure 1-5 Schematic diagram of the industry chain of the multi-touch control technologies

Japanese and US enterprises have a leadership in the upstream components and raw materials and processing thereof of the touch screens. For example, Nippon Mining Holdings, Mitsui, SUMITOMO, TORAY, Asahi Glass, FUJIKURA, Nitto Denko, Oike, Teijin, and TOYOBO are all from Japan, and Corning Inc., 3M, and DuPont are all from the United States. In addition, EPI from Taiwan secures its position in raw materials (silver adhesive), and GemTech and AVCT from Taiwan also take a place in ITO glass. In the aspect of IC control, enterprises from Taiwan and the United States are dominating. For example, ELAN Microelectronics and eGalax from Taiwan, Synaptics and Cypress from the United States, and Chip Homer in China mainland are dominating in the IC field.

The midstream touch screens/touch panels are mainly manufactured by enterprises in China mainland and Taiwan. Laibao Hi-tech has been admitted to the supply chain of iPhone.

Part II: Analysis on Patents from Mainstream Companies in the Area of Multi-Touch Control

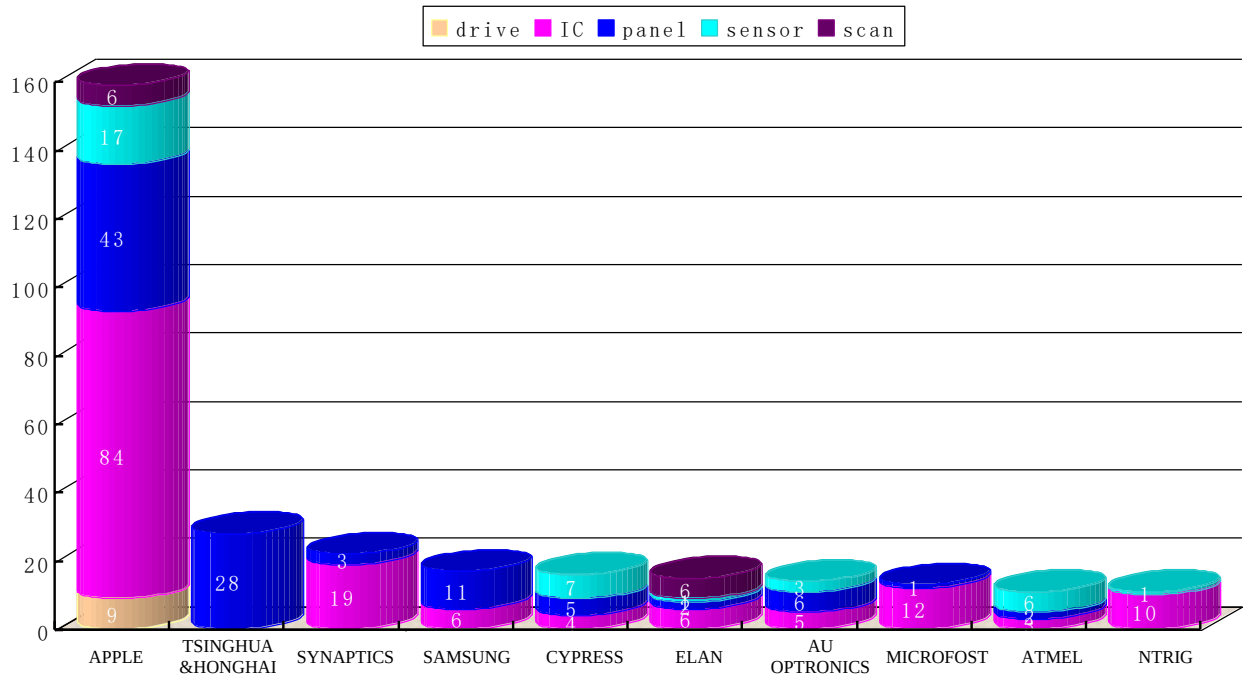


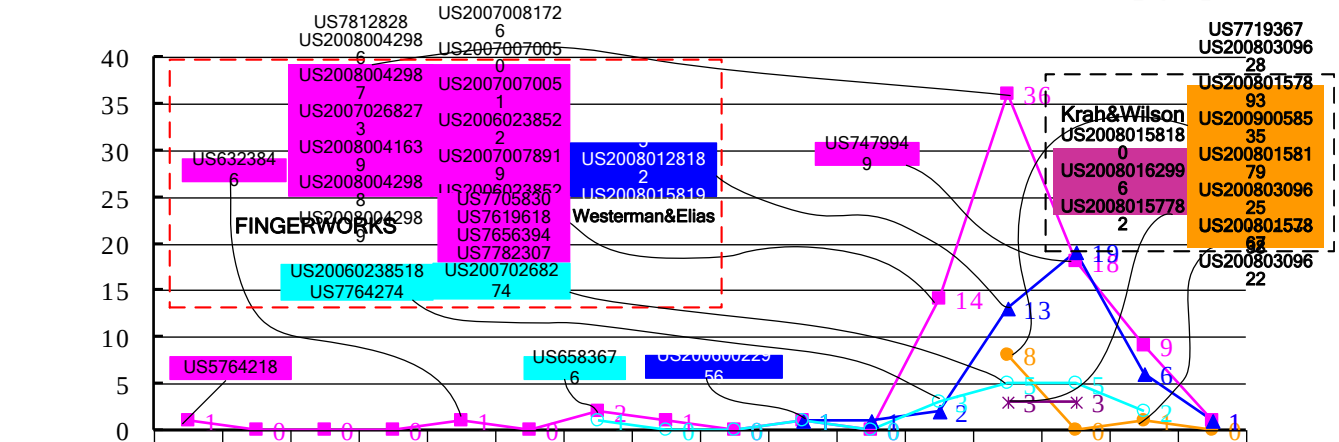
Figure 2-1 Trends of patent applications

Referring to Figure 2-1, in the technical field of multi-touch control, Apple leads in patent quantity (Driver/9 patents, IC/84 patents, Panel/43 patents, Sensor/17 patents, Scan/6 patents, totally 159 patents); and Tsing Hua&Hong Hai takes the second place (Panel/28 patents), Synaptics (IC/19 patents, Panel/3 patents, totally 22 patents), Samsung owns totally 17 patents (IC/6 patents, Panel/11 patents), Cypress owns totally 16 patents (IC/4 patents, Panel/5 patents, Sensor/7 patents), ELAN owned totally 15 patents (IC/6 patents, Panel/2 patents, Sensor/1 patent, Scan/6 patents), AU Optronics owns totally 14 patents (IC/5 patents, Panel/6 patents, Sensor/3 patents), Microsoft owns totally 13 patents (IC/12 patents, Panel/1 patent), ATMEL owns totally 11 patents (IC/3 patents, Panel/2 patents, Sensor/6 patents), and N-TRIG owns totally 11 patents (IC/10 patents, Panel/1 patent). Apple and Synaptics are leaders in the field of multi-touch control and have powerful research and development capabilities. Later, Samsung, Microsoft and other companies are committed to the research and development of the multi-touch control technology.

From the single patent application quantity, Apple has a dominating role, and then Tsing Hua&Hong Hai and the other companies take the second place. It should be noted that Tsing Hua&Hong Hai is in the second place in terms of patent application quantity, which may be related to the fact that Tsing Hua&Hong Hai filed 27 patent applications in 2009.

From the technical classifications of the patent applications filed by the applicants, these companies all filed application documents regarding IC; other companies all filed patent applications regarding Panel except N-TRIG; Apple, Cypress, AU Optronics, ATMEL, and NI-TRIG all filed patent applications regarding Sensor; only Apple and ELAN filed patent applications regarding Scan; and only Apple filed patent applications regarding Driver.

The patent applications from these companies are one by one analyzed hereinafter.



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
drive													8	0	1	0
IC	1	0	0	0	1	0	2	1	0	1	0	14	36	18	9	1
panel										1	1	2	13	19	6	1
sensor							1	0	0	1	0	3	5	5	2	
scan													3	3		

Figure 2-2 Trends of patent applications from Apple Inc.

Referring to Figure 2-2, from 1995 to 2005, Apple only filed 1 to 3 patent applications regarding multi-touch control technologies each year. However, since 2006, Apple increased patent application, and the number of patent application regarding this technology came to a peak in 2007. In addition, from the technical aspect of the patent applications, patent applications filed from 1995 to 2005 were mainly in the IC technical field, and a few patent applications regarding Panel and Sensor were also filed during this period. However, since 2006, the filed patent applications covered an obviously larger technical scope. The IC, Panel and Sensor technologies were hot areas, and some patent applications regarding Driver and Scan were also filed. It should be noted that Apple is the only company which filed patent applications regarding Driver; and in addition, Apple also filed a large number of patent applications regarding Scan (accounting for 50%). The number of patent applications filed by Apple drastically increased since 2006, which is owing to great investment on the multi-touch

control technology and may also be related to purchase of Fingerworks. In 2005, Apple purchased Fingerworks which was established by Wayne Westerman (Wayne for short) and Jon Elias (Elias for short) from Delaware State University in 1999. Wayne and Elias filed patent applications for their achievements in multi-touch control. After Fingerworks was purchased by Apple, the patents of Fingerworks were also transferred to Apple.

Referring to Figure 2-1, Apple's patent application No. US5764218 regarding IC was filed in 1995, which was possibly the earliest patent application regarding IC. This patent is relevant to cursor control. From 1996 to 1998, Apple did not file any patent application regarding IC. Starting from 1999, Apple started filing patent applications, but in a small quantity, regarding IC. Until 2006, Apple started increasing the quantity of patent applications regarding IC. In 2006, among the 14 patent applications regarding IC, 3 patent applications were achievements of Apple, and the other 11 patent applications were transferred from Fingerworks. In fact, as early as in 1999, the first patent No. US6323846 regarding IC was transferred to Apple from Fingerworks. The patent applications transferred from Fingerworks were mostly invented by Wayne and Elias. Apple's patent applications regarding IC peaked in 2007, where most patent applications (29 patent applications) were achievements of Apple, and only a few of patent applications (7 patent applications) were transferred from Fingerworks. In 2008, the number of patent applications regarding IC filed by Apple decreased. However, it should be noted that in 2008, Apple filed patent application No. US7479949 regarding gesture identification, and this patent was granted in January, 2010. This patent involves interpreting a plurality of touch input modes into actions for inputting instructions, including gesture scroll, page turnover, page scale-up and scale-down, and other possible instructions.

Referring to Figure 2-1, Apple's first patent application No. US6583676 regarding Sensor was possibly filed in 2001. Starting from 2001, Apple kept a stable application quantity in the Sensor technical field, and filed a maximum of totally 5 patent applications in 2007 and 2008. Among the 3 patent applications regarding Sensor filed in 2006, 2 patent applications were transferred from Fingerworks. Among the 5 patent applications regarding Sensor filed in 2007, 1 patent application was transferred from Fingerworks.

Referring to Figure 2-1, Apple's first patent application No. US20060022956 regarding Panel was possibly filed in 2004, and Apple kept a stable application quantity in the Panel technical field in the subsequent years. However, from 2007, Apple's patent application quantity regarding Panel started greatly increasing, and came to a peak in 2008. Among the patent applications regarding Panel filed in 2007, 3 patent applications were transferred from Fingerworks.

Referring to Figure 2-1, Apple's first patent applications regarding Driver and Scan were filed relatively late, in 2007. In addition, Apple still filed patent applications regarding Driver in 2009, and filed patent application regarding Scan in 2008. However, Apple is the first and the only applicant who filed the patent applications regarding Driver, and is the first applicant who filed the patent application regarding Scan. Apple's patent applications regarding Driver and Scan were mostly invented by Wilson-Thomas James (Wilson for short) and Krah-Christoph Horst (Krah for short). Therefore, these two inventors have powerful research and development capabilities in these fields.

Data in 2009 and 2010 was not accurately collected due to the US patent examination system, which is not described herein.

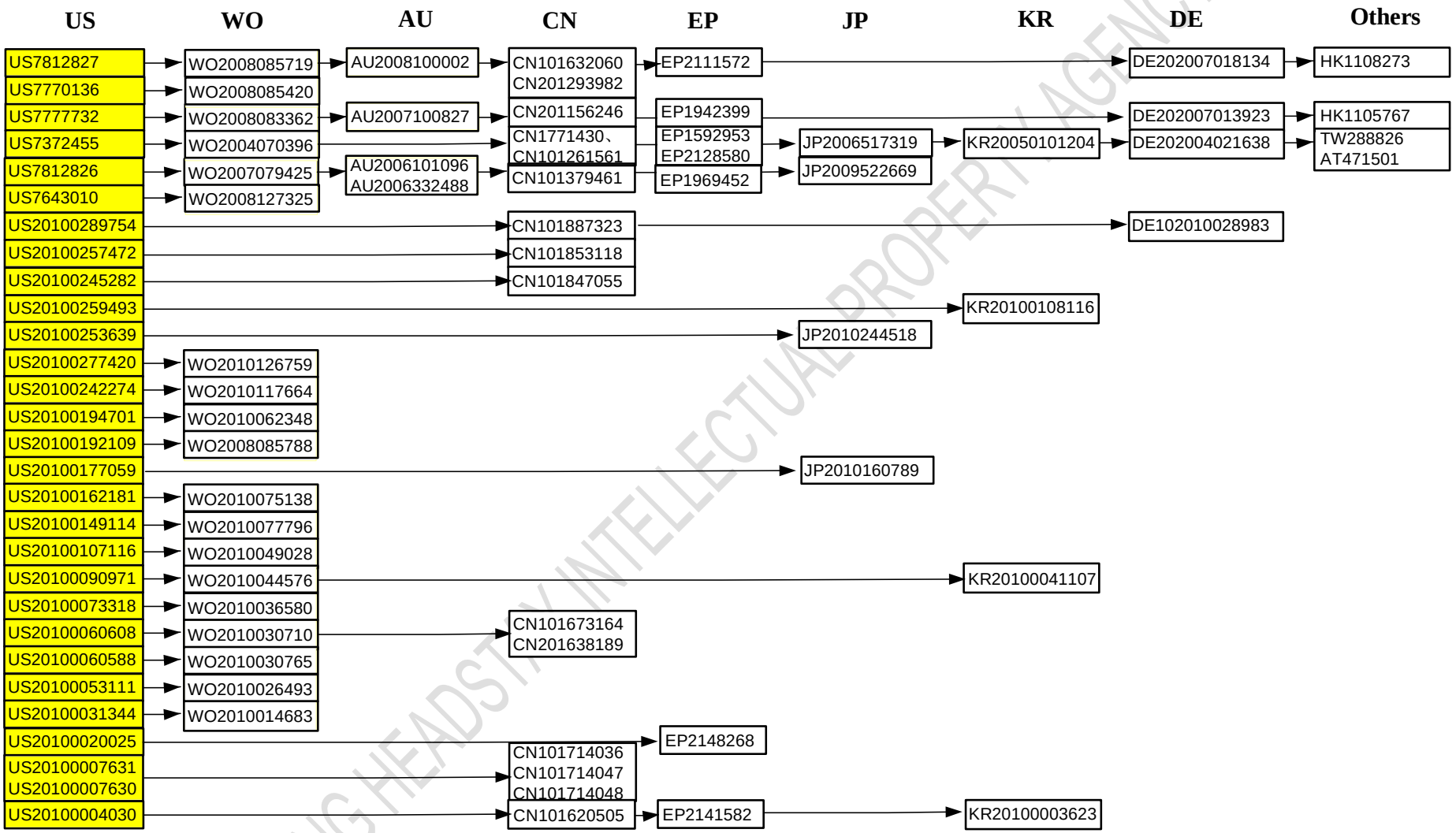
In summary, Apple has strong research and development capabilities in technical field of multi-touch control, and has constructed a secure technical barrier through self-research and development and patent transfer.

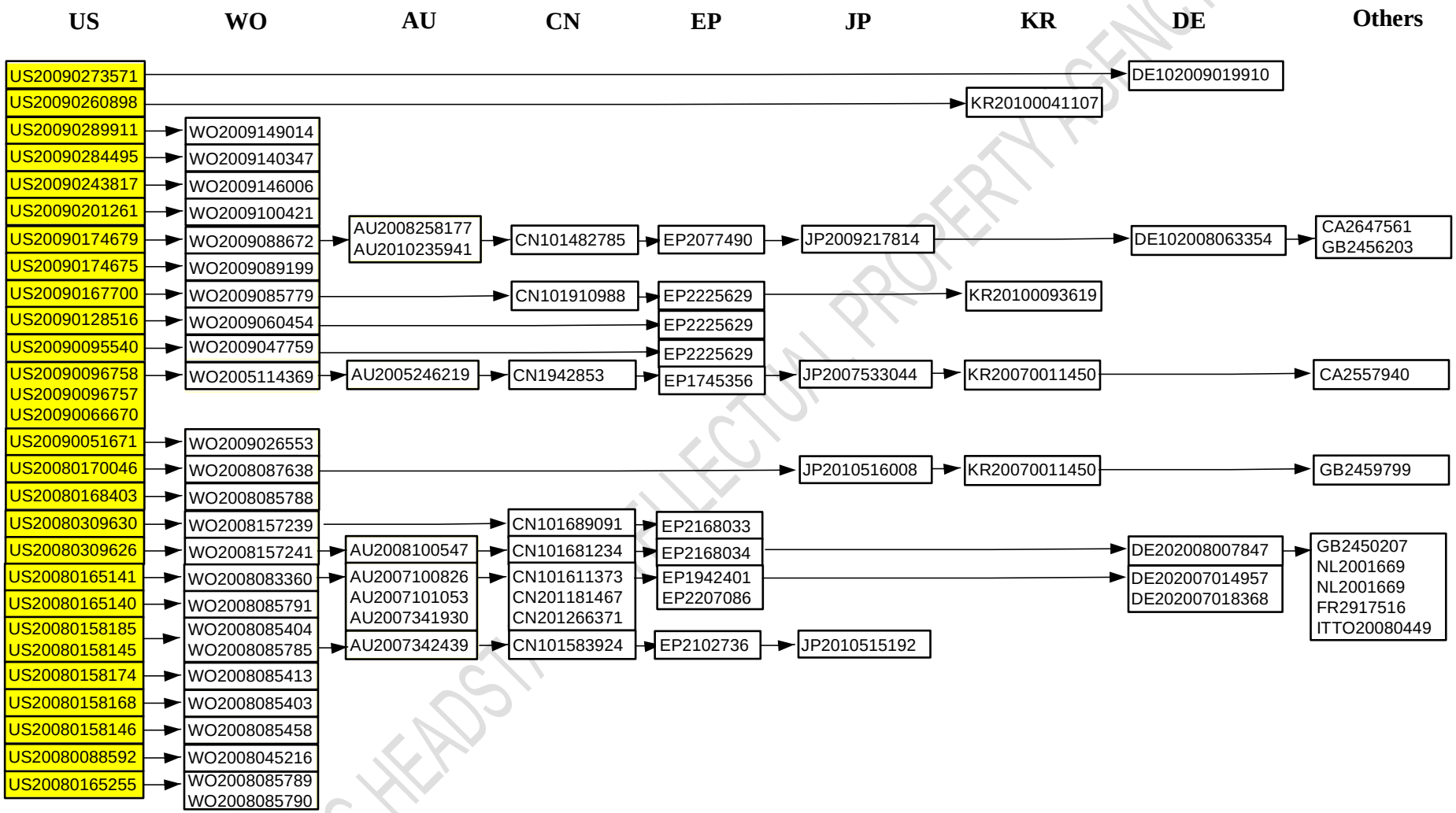
Please note that patent applications from other companies are not analyzed in this report.

Part III: Analysis on Patents of the Same Family Regarding the Multi-Touch Control Technologies

The patents of the same family regarding multi-point touch are as listed in Figure 3-1 The patents of the same families are grouped based on the technical categories. represents a family of patents regarding IC,  represents a family of patents regarding Panel,  represents a family of patents regarding Sensor,  represents a family of patents regarding Driver,  represents a family of patents regarding Scan, and represents 5 groups of massive tree of the same families of patents. Among the 433 US patents and published patent applications in this report, 324 patents have patent applications of the same families. The patents of the same families in various countries and regions are distributed as follows: WO 197, Australia 38, China 149, Europe 81, Japan 125, Korea 61, Germany 61, Taiwan 6, Hong Kong 9, Austria 8, Great Britain 15, Canada 12, Netherlands 3, Italy 1, and France 1.

Referring to Figure 1, the patents applications of the same families regarding IC are distributed as follows: the United States 80, WO 58, Australia 14, China 33, Europe 25, Japan 17, Korea 14, Germany 13, Taiwan 1, Hong Kong 2, Austria 2, Great Britain 5, Canada 3, Netherlands 1, Italy 1, and France 1.





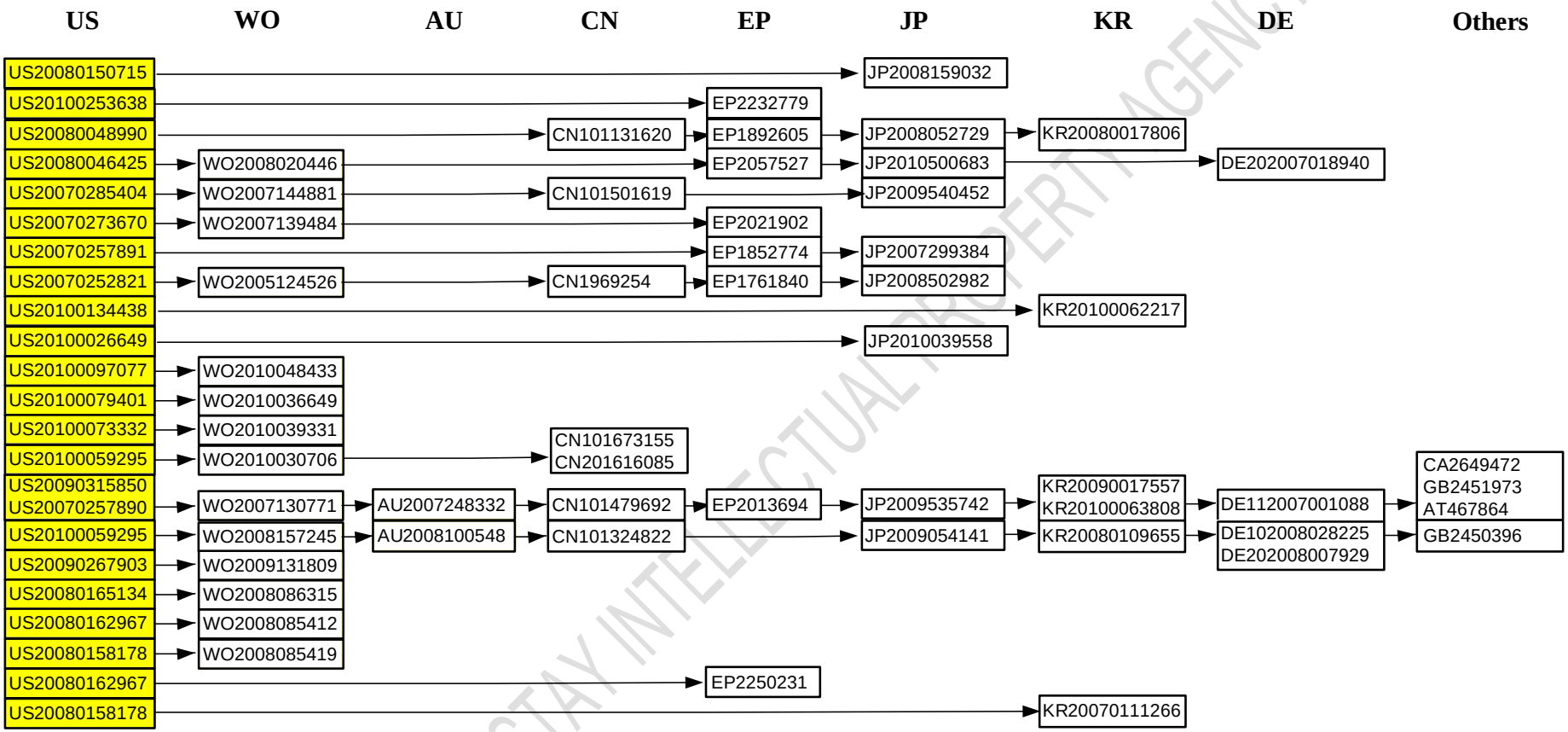


Figure 3-1 Patent family relevant to IC

Please note that the patents of the same families regarding Panel, Sensor, Driver and Scan are not analyzed in this report.

Part IV: Patent Infringement Litigations in the area of multi-Touch control

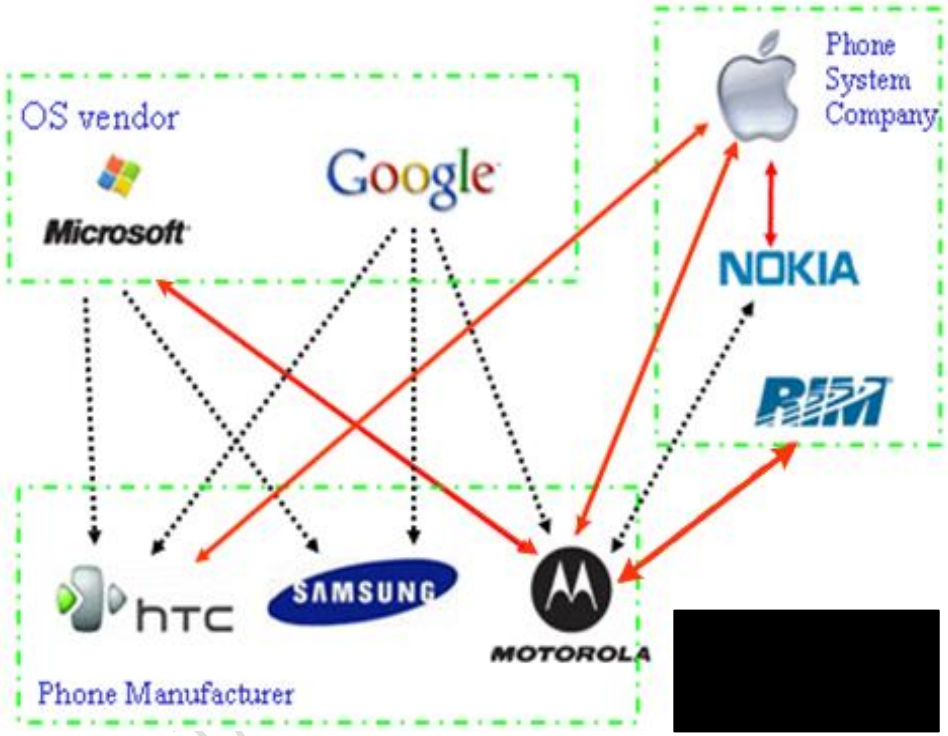


Figure 4-1 Litigations between smartphone manufacturers

In recent years, patent infringements in the area of smartphones are being much concerned. Referring to Figure 1, mainstream phone manufacturers are all involved. Some small-scaled litigations have been solved or settled, which are thus not embodied in Figure 1. Large-scale litigations and group litigations regarding mobile phone touch will be analyzed in detail later. In Figure 1, Apple's lawsuits against Motorola (Google Android) are in progress. However, with engagement of Microsoft, this patent battle is more severe and comes to chaos.

Litigations Between Apple and Nokia

Court	Delaware Federal District Court	US ITC and Delaware Federal District Court	US ITC and Delaware Federal District Court	US ITC and Delaware Federal District Court	Wisconsin Western Court	District courts in GB, GEM and NL
Plaintiff	NOKIA	APPLE	NOKIA	APPLE	NOKIA	NOKIA
Time	2009/10	2009/12	2009/12	2010/01	2010/05	2010/12
Defendant	APPLE	NOKIA	APPLE	NOKIA	APPLE	APPLE
Patents	NOKIA Patents US5802465 US5862178 US5946651 US6359904 US6694135 US6775548 US6882727 US7009940 US7092672 US7403621	APPLE Patents US5634074 US6343263 US5915131 US5555369 US6239795 US5315703 US6189034 US7469381 USRE39486 US5455854 US7383453 US5848105 US5379431	NOKIA Patents US6714091 US6834181 US6895256 US6518957 US6073036 US6262735 US6924789	APPLE Patents US5379431 US5455599 US5519867 US5915131 US5920726 US5969705 US6343263 US6424354 USRE39486	NOKIA Patents US6317083 US6348894 US6373345 US6603431 US7558696	NOKIA Patents 13

[redacted]

Figure 4-2 Litigations between Apple and Nokia

Table 4-1 Patents involved in the litigation between Apple and Nokia

Item	Patent application No.	Filing date	Authorization date	Title of invention
Relevant patents from Apple				
1	USRE39486	20010702	20090707	Method and device for position determination
2	US5315703	19921223	19940524	Object-oriented notification framework system
3	US5379431	19931221	19950103	Boot framework architecture for dynamic staged initial program load
4	US5455599	19950404	19951003	Object-oriented graphic system
5	US5455854	19931026	19951003	Object-oriented telephony system
6	US5519867	19930719	19960521	Object-oriented multitasking system
7	US5555369	19940214	19960910	Method of creating packages for a pointer-based computer system
8	US5634074	19930507	19970527	Serial I/O device identifies itself to a computer through a serial interface during power on reset then it is being configured by the computer
9	US5848105	19961010	19981208	GMSK signal processors for improved communications capacity and quality
10	US5915131	19950505	19990622	Method and apparatus for handling I/O requests utilizing separate programming interfaces to access separate I/O services
11	US5920726	19970612	19990706	System and method for managing power conditions within a digital camera device
12	US5969705	19970313	19991019	Message protocol for controlling a user interface from an inactive application program
13	US6189034	19960508	20010213	Method and apparatus for dynamic launching of a teleconferencing application upon receipt of a call
14	US6239795	19990526	20010529	Pattern and color abstraction in a graphical user interface
15	US6343263	19940802	20020129	Real-time signal processing system for serially transmitted data
16	US6424354	19990401	20020723	Object-oriented event notification system with listener registration of both interests and methods
17	US7383453	20030403	20070206	Extensible, replaceable network component system
18	US7469381	20011106	20080722	System for ensuring encrypted communication after handover
Relevant patents from Nokia				
1	US5802465	19961001	19980901	Data transmission in a radio telephone network
2	US5862178	19960620	19990119	Method and apparatus for speech transmission in a mobile communications system
3	US5946651	19980818	19990831	Speech synthesizer employing post-processing for enhancing the quality of the synthesized speech
4	US6073036	19970428	20000606	Mobile station with touch input having automatic symbol magnification function
5	US6262735	19981104	20010717	Utilizing the contents of a message
6	US6317083	19990716	20011113	Antenna having a feed and a shorting post connected between reference plane and planar conductor interacting to form a transmission line
7	US6348894	20000510	20020219	Radio frequency antenna
8	US6359904	19980814	20020319	Data transfer in a mobile telephone network
9	US6373345	19991029	20020416	Modulator structure for a transmitter and a mobile station
10	US6518957	20000808	20030211	Communications device with touch sensitive screen
11	US6603431	20010824	20030805	Mobile station and antenna arrangement in mobile

				station
12	US6694135	19991229	20040217	Measurement report transmission in a telecommunications system
13	US6714091	20001219	20040330	VCO with programmable output power
14	US6775548	19980622	20040810	Access channel for reduced access delay in a telecommunications system
15	US6834181	20020313	20041221	Mobile communication device and related construction method
16	US6882727	20000306	20050419	Method of ciphering data transmission in a radio system
17	US6895256	20001207	20050517	Optimized camera sensor architecture for a mobile telephone
18	US6924789	20010829	20050802	User interface device
19	US7009940	20011010	20060307	Integrity check in a communication system
20	US7092672	20000919	20060815	Reporting cell measurement results in a cellular communication system
21	US7403621	20050825	20080603	Conserving power by reducing voltage supplied to an instruction-processing portion of a processor
22	US7558696	20071214	20081223	List scrolling and document translation, scaling, and rotation on a touch-screen display

As seen from Figure4-2 and Table 4-1, the long-lasting litigations between Apple and Nokia are triggered by hole sale of Apple's iPhone in the market. The involved products mainly include Apple's iPhone, iPad, iPod, tablet computer, laptop computer, and the like terminal products. The litigations are escalating. Let's wait and see what will happen.

Litigations between Apple and Motorola

Court	US ITC, North District Court of Illinois, and South District Court of Florida	Delaware Federal District Court	US ITC and Wisconsin Western Court	US ITC and Wisconsin Western Court
Plaintiff	MOTO	MOTO	APPLE	APPLE
Time	2010/10/06	2010/10/08	2010/10/29	2010/12
Defendant	APPLE	APPLE	MOTO	MOTO
Patents	MOTO Patents US6272333 US5710987 US6246862 US5754119 US6246697 US5958006 US5359317 US6008737 US5636223 US6101531 US7751826 US6377161 US5359317 US5311516 US5636223 US5319712 US6246697 US5490230 US6246862 US5572193 US6272333 US6175559 US7751826 US6359898	APPLE Patents US5455599 US5519867 US5566337 US5915131 US5929852 US5946647 US5969705 US6275983 US6343263 US6424354 USRE39486	APPLE Patents US7812828 US7663607 US5379430 US7479949 US6493002 US5838315	APPLE Patents 12

[redacted]

Figure 4-3 Litigations between Apple and Motorola

Table 4-2 Patents involved in the litigation between Apple and Motorola

Item	Patent application No.	Filing date	Authorization date	Title of invention
Relevant patents from Apple				
1	7812828	20070222	20101012	Ellipse fitting for multi-touch control surfaces
2	7663607	20040506	20100216	Multipoint touchscreen
3	7479949	20080411	20090120	Touch screen device, method, and graphical user interface for determining commands by applying heuristics
4	RE039486	20030403	20070206	Extensible, replaceable network component system
5	6493002	19970320	20021210	Method and apparatus for displaying and accessing control and status information in a computer system
6	6424354	19990401	20020723	Object-oriented event notification system with listener registration of both interests and methods
7	6343263	19940802	20020129	Real-time signal processing system for serially transmitted data
8	6275983	19980826	20010814	Object-oriented operating system
9	5969705	19970313	19991019	Message protocol for controlling a user interface from an inactive application program
10	5946647	19960201	19990831	System and method for performing an action on a structure in computer-generated data
11	5929852	19980115	19990727	Encapsulated network entity reference of a network component system
12	5915131	19950505	19990622	Method and apparatus for handling I/O requests utilizing separate programming interfaces to access separate I/O services
13	5838315	19971124	19981117	Support for custom user-interaction elements in a graphical, event-driven computer system
14	5566337	19940513	19961015	Method and apparatus for distributing events in an operating system
15	5519867	19930719	19960521	Object-oriented multitasking system
16	5455599	19950404	19951003	Object-oriented graphic system
17	5379430	19930804	19950103	Object-oriented system locator system
Relevant patents from Motorola				
1	7751826	20021024	20100706	System and method for E911 location privacy protection
2	6377161	19980811	20020423	Method and apparatus in a wireless messaging system for facilitating an exchange of address information
3	6359898	19980828	20020319	Method for performing a countdown function during a mobile-originated transfer for a packet radio system
4	6272333	19980612	20010807	Method and apparatus in a wireless communication system for controlling a delivery of data
5	6246862	19990203	20010612	Sensor controlled user interface for portable communication device
6	6246697	19980124	20010612	Method and system for generating a

				complex pseudonoise sequence for processing a code division multiple access signal
7	6175559	19990707	20010116	Method for generating preamble sequences in a code division multiple access system
8	6101531	19980415	20000808	System for communicating user-selected criteria filter prepared at wireless client to communication server for filtering data transferred from host to said wireless client
9	6008737	19960624	19991228	Apparatus for controlling utilization of software added to a portable communication device
10	5958006	19951219	19990928	Method and apparatus for communicating summarized data
11	5754119	19950831	19980519	Multiple pager status synchronization system and method
12	5710987	19950602	19980120	Receiver having concealed external antenna
13	5636223	19950627	19970603	Methods of adaptive channel access attempts
14	5572193	19940822	19961105	Method for authentication and protection of subscribers in telecommunications systems
15	5490230	19941222	19960206	Digital speech coder having optimized signal energy parameters
16	5359317	19921009	19941025	Method and apparatus for selectively storing a portion of a received message in a selective call receiver
17	5319712	19930826	19940607	Method and apparatus for providing cryptographic protection of a data stream in a communication system
18	5311516	19921123	19940510	Paging system using message fragmentation to redistribute traffic

As seen from Figure 4-3 and Table 4-2, the litigations between Apple and Motorola are firstly triggered by Motorola. Motorola initiates a lawsuit against Apple claiming that Apple infringes its 18 patents, including wireless communication technologies, antenna design, and smartphone technologies including wireless email, proximity sensing, software application management, location based service (LBS) and multi-device synchronization. Apple immediately initiates a lawsuit against Motorola claiming that the Motorola's mobile device makes infringements on Apple, including the smartphone mounted with Google Andriod.

Litigations between Apple and ELAN

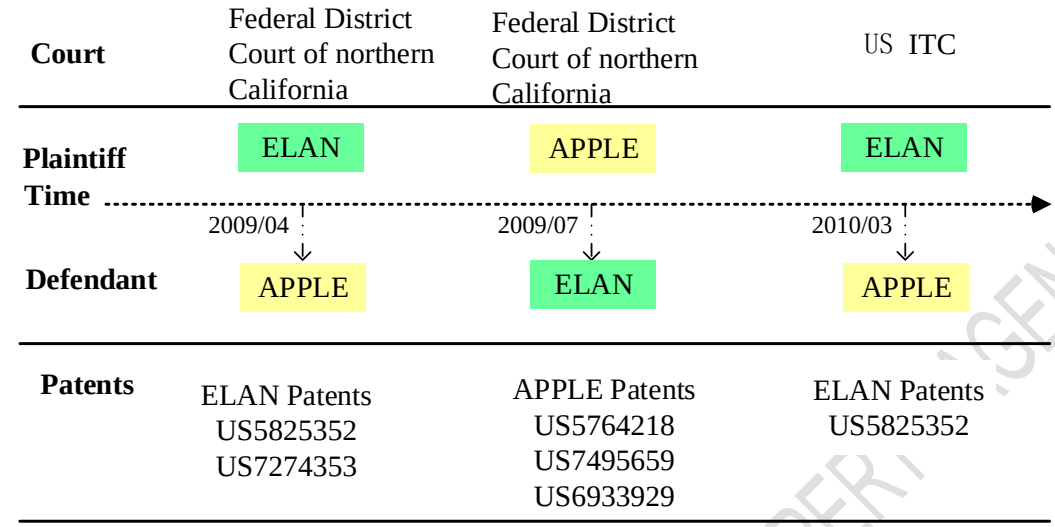


Figure 4-4 Litigations between Apple and ELAN

Table 4-3 Patents involved in the litigation between Apple and ELAN

Item	Patent application No.	Filing date	Authorization date	Title of invention
Relevant patents from Apple				
1	7495659	20031125	20090224	Touch pad for handheld device
2	6933929	20011207	20050823	Housing for a computing device
3	5764218	19950131	19980609	Method and apparatus for contacting a touch-sensitive cursor-controlling input device to generate button values
Relevant patents from ELAN				
1	7274353	20030924	20070925	Capacitive touchpad integrated with key and handwriting functions
2	5825352	19960228	19981020	Multiple fingers contact sensing method for emulating mouse buttons and mouse operations on a touch sensor pad

Referring to Figure 4-4 and Table 4-3, the litigations between Apple and ELAN were firstly triggered by ELAN. ELAN initiated a lawsuit against Apple with patent No. US5764218. This patent was also used to initiate a lawsuit against Synaptics. Finally, ELAN and Synaptics settled the dispute and became friends. Facing the lawsuit from ELAN, Apple keeps calm since Apple owns a large number of patents regarding touch. The result of the disputes between Apple and ELAN remains unknown.

Litigations between Apple and HTC

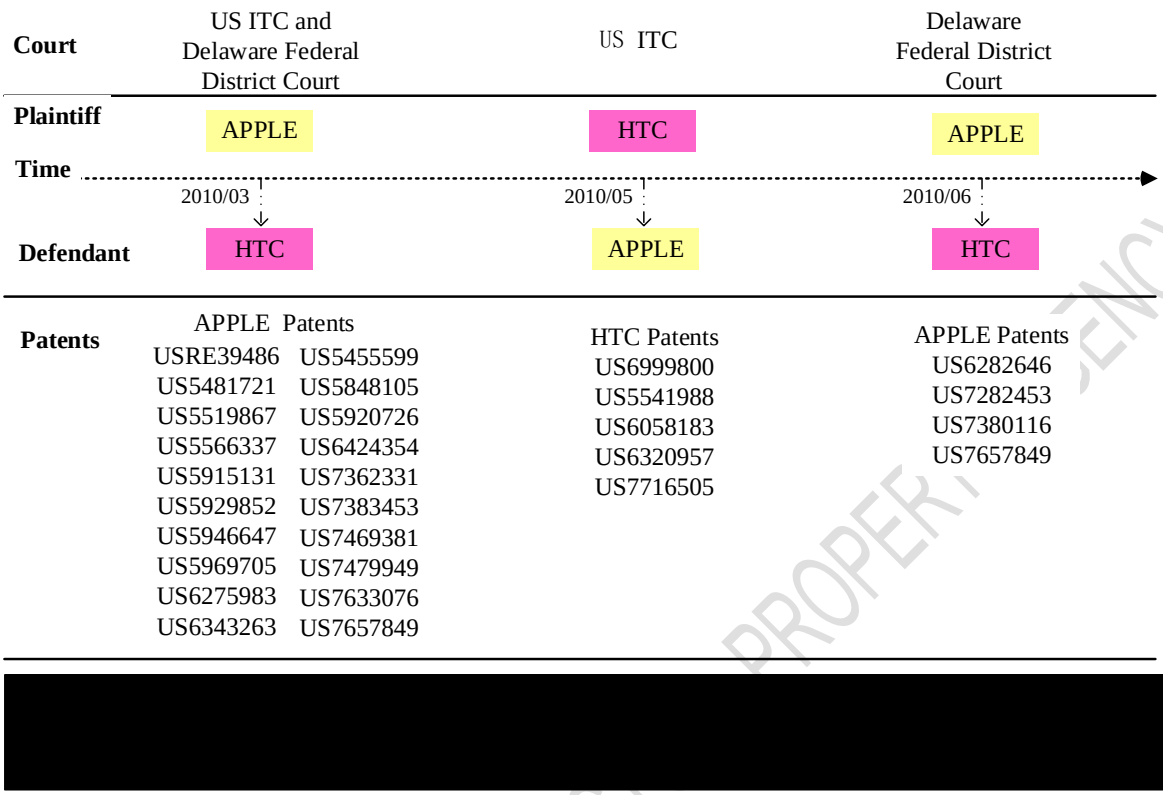


Figure 4-5 Litigations between Apple and HTC

Table 4-4 Patents involved in the litigation between Apple and HTC

Item	Patent application No.	Filing date	Authorization date	Title of invention
Relevant patents from Apple				
1	7657849	20051223	20100202	Unlocking a device by performing gestures on an unlock image
2	7633076	20061024	20091215	Automated response to and sensing of user activity in portable devices
3	7479949	20080411	20090120	Touch screen device, method, and graphical user interface for determining commands by applying heuristics
4	7469381	20071214	20081223	List scrolling and document translation, scaling, and rotation on a touch-screen display
5	7383453	20050825	20080603	Conserving power by reducing voltage supplied to an instruction-processing portion of a processor
6	7380116	20050808	20080527	System for real-time adaptation to changes in display configuration
7	7362331	20010105	20080422	Time-based, non-constant translation of user interface objects between states
8	7282453	20060629	20071016	Method for fabricating semiconductor device
9	RE039486	20030403	20070206	Extensible, replaceable network component system
10	6424354	19990401	20020723	Object-oriented event notification system with listener registration of both interests and methods

11	6343263	19940802	20020129	Real-time signal processing system for serially transmitted data
12	6282646	19980508	20010828	System for real-time adaptation to changes in display configuration
13	6275983	19980826	20010814	Object-oriented operating system
14	5969705	19970313	19991019	Message protocol for controlling a user interface from an inactive application program
15	5946647	19960201	19990831	System and method for performing an action on a structure in computer-generated data
16	5929852	19980115	19990727	Encapsulated network entity reference of a network component system
17	5920726	19970612	19990706	System and method for managing power conditions within a digital camera device
18	5915131	19950505	19990622	Method and apparatus for handling I/O requests utilizing separate programming interfaces to access separate I/O services
19	5848105	19961010	19981208	GMSK signal processors for improved communications capacity and quality
20	5566337	19940513	19961015	Method and apparatus for distributing events in an operating system
21	5519867	19930719	19960521	Object-oriented multitasking system
22	5481721	19941031	19960102	Method for providing automatic and dynamic translation of object oriented programming language-based message passing into operation system message passing using proxy objects
23	5455599	19950404	19951003	Object-oriented graphic system
Relevant patents from HTC				
1	7716505	20070614	20100511	Power control methods for a portable electronic device
2	6999800	20030701	20060214	Method for power management of a smart phone
3	6320957	19971009	20011120	Telephone dialler with easy access memory
4	6058183	19980521	20000502	Telephone dialler with a personalized page organization of telephone directory memory
5	5541988	19940627	19960730	Telephone dialler with a personalized page organization of telephone directory memory

Referring to Figure 4-5 and Table 4-4, the litigations between Apple and HTC are firstly triggered by Apple, and the battle therebetween is severe. In this battle, it is speculated that Apple is intended to attach Google Android with the infringement litigations as a commercial means. Litigations issued by HTC against Apple are mainly directed to Apple computer, which are counter fights from HTC.

Litigations between Microsoft and Motorola and between Microsoft and RIM, litigations between ELAN and Synaptics and between ELAN and Pixcir, infringement litigations initiated by TSERA regarding multi-touch control technologies, and litigations between patent license company MobileMedia Ideas LLC and RIM, Apple and HTC are not analyzed in this report.