

INFORMATION ONLY



## EU/ Claim Chart - SAMPLE

### US6141436 (CLAIM 4) Vs APPLE TOUCH ID

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US006141436A

**United States Patent** [19]  
**Srey et al.**

[11] **Patent Number:** **6,141,436**  
[45] **Date of Patent:** **Oct. 31, 2000**

[54] **PORTABLE COMMUNICATION DEVICE  
HAVING A FINGERPRINT IDENTIFICATION  
SYSTEM**

[75] Inventors: **Lena Srey**, Chicago; **Mark William  
Podl**, Bartlett; **Kevin D. Kaschke**,  
Hoffman Estates, all of Ill.

[73] Assignee: **Motorola, Inc.**, Schaumburg, Ill.

[21] Appl. No.: **09/047,773**

[22] Filed: **Mar. 25, 1998**

[51] **Int. Cl.**<sup>7</sup> ..... **G06K 9/00**; G07D 7/00

[52] **U.S. Cl.** ..... **382/124**; 340/825.34

[58] **Field of Search** ..... 382/124, 125,  
382/127; 380/23, 30; 340/825.34, 825.69,  
825.72; 348/552

[56] **References Cited**

**U.S. PATENT DOCUMENTS**

4,099,033 7/1978 Murray ..... 179/90  
4,358,640 11/1982 Murray ..... 179/90

**OTHER PUBLICATIONS**

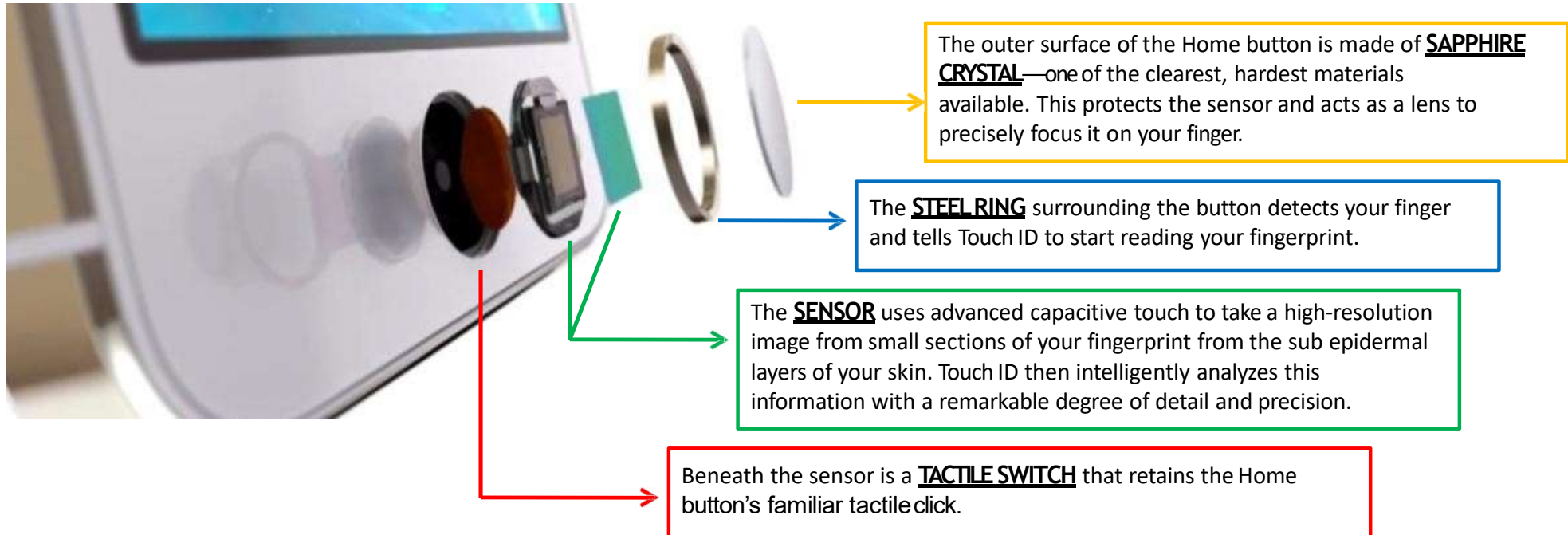
StarTAC™90 Wearable Cellular Telephone User Manual,  
1995, Motorola, Pan American Cellular Subscriber Group,  
600 North U.S. Highway 45, Libertyville, Illinois 60048, pp.  
2, 3 and 84–99.

*Primary Examiner*—Jose L. Couso  
*Assistant Examiner*—Shawn B. Cage  
*Attorney, Agent, or Firm*—Kevin D. Kaschke; Paul J.  
Bartusiak

[57] **ABSTRACT**

A portable communication device (**100, 300, 400, 500**) comprises a fingerprint identification system (**709**) including a scanner (**115**) for scanning a fingerprint (**123**) of a finger (**121**) to generate an image of the fingerprint (**123**). In a first embodiment, the scanner (**115**) is positioned relative to a switch (**201**) on the device (**100, 300, 400, 500**) to permit the finger (**121**) to generate the actuation force for the switch (**201**) when the fingerprint (**123**) is positioned on the scanner (**115**). In a second embodiment, the scanner (**115**) is ergonomically positioned on a housing (**113, 117, 119**) of the device (**100, 300, 400, 500**) where the finger (**121**) or a thumb naturally rests on the housing (**113, 117, 119**) when the person holds the housing (**113, 117, 119**) while the device (**100, 300, 400, 500**) is in use. In a third embodiment, a transmitter (**205**) of the device (**100, 300, 400, 500**) transmits

## APPLE 'TOUCHID'



**Touch ID** is the fingerprint sensing and unlocking system built into iPhone 5s, making secure access to the device faster and easier. This forward-thinking technology reads fingerprints from any angle and learns more about a user's fingerprint over time. Touch ID sensor takes a high resolution image of the fingerprint and stores it in mathematical representation. Touch ID makes using a longer, more complex passcode far more practical because users won't have to enter it as frequently. Touch ID also overcomes the inconvenience of a passcode-based lock, not by replacing it but rather by securely providing access to the device within thoughtful boundaries and time constraints.

## Claim 4 of US 6141436



**US6141436:** Portable communication device having a fingerprint identification system

### Claim 4:

A cellular telephone for sending and receiving information such as voice signals, the cellular telephone comprising:

- a housing;
- a transmitter carried by the housing, the transmitter for modulating and transmitting input information; a receiver carried by the housing, the receiver for receiving and demodulating transmitted information;
- a fingerprint identification security system carried by the housing, the fingerprint identification security system to detect authorized and unauthorized use of the cellular telephone, the fingerprint identification security system including: a scanner for scanning a fingerprint of a finger to generate an image of the fingerprint,
- a first memory coupled to the scanner for storing the image of the fingerprint,
- a second memory coupled to the first memory for storing a reference fingerprint, and
- control circuitry coupled to the first memory and the second memory, the control circuitry for determining whether the image of the fingerprint matches the reference fingerprint, wherein when the image of the fingerprint matches the reference fingerprint, the control circuitry activates the cellular telephone for use, and
- when the image of the fingerprint does not match the reference fingerprint, the control circuitry causes the cellular telephone to temporarily transmit the image of the fingerprint to a remote site and then deactivate the cellular telephone from use.

# CLAIM MAP ANALYSIS

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## US 6,141,436 (CLAIM 4)–Apple iPhone 5S (Touch ID)

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## CLAIM MAP ANALYSIS

### US 6,141,436 (CLAIM 4) - Apple iPhone 5S (Touch ID)

#### CLAIM 4

A cellular telephone for sending and receiving information such as voice signals, the cellular telephone comprising:

a housing

The outer cover of iPhone 5S acts as a housing



Source: <https://www.apple.com/in/iphone-5s/specs/>

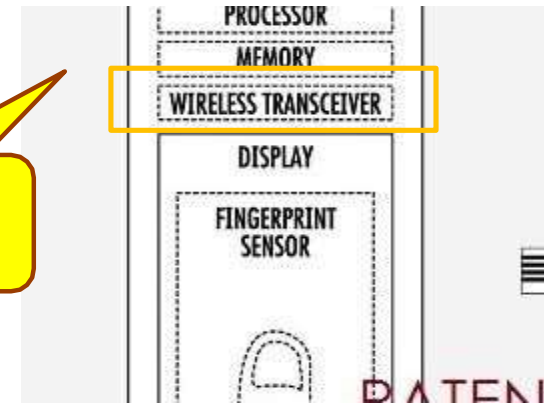
## CLAIM MAP ANALYSIS

US 6,141,436 (CLAIM 4)–Apple iPhone 5S (Touch ID)

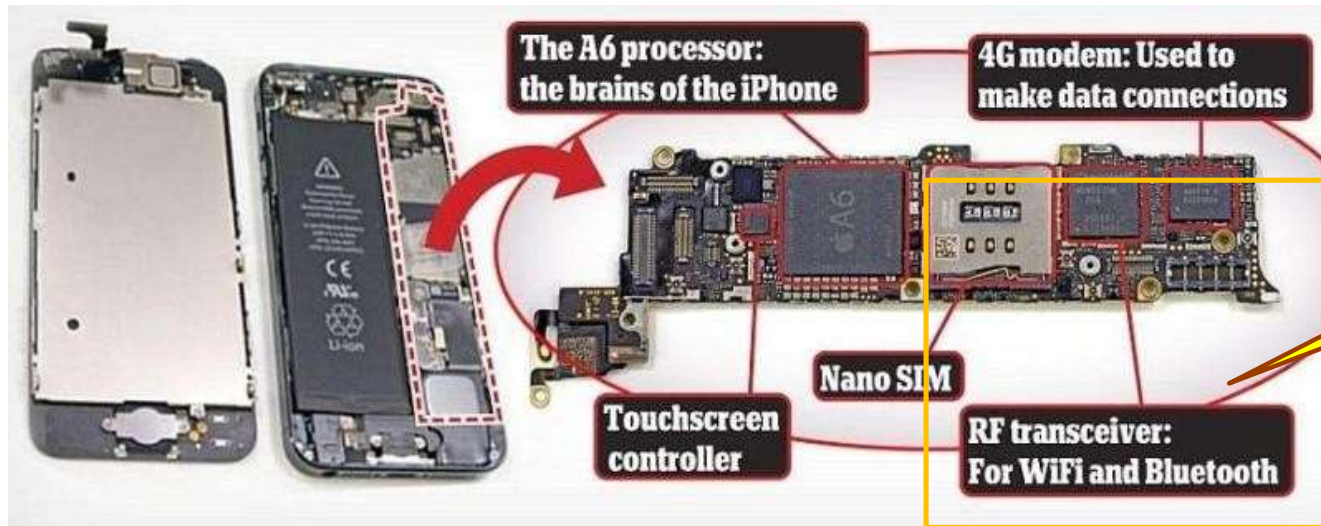
### CLAIM 4(Cont...)

a transmitter carried by the housing, the transmitter for modulating and transmitting input information;

a receiver carried by the housing, the receiver for receiving and demodulating transmitted information;



Transmitter & Receiver is present inside the iPhone



Transmitter clearly shown inside the iPhone circuitry.

Source: <http://www.patentlyapple.com/patently-apple/2013/07/apples-acquired-fingerprint-sensor-patent-from-authentec-comes-to-light.html>

Source: <http://juantadeo.wordpress.com/2012/09/21/iphone-5-inside/>

Source: <https://support.google.com/glass/answer/4347178>

## CLAIM MAP ANALYSIS

### US 6,141,436 (CLAIM 4)–Apple iPhone 5S (Touch ID)



#### CLAIM 4(Cont...)

a fingerprint identification security system carried by the housing, the fingerprint identification security system to detect authorized and unauthorized use of the cellular telephone, the fingerprint identification security system including:

a scanner for scanning a fingerprint of a finger to generate an image of the fingerprint,

a first memory coupled to the scanner for storing the image of the fingerprint,

a second memory coupled to the first memory for storing a reference fingerprint, and



Source: <http://appleinsider.com/articles/13/09/20/crowd-sourced-site-offers-cash-wine-bitcoins-for-hackers-to-crack-iphone-5s-touch-id>



## CLAIM MAP ANALYSIS

### US 6,141,436 (CLAIM 4)–Apple iPhone 5S (Touch ID)



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#### Advanced technologies

The technology within Touch ID is some of the most advanced hardware and software we've put in any device. To fit within the Home button, the Touch ID sensor is only 170 microns thin, not much thicker than a human hair. This high-resolution 500 ppi sensor can read extremely fine details of your fingerprint. The button itself is made from sapphire crystal—one of the clearest, hardest materials available. This protects the sensor and acts as a lens to precisely focus it on your finger.

The steel ring surrounding the button detects your finger and tells Touch ID to start reading your fingerprint. The sensor uses advanced capacitive touch to take a high-resolution image from small sections of your fingerprint from the subepidermal layers of your skin. Touch ID then intelligently analyzes this information with a remarkable degree of detail and precision. It categorizes your fingerprint as one of three basic types—arch, loop, or whorl. It also maps out individual details in the ridges that are smaller than the human eye can see and even inspects minor variations in ridge direction caused by pores and edge structures.

Touch ID can even read multiple fingerprints, and it can read fingerprints in 360-degrees of orientation. It then creates a mathematical representation of your fingerprint and compares this to your enrolled fingerprint data to identify a match and unlock your iPhone. Touch ID will incrementally add new sections of your fingerprint to your enrolled fingerprint data to improve matching accuracy over time. Touch ID uses all of this to provide an accurate match and a very high level of security.

Source: <http://support.apple.com/kb/HT5949>

## CLAIM MAP ANALYSIS

### US 6,141,436 (CLAIM 4)–Apple iPhone 5S (Touch ID)



#### CLAIM 4(Cont...)

a fingerprint identification security system carried by the housing, the fingerprint identification security system to detect authorized and unauthorized use of the cellular telephone, the fingerprint identification security system including:

a scanner for scanning a fingerprint of a finger to generate an image of the fingerprint,

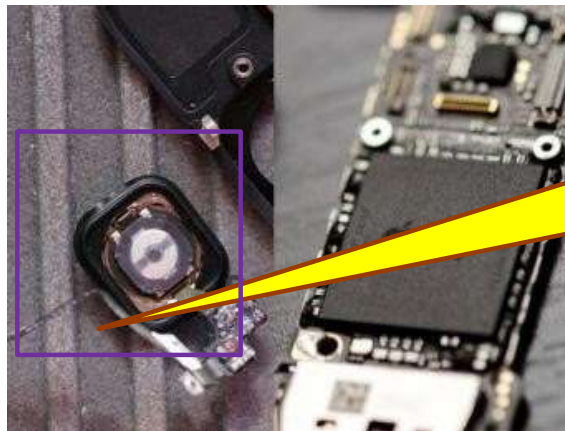
a first memory coupled to the scanner for storing the image of the fingerprint,

a second memory coupled to the first memory for storing a reference fingerprint, and

*Touch ID authentication and the data associated with the enrolled fingerprints are not available to other apps or third parties*

The document also includes previously revealed technical data around the Touch ID scanner itself, which takes an 88-by-88-pixel, 500-ppi raster scan of the finger being applied, which is then transmitted to the Secure Enclave, vectorized for the purposes of being analyzed and compared to fingerprints stored in memory, and then discarded. This info, it's worth recalling, is never transmitted to Apple's servers, nor is it stored in iCloud or the iTunes backup of a device.

Source: <http://b-i.forbesimg.com/anthonykosner/files/2013/11/Apple-TouchID-A7Chip-iMore.jpg>



The fingerprint sensor is coupled to the A7 processor which forwards the data to Secured Enclave. The secured enclave stores the reference image of the fingerprint in a mathematical form. In other terms, the reference image is stored as ROM And user input as RAM which is specifically mentioned in the patent.

Source: <http://techcrunch.com/2014/02/26/how-touch-id-and-secure-enclave-work/>

## CLAIM MAP ANALYSIS

US 6,141,436 (CLAIM 4)–Apple iPhone 5S (Touch ID)

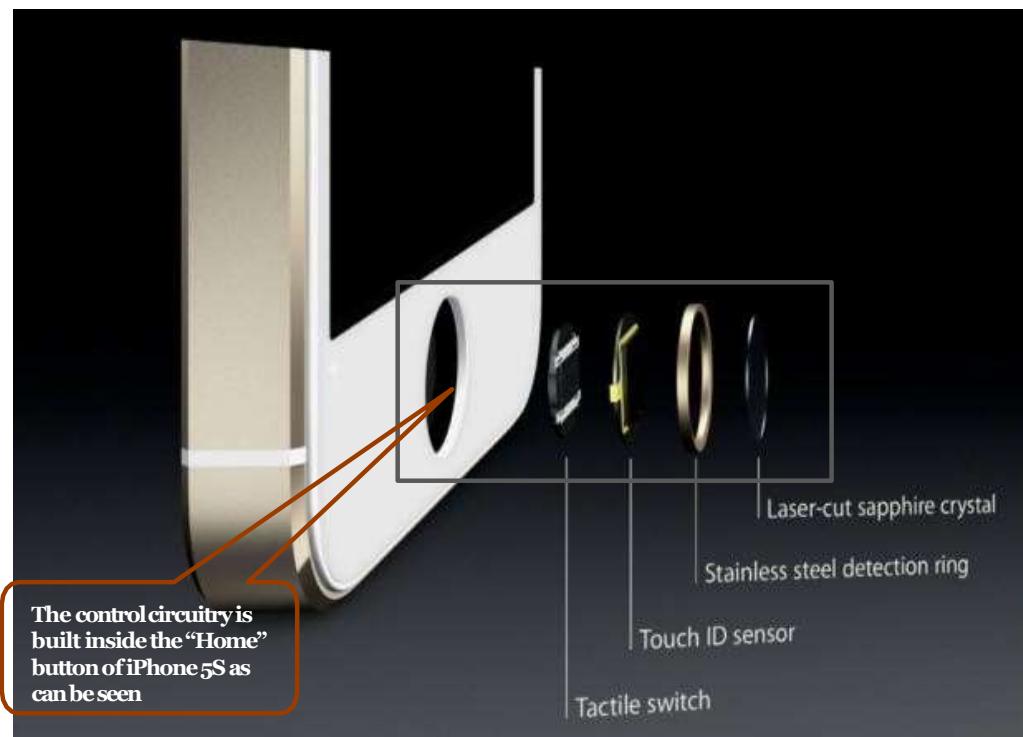


### CLAIM 4(Cont...)

control circuitry coupled to the first memory and the second memory, the control circuitry for determining whether the image of the fingerprint matches the reference fingerprint, wherein

when the image of the fingerprint matches the reference fingerprint, the control circuitry activates the cellular telephone for use, and

when the image of the fingerprint does not match the reference fingerprint, the control circuitry causes the cellular telephone to temporarily transmit the image of the fingerprint to a remote site and then deactivate the cellular telephone from use.



Source: <http://deepapple.com/articles/25493.html>

## CLAIM MAP ANALYSIS

US 6,141,436 (CLAIM 4)–Apple iPhone 5S (Touch ID)



### CLAIM 4(Cont...)

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when the image of the fingerprint does not match the reference fingerprint, the control circuitry causes the cellular telephone to temporarily transmit the image of the fingerprint to a remote site and then deactivate the cellular telephone from use.

Additionally, data that is saved to the file system by the Secure Enclave is encrypted with a key tangled with the UID and an anti-replay counter.

The Secure Enclave is responsible for processing fingerprint data from the Touch ID sensor, determining if there is a match against registered fingerprints, and then enabling access or purchase on behalf of the user. Communication between the A7 and the Touch ID sensor takes place over a serial peripheral interface bus. The A7 forwards the data to the Secure Enclave but cannot read it. It's encrypted and authenticated with a session key that is negotiated using the device's shared key that is built into the Touch ID sensor and the Secure Enclave. The session key exchange uses AES key wrapping with both sides providing a random key that establishes the session key and uses AES-CCM transport encryption.

**If the user is recognized, then access to the phone or purchase is granted**

Source: [http://www.apple.com/ipad/business/docs/iOS\\_Security\\_Feb14.pdf](http://www.apple.com/ipad/business/docs/iOS_Security_Feb14.pdf)

## CLAIM MAP ANALYSIS



### US 6,141,436 (CLAIM 4)–Apple iPhone 5S (Touch ID)

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Source: [http://www.apple.com/ipad/business/docs/iOS\\_Security\\_Feb14.pdf](http://www.apple.com/ipad/business/docs/iOS_Security_Feb14.pdf)

#### Touch ID security

The fingerprint sensor is active only when the capacitive steel ring that surrounds the Home button detects the touch of a finger, which triggers the advanced imaging array to scan the finger and send the scan to the Secure Enclave.

The 88-by-88-pixel, 500-ppi raster scan is temporarily stored in encrypted memory within the Secure Enclave while being vectorized for analysis, and then it's discarded after. The analysis utilizes subdermal ridge flow angle mapping, which is a lossy process that discards minutia data that would be required to reconstruct the user's actual fingerprint. The resulting map of nodes never leaves iPhone 5s, is stored without any identity information in an encrypted format that can only be read by the Secure Enclave, and is never sent to Apple or backed up to iCloud or iTunes.

Additionally, data that is saved to the file system by the Secure Enclave is encrypted with a key tangled with the UID and an anti-replay counter.

The Secure Enclave is responsible for processing fingerprint data from the Touch ID sensor, determining if there is a match against registered fingerprints, and then enabling access or purchase on behalf of the user. Communication between the A7 and the Touch ID sensor takes place over a serial peripheral interface bus. The A7 forwards the data to the Secure Enclave but cannot read it. It's encrypted and authenticated with a session key that is negotiated using the device's shared key that is built into the Touch ID sensor and the Secure Enclave. The session key exchange uses AES key wrapping with both sides providing a random key that establishes the session key and uses AES-CCM transport encryption.

Source: <http://cdn-static.zdnet.com/>

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+1 678 666 0143



info@immunisip.com

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