INVALIDITY SEARCH REPORT

Patent Number:

Patent Title:

Our Ref No.:

Client Ref No.:

Date

TT Consultants
India| USA| Taiwan
project@ttconsultants.com
www.ttconsultants.com

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Validity / Invalidity Search Report

1. Report

1.1 Objective

The objective of the search is to conduct a Patent and Non-patent literature search and to identify the references that belong to substantially the same technical field and subject to adequate legal review, may be construed as prior art for subject patents **(US x,xxx,xxx)**.

Scope: References that have one or more technical features overlapping with the key features of the subject patent are also included in the analysis based on the concept that they can be combined with other references to form a relevant prior art.

The references cited in the report may have other features/elements that may not be present in the subject patent. These references have been cited for the information of the client to provide related references that are present in the domain.

Patent references cited on the face of the subject patent along with their family members are being excluded from the purview of this search. Non-Patent references cited on the face of the patent are also being excluded from the purview of this search.

Please refer to the conditions and limitations of search for details.

We hope that results of this search allow you to assess the situation of the subject patent. We would be happy to answer any further questions.

Key Dates of the Subject Patents

Priority Date: 1996-09-06
Filing Date: 1996-09-06
Issue Date: 2000-10-03

Search concluded on: 2012-02-21

Ranjit Malhotra – Patent Analyst
Sandeep Singh – Senior Patent Analyst
TT Consultants Pvt. Ltd.
project@ttconsultants.com

After thorough understanding the subject patent, the researcher breaks down the invention into several key features. These key features form the basis of the search.

1.2 Key Features/Claims

The key features are prepared based on the subject patent (**US x,xxx,xxx**) and information provided by the client. The analysis of the references has been done based on one or more features overlapping with the key features of the patent to form a relevant prior art.

Key Features/Claim(s) of the Subject Patent

Note: *Key Features A-H are extracted from Independent Claims (1,3,5.....) of the subject patent.*

Key Features	
A	A drum adapted to be …
B	said drum having ….
C	said bulges ….
D	characterised in that …
E	each bulge is ….
F	each bulge has ….
G	the bulges are arranged …..
H	the offset ……

Summary of identified references along with hyperlinks of the patents

1.3 Summary

Based on the details of the invention, five patents and two non-patent literatures were identified. *Only one patent per family is being mapped and other family members of the family are incorporated by reference.* Summary of the citations is presented in the tables below. Clicking on the hyperlinks will open the patent record in Esp@cenet/USPTO with e.g. full text, family and legal data and the possibility to download the original document.

1. Patent Citations

Sr. No.	Citation No.	Title	Priority Date	Publication Date
1.	US5845263	Interactive Visual Ordering System	1995-06-16	1998-12-01
2.	US6731951B1	Wireless Equipment	1999-04-20	2004-05-04
3.	US1505881A			
4.	DE19951743A1			
5.	WO2006131416A1			

2. Non-Patent Citations

Sr. No.	Title	Publication Date
1.	Low Contact Resistance Metallization for Gigabit Scale DRAM's Using Fully-Dry Cleaning by Ar/H ECR Plasma	April 1997
2.		2001-05-03

3. References provided by the client (Excluded from Scope of Search)

Sr. No.	Citation No.	Title	Family Members
1.	US5845263	Interactive Visual Ordering System	
2.	US6731951B1	Wireless Equipment	
3.	US1505881A		

Provided on client's request This analysis compares all the identified references in light of the key features. Technical comments are also provided for each identified reference.

1.4 Key Features Analysis (Optional)

Sr. No.	Citation No.	Key Feature 1	Key Feature 2	Key Feature 3	Remarks
1.	US5845263	Yes	Yes	Yes	Covers all the features
2.	US6731951B1	Yes	Yes*	Yes	Unidirectional flow (Inspiration only)
3.	US1505881A	Yes	No	Yes	Provides impediment to air flow in one direction
4.	DE19951743A1	Yes	Yes	No	Completely fits within the oral cavity
5.	WO2006131416A1	No	Yes	Yes	Polygonal bulges

(The Key feature is implicitly or partially inferred.)*

1.5 Possible Combination of the Identified Citations

Sr. No.	Combination of Identified Citations	Challenged Claims		Reason to Combine
		Target Claims	Target Claim Type	
1.	**1) US'xyz** (Juhasz et al.) **2) US'pqr** (Mackey et al.) **3) Netware** (Sony)	**Claim 1, 12**	**Independent Claims**	US'xyz does not disclose explicitly an integrated indexed database and storing said database. US'pqr covers these limitations. US'pqr does not disclose explicitly a video camera for generating video signals proximate a vehicle, an authentication code for accessing the recorded data and secure transmission of data from the recording device. US'xyz covers these limitations.
		Claim 20, 21	**Dependent Claims**	
2.	**1) US'abc** (Juhasz et al.) **2) US'pqr** (Mackey et al.)	**Claim 1, 12**	**Independent Claims**	US'pqr does not disclose explicitly an integrated indexed database and storing said database. US'abc covers these limitations. US'abc does not disclose explicitly a video camera for generating video signals proximate a vehicle, an authentication code for accessing the recorded data and secure transmission of data from the recording device. US'pqr covers these limitations.
		Claim 20, 21	**Dependent Claims**	
3	**1) US'abc** (Juhasz et al.)	**Claim 1, 12**	**Independent**	US'abc is explicitly or partially discloses/inferred all the claim

			Claims	elements of the independent claims of subject patent US'xxx.

2. Prior Art Results (35 U.S.C. 102)

The following citations are only for personal use.

All the results are mapped based on the key features of the subject patent. The relevant texts of the patent citations are highlighted with different colors to support the mapping based on the subject patent.

2.1 Details of Patent Citations

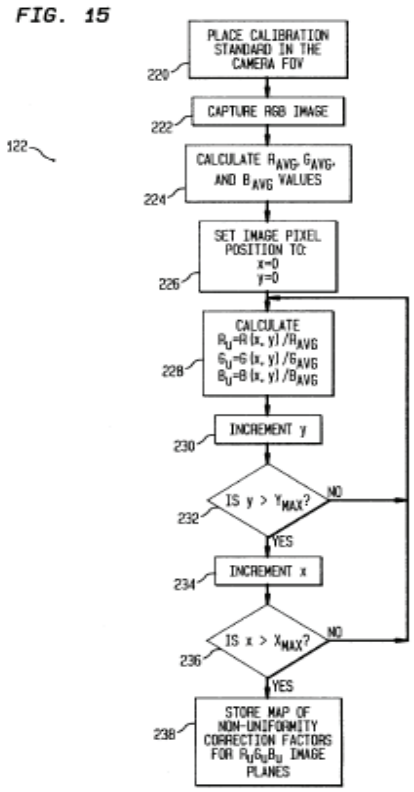
Result 1 **US5xxxx2A**

Detailed Searcher's Comment (As Per Client Instructions): The mapped citation discloses a treatment planning, simulation, and verification system for providing integration of diagnostic and imported digitally reconstructed radiograph ("DRR") images (inferred as the second image) from a computed tomography ("CT") scanner, which may be added to a patient's record (inferred as the patient profile) immediately after capture. Also, In this way the treatment planning, simulation, and verification components of the system enable the clinicians to fine-tune or update treatment plans by analyzing the high-quality anatomical images of patients in their treatment positions. Further, these images are used for comparisons with treatment plan reference images so that care providers may analyze and make necessary adjustments and corrections to the treatment plan immediately.

Publication No.	US5xxxx2A	**Application No.**	US199xxxxxx07	**Priority No.**	US199xxxxx07
Title	Colorimetric imaging ……..				
Publication Date		**Application Date**		**Priority Date**	
Assignee	Color And …….				
Inventor(s)	Alston ……				
Family Member(s)	None				
Abstract					

A color and appearance measurement apparatus combines a computer controlled color video camera, controlled illumination conditions, frame grabber to digitize the video signal, and image processing methods to perform non-contact calorimetric measurements of complex patterns of color. Video images of samples placed into the field of view of the camera are digitized and converted from the color camera's red, green, and blue (RGB) color space to the internationally recognized and standardized CIE XYZ color space. …. These measurements provide quantifiable metrics, to which various color and appearance attributes of other samples can be compared, for quality control inspection of complex colored samples that cannot be measured using conventional color measuring instruments.

Provided on client's request This analysis compares all the identified references in light of the key features. Technical comments are also provided for each identified reference.

Key features/Claims		Identified Patent Number: USxxxx72A
A	In a computer system, **an virtua**	**Directing API achieves this by creating an intermediate er that translates generic hardware commands into specific ommands for particular pieces of hardware.** *(Column no.8 , Line no. 7)*
A1	the interface comprising: a **command receiver unit**	**The GUI of the VP application is made to include features allowing a user to play,; reverse, stop, pause, forward or scrub a particular video sequence**. If the forward or reverse features are activated, the VP application seeks the selected key-frame (in the video sequence) and optionally the selected audio segment (in the corresponding audio file) and begins playing the video and audio segment, if any, from that point on in the direction indicated. 
A2	**and a translation unit,**	**The translation unit translates this virtual device command from the application to the specific hardware-related commands that can be understood by the vendor-or standards-specific telecommunication resources in the telecommunication system. Directs is a set of API's (Application Program Interfaces) that enables programmers in the Windows 10environment to write programs in memory that access hardware features of a**

		computer without knowing exactly what hardware will be installed on the machine where the program eventually runs. *(Column no.11 , Line no. 58)*
A3	a command send unit	DirectDraw is a software interface standard for transferring video processing from a PC's CPU to the video adapter. *(Column no.6 , Line no. 38)*
A4	a storage medium	An API provides the building blocks necessary to develop a program. An API is a set of routines, protocols and tools for building software applications. Directs is a set of API's (Application Program Interfaces) that enables programmers in the Windows 10environment to write programs in memory that access hardware features of a computer without knowing exactly what hardware will be installed. *(Column no.7, Line no. 25)*

2.2 Details of Non-Patent Citations

Result 1 Low Contact Resistance Metallization.... DRAM's Using Fully-Dry Cleaning .....

Title	Low Contact Resistance Metallization for Gigabit Scale DRAM's Using Fully-Dry Cleaning by Ar/H ECR Plasma
Author/Company	Tetsuya Taguwa | Koji Urabe| Makoto Sekine | Yoshiaki Yamada | Takamaro Kikkawa
Publication Date	April 1997
Link(s)	http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=563363&url=http%3A%2F%2Fieeexplore.ieee.org%2Fiel1%2F16%2F12237%2F00563363.pdf%3Farnumber%3D563363
Abstract	

A fully-dry cleaning technique with Ar/H2 Electron Cyclotron Resonance (ECR) plasma was developed as a low contact resistance metallization technology for Gigabit scale DRAM contacts. By combining with ECR TiN/Ti-CVD, extremely low contact resistances of 296 and 350 for 0.3-m contact diameter with aspect ratio of 7 were realized on n+ and p+ diffusion layers, respectively. No leakage current was observed. By using this technology, a DRAM ULSI, which was planarized by Chemical Mechanical Polishing (CMP) and had deep contact holes with aspect ratio of 6, was successfully demonstrated.

Key features/Claims		Relevant Text
IN1	**A method of forming a contact, comprising:** *(Claims 1, 12)*	A fully-dry **cleaning technique with Ar/H2 Electron Cyclotron Resonance (ECR) plasma was developed as a low contact resistance metallization technology for Gigabit scale DRAM contacts. By combining with ECR TiN/Ti-CVD,** extremely low contact resistances of 296 and 350 for 0.3-m contact diameter with aspect ratio of 7 were realized on n+ and p+ diffusion layers, respectively. No leakage current was observed. By using this technology, a DRAM ULSI, which was planarized by Chemical Mechanical Polishing (CMP) and had deep contact holes with aspect ratio of 6, was successfully demonstrated. *(Page no. 01)*

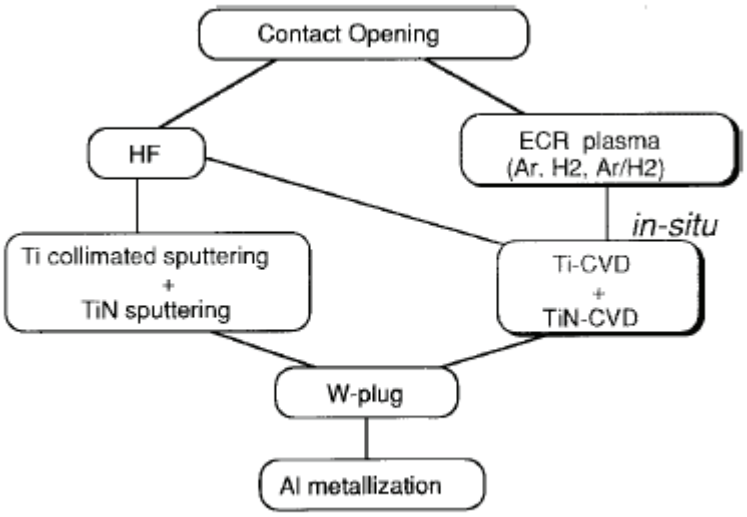
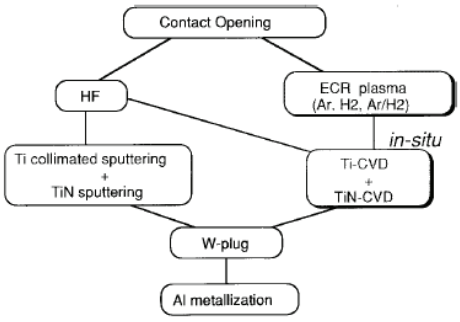
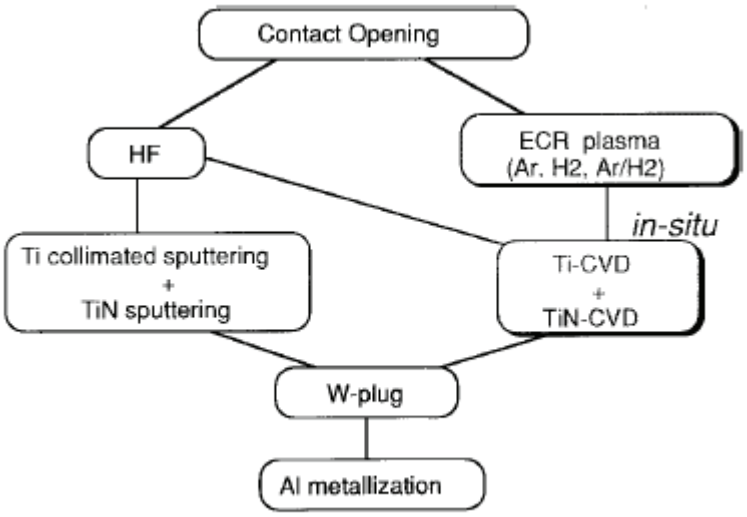
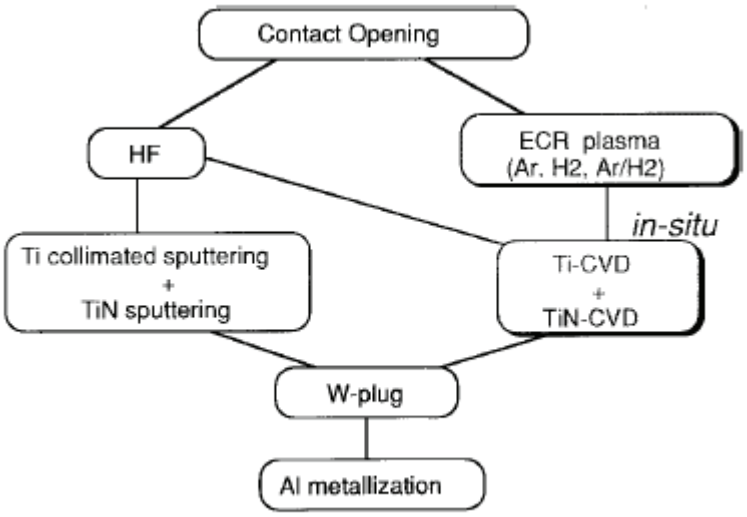
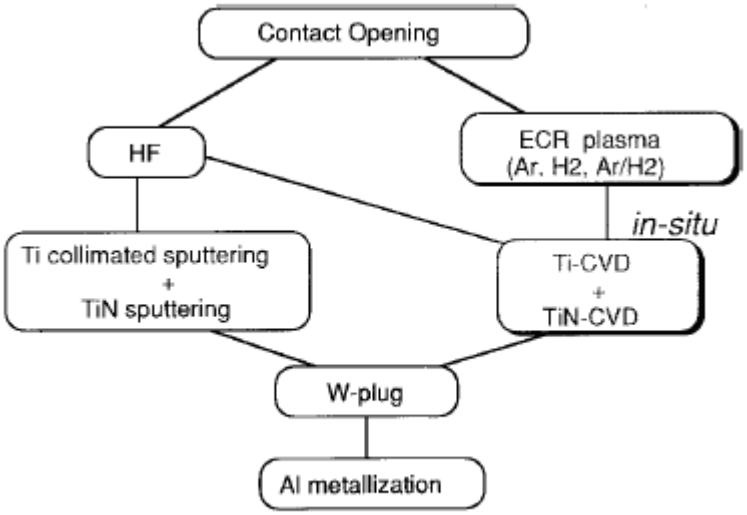
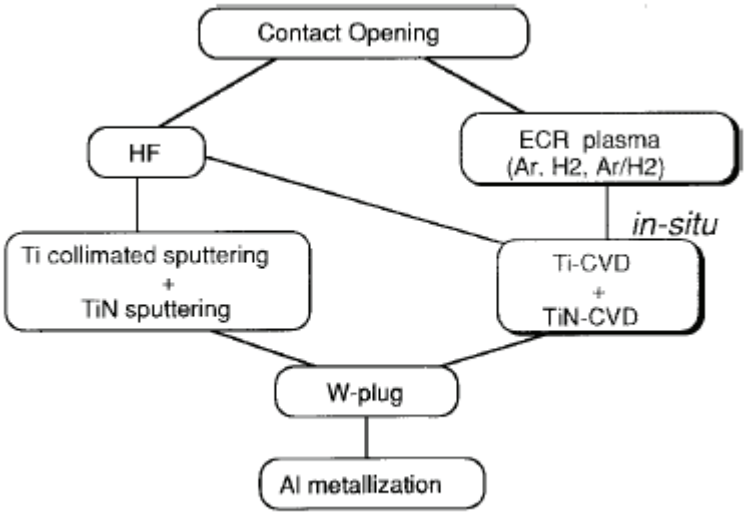
		 Fig. 1. Experimental procedure of contact metallization.
IN2	**performing an in-situ contact clean with high density biased Ar and NF3 plasma;** *(Claim 1)*	The **mixture gas of Ar and H improves the Si/SiO etch rate**. Since H radicals in ECR plasma are effective for etching of SiO and poly-Si, active H radicals are obtained by increasing H content in Ar/H mixture gas. However, H ECR plasma is unstable, **therefore it is necessary to use Ar/H mixture gas to obtain active H radicals.** Furthermore, the mixture gas prevents resputtered SiO deposition and knockedon native oxide. Ar content decreases with increasing H content, so that resputtered SiO deposition and knocked-on native oxide formation is prevented by decreasing Ar content Consequently, **the combination of Ar and H whose content is greater than 26% is effective to remove SiO and to etch Si surface at the bottom of the contact holes.** *(Page no. 02)*  Fig. 1. Experimental procedure of contact metallization.

		TABLE I EXPERIMENTAL CONDITIONS OF DIFFERENT ECR PLASMA CLEANING METHODS AND ECR TiN/Ti-CVD **ECR gases** **Ar(sccm) / H_2(sccm) / content / $TiCl_4$ (sccm) / N_2 (sccm)** ECR cleaning — Ar ECR: 290 / 0 / 100%Ar / - / - ECR cleaning — Ar/H_2 ECR: 100-290 / 25-100 / 8-50%H2 / - / - ECR cleaning — H_2 ECR: 0 / 100 / 100%H2 / - / - Ti-CVD: 290 / 100 / - / 10 / - TiN-CVD: 70-290 / 6-30 / - / 5-20 / 2-8 ***Searcher's Comment:* In the mapped citation Ar/H mixture is used for the contact cleaning. However, contact cleaning with high density biased NF3 plasma is not explicitly mentioned.**
IN3	**forming titanium;** *(Claim 1)*	Fig. 3 shows impurity intensities in **thin TiSix films deposited on p Si surface after contact dry etching.** Etched SiO equivalent thickness was 50 A° . After various pretreatments, **Ti films was deposited on p Si for 150 s.** p Si substrates were utilized because the surface inactivation for p Si is worse than n Si after contact fabrication processes [11]. *(Page no. 03)* In order to investigate the effect of Ar/H ECR plasma cleaning, TiSix/p Si interfaces at the bottom of contact holes were observed by TEM. Fig. 4 shows cross-sectional TEM micrographs and TED patterns of **TiN/TiSix/p Si interfaces at the bottom of contact holes. Ti film was deposited for 30 s. A thick uniform silicide layer was formed at the Ti/Si interface after Ar/H plasma cleaning as shown in Fig. 4(b).** A selected area electron diffraction pattern showed the clear existence of C49-TiSi after Ar/H plasma cleaning. On the other hand, nonuniform thin silicide layer was formed after HF dipping as shown in Fig. 4(a). The difference is due to surface conditions between HF and Ar/H ECR cleaning**. It is important for Ti- CVD to be grown on the clean surface.** The impurities, such as carbon and oxygen, prevent TiSix from growing during Ti-CVD. *(Page no. 03)* Fig. 5 showed the effects of cleaning methods on contact resistance, in which four different cleanings were compared. In order to investigate the effect of contact cleaning at the bottom, shallow contact holes were used **and thin Ti film was deposited.** That is, depth of contact hole was fixed at 0.3 m and Ti film was deposited for 30 s. Etching time of Ar, H and Ar/H ECR plasma cleanings were 90, 120, and 30 s,

		respectively. Then **Ti was sequentially deposited for 30 s.** *(Page no. 04)*  Fig. 1. Experimental procedure of contact metallization.
IN4	**forming titanium by reacting Ti(N(CH3)2)4 with hydrogen;** *(Claim 12)*	**Not Explicitly Disclosed**
IN5	**depositing the titanium on silicon exposed to chemical vapor deposition (CVD) reactants at a bottom of a contact hole;** *(Claim 1)*	Fig. 3 shows impurity intensities in **thin TiSix films deposited on p Si surface after contact dry etching.** Etched SiO equivalent thickness was 50 A° . After various pretreatments, **Ti films was deposited on p Si for 150 s.** p Si substrates were utilized because the surface inactivation for p Si is worse than n Si after contact fabrication processes [11]. *(Page no. 03)* In order to investigate the effect of Ar/H ECR plasma cleaning, TiSix/p Si interfaces at the bottom of contact holes were observed by TEM. Fig. 4 shows cross-sectional TEM micrographs and TED patterns of **TiN/TiSix/p Si interfaces at the bottom of contact holes. Ti film was deposited for 30 s. A thick uniform silicide layer was formed at the Ti/Si interface after Ar/H plasma cleaning as shown in Fig. 4(b).** A selected area electron diffraction pattern showed the clear existence of C49-TiSi after Ar/H plasma cleaning. On the other hand, nonuniform thin silicide layer was formed after HF dipping as shown in Fig. 4(a). The difference is due to surface conditions between HF and

		Ar/H ECR cleaning**. It is important for Ti- CVD to be grown on the clean surface.** The impurities, such as carbon and oxygen, prevent TiSix from growing during Ti-CVD. *(Page no. 03)* Fig. 5 showed the effects of cleaning methods on contact resistance, in which four different cleanings were compared. In order to investigate the effect of contact cleaning at the bottom, shallow contact holes were used **and thin Ti film was deposited.** That is, depth of contact hole was fixed at 0.3 m and Ti film was deposited for 30 s. Etching time of Ar, H and Ar/H ECR plasma cleanings were 90, 120, and 30 s, respectively. Then **Ti was sequentially deposited for 30 s.** *(Page no. 04)*  Fig. 1. Experimental procedure of contact metallization.
IN6	**depositing the titanium on silicon exposed at a bottom of a contact hole and on an insulator exposed at sidewalls of the contact hole;** *(Claim 12)*	Fig. 3 shows impurity intensities in **thin TiSix films deposited on p Si surface after contact dry etching.** Etched SiO equivalent thickness was 50 A° . After various pretreatments, **Ti films was deposited on p Si for 150 s.** p Si substrates were utilized because the surface inactivation for p Si is worse than n Si after contact fabrication processes [11]. *(Page no. 03)* In order to investigate the effect of Ar/H ECR plasma cleaning, TiSix/p Si interfaces at the bottom of contact holes were observed by TEM. Fig. 4 shows cross-sectional TEM micrographs and TED patterns of **TiN/TiSix/p Si interfaces at the bottom of contact holes. Ti film**

		was deposited for 30 s. A thick uniform silicide layer was formed at the Ti/Si interface after Ar/H plasma cleaning as shown in Fig. 4(b). A selected area electron diffraction pattern showed the clear existence of C49-TiSi after Ar/H plasma cleaning. On the other hand, nonuniform thin silicide layer was formed after HF dipping as shown in Fig. 4(a). The difference is due to surface conditions between HF and Ar/H ECR cleaning**. It is important for Ti- CVD to be grown on the clean surface.** The impurities, such as carbon and oxygen, prevent TiSix from growing during Ti-CVD. *(Page no. 03)* Fig. 5 showed the effects of cleaning methods on contact resistance, in which four different cleanings were compared. In order to investigate the effect of contact cleaning at the bottom, shallow contact holes were used **and thin Ti film was deposited.** That is, depth of contact hole was fixed at 0.3 m and Ti film was deposited for 30 s. Etching time of Ar, H and Ar/H ECR plasma cleanings were 90, 120, and 30 s, respectively. Then **Ti was sequentially deposited for 30 s.** *(Page no. 04)*  Fig. 1. Experimental procedure of contact metallization. ***Searcher's Comment:*** ***The mapped citation discloses titanium deposition on contact hole. However, its deposition on an insulator exposed at sidewalls of the contact hole is not explicitly mentioned.***
IN7	**depositing titanium nitride on the titanium;**	Ti film was deposited by ECR plasma, with TiCl , H and Ar gases. **And then adding N , TiN film was also deposited at 620 C and 2.8 kW**

	(Claims 1, 12)	**microwave power.** As a reference for CVD, **TiN/Ti sputtering was carried out.** Ti film was deposited by using 2:1 collimator at 400 C and 20 kW power. **Then TiN film was deposited by conventional reactive sputtering at 500 C and 6 kW power, with nitrogen gas flow of 4 sccm. Ti and TiN deposition thickness were 1200 °A and 1000 A° , respectively.** The deposition pressure was 3 mtorr. Blanket tungsten (W) deposition and its etch back were used for filling contact holes. Finally, Aluminum (Al) was deposited for metallization. *(Page no. 02)* **TiN film has been widely used as a barrier and an adhesion layer** prior to blanket tungsten deposition. Since conventional TiN plasma CVD gave poor bottom coverage, so it causes barrier property degradation as the contact aspect ratio increases. Therefore, **in order to study TiN barrier property against WF during W-CVD, the influence of TiN bottom coverage deposited by ECR CVD on deep contact holes is investigated. First, we evaluated TiN barrier property to WF. Then we improved TiN bottom coverage.** *(Page no. 04)*  Fig. 1. Experimental procedure of contact metallization.
IN8	**annealing the titanium nitride using rapid thermal annealing; and** *(Claim 1)*	**TiN film was deposited by ECR plasma, with TiCl4 , H , Ar and N at 620 C and 2.8 kW microwave power.** Deposition pressures were changed. The thickness of BPSG/HTO films used in this experiment was 2.1 m. It is found that TiN bottom coverages were improved by decreasing the deposition pressures because the directionality of molecules or atoms was changed.

		(Page no. 05) ***Searcher's Comment:*** ***The mapped citation discloses TiN film deposition by ECR plasma, with TiCl4, Ar and N at 620 C. However, annealing the titanium nitride using rapid thermal annealing is not explicitly mentioned.***
IN9	**annealing the titanium nitride; and** *(Claim 12)*	**TiN film was deposited by ECR plasma, with TiCl , H , Ar and N at 620 C and 2.8 kW microwave power.** Deposition pressures were changed. The thickness of BPSG/HTO films used in this experiment was 2.1 m. It is found that TiN bottom coverages were improved by decreasing the deposition pressures because the directionality of molecules or atomswas changed. *(Page no. 05)*
IN10	**filling the contact hole with tungsten.** *(Claim 1)*	**TiN film has been widely used as a barrier and an adhesion layer prior to blanket tungsten deposition.** Since conventional TiN plasma CVD gave poor bottom coverage, so it causes barrier property degradation as the contact aspect ratio increases. *(Page no. 04)* Ti film was deposited by ECR plasma, with TiCl , H and Ar gases. And then adding N , TiN film was also deposited at 620 C and 2.8 kW microwave power. As a reference for CVD, TiN/Ti sputtering was carried out. Ti film was deposited by using 2:1 collimator at 400 C and 20 kW power. Then TiN film was deposited by conventional reactive sputtering at 500 C and 6 kW power, with nitrogen gas flow of 4 sccm. Ti and TiN deposition thickness were 1200 °A and 1000 A° , respectively. The deposition pressure was 3 mtorr. **Blanket tungsten (W) deposition and its etch back were used for filling contact holes. Finally, Aluminum (Al) was deposited for metallization.** *(Page no. 02)*
IN11	**filling the contact hole with a plug material.** *(Claim 12)*	TiN film has been widely used as a barrier and an adhesion layer prior to **blanket tungsten deposition.** Since conventional TiN plasma CVD gave poor bottom coverage, so it causes barrier property degradation as the contact aspect ratio increases. *(Page no. 04)* Ti film was deposited by ECR plasma, with TiCl , H and Ar gases. And then adding N , TiN film was also deposited at 620 C and 2.8 kW microwave power. As a reference for CVD, TiN/Ti sputtering was

carried out. Ti film was deposited by using 2:1 collimator at 400 C and 20 kW power. Then TiN film was deposited by conventional reactive sputtering at 500 C and 6 kW power, with nitrogen gas flow of 4 sccm. Ti and TiN deposition thickness were 1200 °A and 1000 A° , respectively. The deposition pressure was 3 mtorr. **Blanket tungsten (W) deposition and its etch back were used for filling contact holes. Finally, Aluminum (Al) was deposited for metallization.**

(Page no. 02)

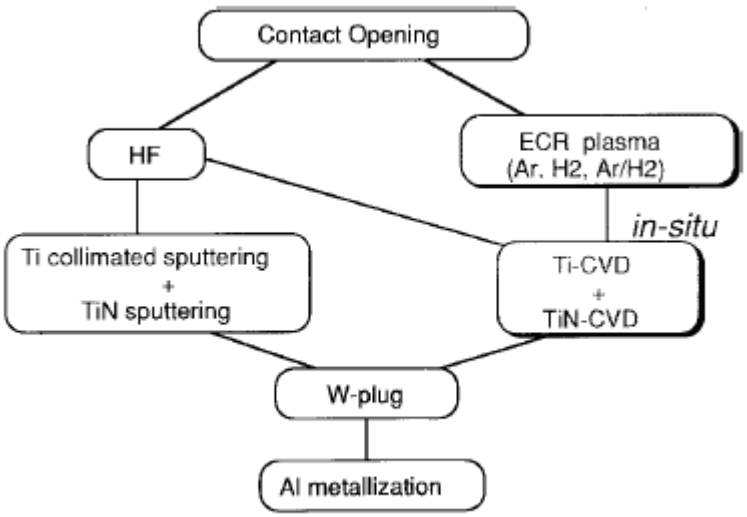


Fig. 1. Experimental procedure of contact metallization.

3. Prior Art Results (35 U.S.C. 103)

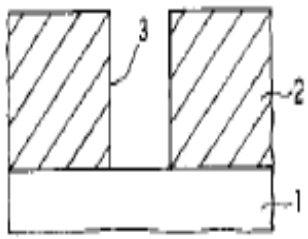
Note 1: As per our interpretation, the identified citations may be used in the following combination to anticipates the atleast one or more target independent claims of the subject patent.

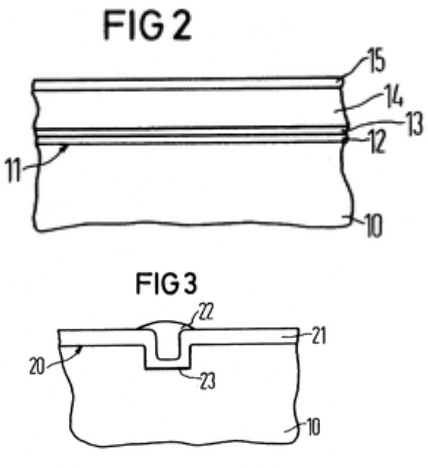
Note 2: We have also analyzed and provided those citations separately which are individually relevant to anticipates the atleast one or more target independent claims of the subject patent.

Prior Art Reference No. 1					
Publication No.	US5xxxx2A	**Application No.**	US199xxxxxx07	**Priority No.**	US199xxxxx07
Title	Colorimetric imaging ……..				
Publication Date		**Application Date**		**Priority Date**	
Assignee	Color And …….				
Inventor(s)	Alston ……				
Family Member(s)	None				

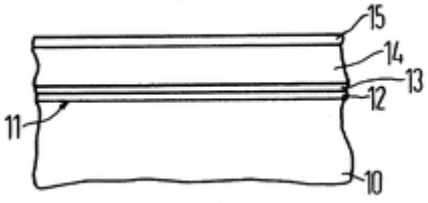
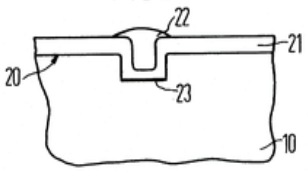
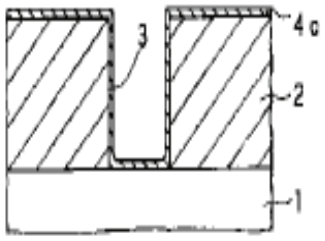
Prior Art Reference No. 2					
Publication No.	US5xxxx2A	**Application No.**	US199xxxxxx07	**Priority No.**	US199xxxxx07
Title	Colorimetric imaging ……..				
Publication Date		**Application Date**		**Priority Date**	
Assignee	Color And …….				
Inventor(s)	Alston ……				
Family Member(s)	None				

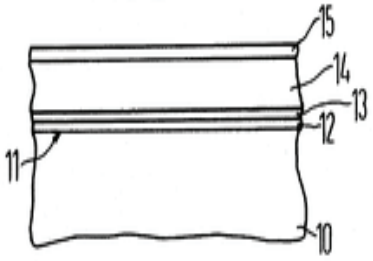
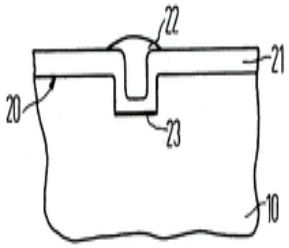
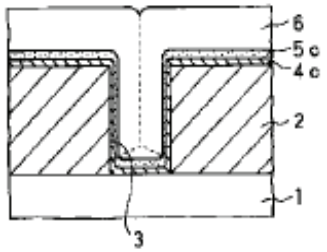
Key features/Claims		**Identified Patent Number : USX47XXX**	**Identified Patent Number : JPXXX19XX**
IN1	**A method of forming a contact, comprising:** *(Claim 10)*	**Description:** This object is achieved by a multi-stage method **for producing conductive layers or structures for VLSI circuits on a semiconductor substrate.** In one embodiment, the method stages are the **steps of applying a barrier layer onto the surface of the semiconductor substrate and applying an interconnect**	**Description:** Then, the present invention improves the conformality of the Ti film formed by an ECR plasma CVD method, and **an object of the present invention is to provide the wiring formation method which improves the reliability of a contact part.** [0018]**In a contact hole embedding**

		layer onto the barrier layer. Further method stages consist of the steps of applying a contact layer before applying the barrier layer, and/or cleaning the surface of the semiconductor substrate before applying the barrier layer or the contact layer, and/or applying a layer that supplies alloy constituents before, after or in interaction with the interconnect layer, and/or providing temperature treatment. *(Column no. 02; Line no. 54)*	**process working-example 1 this example,** After forming a Ti film on condition of $TiCl_4/H_2$ flow rate =0.8 with an ECR plasma CVD method, it is the example which similarly formed the TiN film continuously with the ECR plasma CVD method, **and embedded the contact hole with the aluminum-1% Si film eventually.** This process is described referring to Fig.1. **As the sample wafer used by this example is shown in Fig.1 (a), the opening of the contact hole 3 with an opening diameter of about 0.3 micrometer is carried out to the SiO2 interlayer insulation film 2 deposited** on Si substrate 1 at a thickness of about 1 micrometer. Therefore, although the aspect ratio of this contact hole 3 is three or more, it is compressing and expressing the aspect ratio for the sake of illustrated convenience in Fig.1. (a) 【図1】 
IN2	**performing contact clean with high density plasma;** *(Claim 10)*	**(b1) Pre-treatment of the surface:** In the first process **chamber 1 which is filled with Ar, the surface 20 to be coated is cleaned by being bombarded with, for example, low-energy argon ions (approximately 100 eV); the natural oxide is thereby removed, particularly in the later through hole region and on**	***Not Disclosed***

		the polysilicon of gate contactings. Simultaneously with this cleaning of the surface, an incorporation of argon atoms of approximately <1013 atoms per cm2 occurs. The silicon is pre-amorphized. A uniform silicidation of the layers is thereby achieved independently of the doping. *(Column no. 08; Line no. 50)*  	
IN3	**forming titanium by reaction of Ti(N(CH3)2)4 with hydrogen;** *(Claim 10)*	***Not Disclosed***	For improving the electrical contact with the underlying silicon regions, for example, **a titanium layer is applied as a contact layer.** This can be implemented with known sputtering methods or CVD methods; the process chamber is correspondingly constructed based on the desired manufacturing method. Given utilization of a CVD method, **a suitable initial compound containing titanium is introduced into the process chamber with a carrier gas or by imbibition and is thermally excited given a process pressure of 0.1 through 100 mbar (10 through 10,000 Pa) and given a temperature of approximately 200° C. through 450° C.** An excitation with a plasma can additionally be provided. The organic, **nitrogen containing**

			titanium compound is introduced into the chamber by means of a carrier gas (such as H2, N2, Ar, He) or by suction. Furthermore, H2, N2 and NH3 can be introduced into the chamber as process gases. For instance, the following classes of substances can be considered for use as initial substances; **1. Ti(NR2)4, where R represents alkyl,** aryl or CF3 ; 2. Ti(NHR)4, where R represents alkyl, aryl or CF3 ; 3. Ti(NR2)2 R'2, where R represents alkyl, and R' represents alkyl, aryl or CF3.
IN4	**depositing the titanium on silicon exposed to CVD reactants at a bottom of a contact hole;** *(Claim 10)*	For improving the electrical contact with the underlying silicon regions, for example, **a titanium layer 12 approximately 10 through 100 nm thick is applied as a contact layer.** This can be implemented with known sputtering methods or CVD methods; the process chamber 2 is correspondingly constructed based on the desired manufacturing method. Given utilization of a CVD method, **a suitable initial compound containing titanium is introduced into the process chamber 2 with a carrier gas or by imbibition and is thermally excited given a process pressure of 0.1 through 100 mbar (10 through 10,000 Pa) and given a temperature of approximately 200° C. through 450° C.** An excitation with a plasma can additionally be provided. *(Column no. 05; Line no. 54)* In another chamber or in the same	**Claims:** [Claim 1]**A wiring formation method making flow rate of halide gas of the aforementioned IVa group element, and H2 or more into 0.4 in a wiring formation method which forms a thin film of an IVa group element on a substrate while returning halide gas of an IVa group element by H2 with an ECR plasma CVD method.** **Description:** The wiring formation method of the present invention is what is proposed in order to attain the above-mentioned purpose, **When forming the thin film of an IVa group element on a substrate, returning the halide gas of an IVa group element by H2 with an ECR plasma CVD method, flow rate of the halide gas of the aforementioned IVa group element and H2 is made or**

		chamber of the high-vacuum system, **the metal layer 21 required for the formation of the silicide is deposited on the newly cleaned surface by sputtering from a high-purity metal target without vacuum interruption. Also the use of CVD for depositing e.g. the Ti metal layer is within the scope of the invention.** The layer thickness is dependent on the geometrical relationships of the through hole, on the doping profile as well as on the pre-treatment and typically lies between 40 nm and 80 nm. *(Column no. 08; Line no. 62)* FIG 2  FIG 3  	**more into 0.4.** **Although an IVa group element is three kinds, Ti, Zr (zirconium), and Hf (hafnium), when forming a Ti** film using $TiCl_4$ gas especially, a practically important process can be realized In a contact hole embedding process working-example 1 this example, **After forming a Ti film on condition of TiCl4/H2 flow rate =0.8 with an ECR plasma CVD method, it is the example which similarly formed the TiN film continuously with the ECR plasma CVD method**, and embedded the contact hole with the aluminum-1% Si film eventually. (b) 【図1】 
IN5	**filling the contact hole with a plug material.** *(Claim 10)*	(a4) Applying a CVD aluminum layer 14: **The application of the aluminum layer 14 with CVD occurs in the temperature range from 200° through 450° C. at a pressure of 0.1 mbar through 100 mbar (10 through 10,000 Pa). An organic aluminum compound 40 is utilized as an initial substance,** for example dimethylaluminumhydride HAl (CH3)2, trimethylamine aluminum hydride A1H3 , N(CH3)3 or triethylaluminum Al(Et)3 or the like. *(Column no. 06; Line no. 67)*	For example, if it grows up that a Ti film is not conformal and granular under a certain conditions, since the TiN film which grows on it succeeds the surface profile of a Ti film and grows, it will increase the surface unevenness of a barrier metal further. **As a result, problems, like a crack occurs in the bottom corner part of a contact hole, or the embedding of the contact hole by the upper wiring material of a post process becomes difficult arise**. Since a Ti film is indispensable in order to secure the ohmic nature of contact, the

		(b4) Selective metal deposition: Again without interrupting the high-vacuum, **a selective metal 22 deposition of, for example, tungsten,** copper or aluminum can now be implemented with a CVD process on the newly silicized contacts 23 without nucleation delay and with excellent selectivity. To that end, a further chamber of the high-vacuum system and a selective deposition process in conformity with the prior art is utilized. *(Column no. 09; Line no. 13)* FIG 2  FIG 3  	conformality of this Ti film serves as a key which influences the reliability of a contact part. **The contact hole 3 in which the good barrier metal was formed as mentioned above was able to be uniformly embedded by the upper wiring layer 6**, as shown in Fig.1 (d). **As the upper wiring layer 6 at this time, the aluminum-1% Si film formed by elevated-temperature sputtering process, for example or W (tungsten) film** formed by a blanket CVD method could be used, and the result with good all was obtained. (d) 【図1】 

4. Other Shortlisted Broad References

Sr. No.	Citation No.	Title OR Derwent Title	Family Members
1.	US5239625A	Apparatus And Method To Merge Images Rasterized At Different Resolutions	US5239625A_ | EP575483A1 | EP575483A4 | IL101138D0 | JP6505845A_ | WO1992015958A1
2.	US4467525A	Automated Sign Generator	US4467525A_ | AT56177T_ | AT56648T_ | AT56908T_ | AU198425638A_ | AU563752B2 | CA1195233A1 | DE3381863D1 | DE3381896D1 | DE3381914D1 | DK167604B1 | DK198302875A_ | DK198302875D0 | EP101814A2 | EP101814A3 | EP101814B1 | EP276026A2 | EP276026A3 | EP276026B1 | EP276027A2 | EP276027A3 | EP276027B1 | ES198406269A1 | ES198406928A1 | ES523545D0 | ES527910D0 | FI198302081A_ | FI82895B_ | FI82895C_ | FI832081A0 | JP2109561C_ | JP5050395A_ | JP59064300A_ | JP6030048B_ | JP6098594B_ | NO169033B_ | NO169033C_ | NO198302142A_
3.	US5061063A	Methods And Apparatus For Optical Product Inspection	US5061063A_ | AU199064548A_ | AU644107B2 | BR199005509A_ | CA2028716A1 | EP426310A2 | EP426310A3 | JP3224068A_
4.	IT198748271D0	Stazione Di Lavoro Computerizzata Per L'approntamento E/O Elaborazione Di Bozzetti Per Oggetti Di Abbigliamento O Simili	IT198748271D0 | EP302843A2 | EP302843A3 | IT1211696B_
5.	US6181439B1	Apparatus And Techniques For Computerized Printing	US6181439B1 | AT151583T_ | AT156642T_ | AT197362T_ | CA2035658A1 | CA2035666A1 | CA2059193A1 | CA2059193C_ | DE69125519D1 | DE69127151D1 | DE69127151T2 | DE69231540D1 | DE69231540T2 | DE69231540T3 | DK495563T3 | DK495563T4 | EP449407A2 | EP449407A3 | EP449407B1 | EP475554A2 | EP475554A3 | EP475554B1 | EP495563A2 | EP495563A3 | EP495563B1 | EP495563B2 | ES2152223T3 | ES2152223T5 | IL93274A_ | IL93274D0 | IL93493A_ | IL93493D0 | IL96816A_ | IL96816D0 | IL96829A_ |

			IL96829D0 | IL96955D0 | IL96957A_ | IL96957D0 | IL97147A_ | IL97147D0 | JP4316848A_ | JP5153380A_ | JP7064525A_ | US20020012130A1 | US20030090725A1 | US20030123090A1 | US20030123091A1 | US20040036918A1 | US20040079253A1 | US20050030561A1 | US5296935A_ | US5339176A_ | US5615282A_ | US5875288A_ | US6545772B2 | US6856419B2 | US6856424B2 | US7130079B2
6.	US4075695A	Display Processor System	US4075695A_ | CA1091354A1 | DE2724199A1 | DE2724199C2 | GB1579643A_
7.	US4025946A	Method And Apparatus For Generating Graphic Designs	US4025946A_
8.	US5467443A	System And Method For Automatically Generating Derived Graphic Elements	US5467443A_
9.	US4897802A	Method And Apparatus For Preparing And Displaying Visual Displays	US4897802A_ | AU198780937A_ | AU598866B2 | EP268299A2 | EP268299A3 | JP02729482B2 | JP63226685A_ | MX161946A_
10.	EP544255A2	Document Processing Method And System	EP544255A2 | EP544255A3 | JP5151254A_ | US5813018A_
11.	US5243665A	Component Surface Distortion Evaluation Apparatus And Method	US5243665A_ | CA2036687A1 | EP445697A2 | EP445697A3 | FI199101140A_ | FI911140A0 | IL97224A_ | IL97224D0 | JP7110220A_ | TR27885A_
12.	JP3198164A	Objective Element Designating System In Interactive Graphic Processing	JP3198164A_ | JP02937374B2
13.	US4800510A	Method And System For Programmed Control Of Computer Generated Graphics Layout	US4800510A_
14.	US4254416A	Variable Size Character Generator	US4254416A_ | CA1084641A1 | DE2724158A1 | GB1579642A_

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6. Patent & Non-Patent Databases

Non-Patent Search Databases		
NCBI	Europe PMC	HubMed
EMBASE- ELSEVIER	Biological Abstracts	PubMed
The European Nucleotide Archive (EMBL-EBI)	DNA Data Bank of Japan (DDBJ)	UniProt
InterPro	Wiley Online Library	Taylor & Francis Online
SureChEMBL	Molbase	PubChem
ChemSpider	eMolecules	Cambridge Scientific Abstracts
British Dental Journal	Dental Materials Journal	European Journal of Prostodontics
Nature	Digital Library	Biomicrofluidics (Pub: AMER INST PHYSICS)

Microfluidics and Nanofluidics (Pub. SPRINGER HEIDELBERG)	Onesearch	Research Gate
SAE	Onepetro	ProQuest
IMechE Journal Collection Archive (SAGE)	Academia	OSTI.GOV
ASME	NTRS	EBSCOhost
NTRL	SCOPUS	TRID
SIAM	OpenStax	AAPG
Jurn	Deepdyve	Wiley
Some Major Standards Expertise		
ETSI	3GPP	IEEE
IETF	OMA	ITU
DICOM	SPIE	DLNA
HGI	OIPF	Broadband Forum
W3C	AVS	MPEG
Non-Patent Databases		
Citeseerx	Semiconductor Engineering	IOP Science
Hindwai	AIP Citation	SPIE
EE Times	Embedded	Evaluation Engineering
Electronic Design	Chip Design	EIN Semiconductor News

SEMI	Power Electronics	SemiWiki
Semi Accurate	ECNMag	Semico
AnySilicon	ELE Times	Digitimes

Sr. No.	Database Name	Comments
1.	IEEE Xplore	A research database for discovery and access to journal articles, conference proceedings, technical standards, and related materials on computer science, electrical engineering and electronics, and allied fields.
2.	ACM Digital Library	Electronic archive of academic journals in many fields.
3.	ResearchGate	Electronic archive of academic journals in many fields.
4.	Springer	Electronic archive of academic journals in many fields.
5.	IP.Com	Multilingual source of unique and rare technical disclosures and other non-patent literature.
6.	XLPAT Non-Patent Search	Integrated non-patent search platform for accessing multiple digital libraries
7.	CrossRef	Search CrossRef's database of 64 million records for authors, titles, DOIs, ORCIDs, ISSNs, FundRefs, license URIs, etc
8.	JSTOR	Electronic full text archive of academic journals in many fields.
9.	ScienceDirect	Electronic archive of academic journals in many fields.
10.	Knovel	Ability to search leading reference works and databases from international publishers and professional societies through a

		single interface.
11.	Microsoft Academic	Electronic full text archive of academic journals in many fields.
12.	arXiv.org	Open access to thousands of e-prints in Physics, Mathematics, Computer Science, Quantitative Biology, Quantitative Finance and Statistics
13.	Open Access Theses and Dissertations	Open access graduate theses and dissertations published around the world.
14.	OpenThesis	Free repository of theses, dissertations, and other academic documents, coupled with powerful search, organization, and collaboration tools.
15.	Oxford Journals	Publishes the highest quality journals and delivers this research to the widest possible audience.
16.	Nature	Electronic archive of academic journals in many fields.
17.	Elsevier	Electronic archive of academic journals in many fields.
18.	Web of Science	Online subscription-based scientific citation indexing service maintained by Thomson Reuters that provides a comprehensive citation search. It gives access to multiple databases that reference cross-disciplinary research, which allows for in-depth exploration of specialized sub-fields within an academic or scientific discipline.
19.	Google Scholar	A web search engine that indexes the full text or metadata of scholarly literature across an array of publishing formats and disciplines. Google Scholar index includes most peer-reviewed online academic journals and books, conference

		papers, theses and dissertations, preprints, abstracts, technical reports, and other scholarly literature, etc.
20.	USENIX	The Advanced Computing Systems Association that supports operating system research
21.	SNIA	Storage Networking Industry Association specializes in the field of storage and information management solutions

*(*The list is suggestive as per the technology domain)*

Appendix I – Search Details

1.1 Search Phases

Phases	Steps	Phase Details
Understanding Development Phase	**1**	Reading the subject patent/application and developing understanding over the invention/patent **Optional but recommended** – Pre-search initiation call to bring search teams understand at par with Attorney requirement.
	2	Reading the file history of the subject patent, especially the final/non-final rejections, applicant's argument and remarks and notice of allowances.
	3	Key Features of the invention are identified based on the novel aspect of the invention/Client's requirement.
	4	Relevant key words and their logical variations are determined based on the key features and the technology domain of the invention.
	5	Checking if any prior litigation OR re-exam happened for the subject patent OR not and identifying references which were cited in those litigations OR re-examination and analyzing those in detail to combine with other references to have stronger 103 art.
	6	Date limitation for the search process is confirmed from the Project Manager/client.
First Pass Automation Phase	**7**	Using our proprietary automated **Invalidator+** module which is backed by AI, NLP, Cognitive computing and other add-ons like Corpus etc., we perform a first pass automated search which in a matter of few minutes this provides valuable insights into the relevant art, assignees, inventors, jurisdictions, classifications, keywords etc. The head-start provided by automation allows us to quickly focus the search which, in turn, allows our talented teams to devote more time to the manual investigation.

NOT Query formation *(excluded from scope of search)*	**8**	Family members of the subject patent and its Backward Citations are identified and are framed as a "NOT query" so as to exclude these patents from the search process. This is again subjective to client's approval depending on if it's a litigation case OR IPR needs to be filed for the subject patent. Each key string is combined with the "NOT Query" so as to exclude the patents associated with the "NOT query" Already identified references (***if any***) along with their family members will be excluded from scope of the search to avoid any duplicity and save time.
Keyword Based Search	**9**	Different key strings verified by the project manager with variable scope (broad to narrow) are formed in different search fields on patent databases with a global coverage using Orbit, TI, PAJ, AUSPAT, CIPO, CNPAT, ESPACENET, TIPO, SIPO, INPADOC, etc.
Classification based Search	**10**	Relevant USC, CPC, ECLA & IPC classes are identified.
	11	Independent full classification (USC, CPC, ECLA & IPC) search strings were formed.
Assignee Based Search	**12**	Assignees of the relevant patents are identified and a search with various scope (combination with keywords, classes etc.) is conducted to identify relevant patents associated with these assignees. Identification of top companies/ universities/ inventors/ scientists operating in the domain (top patent applicants, top product sellers, top inventors, etc.) Perform dedicated search on company/university websites to identify references dating back the priority date of the subject patent
Inventor Based Search	**13**	Inventors of the relevant patents are identified and a search with various scope (combination with keywords, classes etc.) is conducted to identify relevant patents associated with these inventors.

Combination search	**14**	Narrow keywords and broad USC, CPC, ECLA & IPC or all class combination key strings were formed.
	15	Broad keywords and narrow USC, CPC, ECLA & IPC or all class combination key strings were formed.
	16	Various Boolean searching options are used to combine two or more search strings or search options.
Inequitable Conduct Search = A not B	**17**	Identify references which were cited during prosecution in foreign countries but not cited during prosecution in US. **A:** "Backward citations and their family members" of the family members of the subject patent **B:** "Backward citations and their family members" of the subject patent
Webbing	**18**	Forward citations (falling under the date limitation) of the backward citations of the subject patent are analyzed.
	19	Backward citations (falling under the date limitation) of the forward citations of the subject patent are analyzed.
	20	Forward and backward citations of the identified close citations are analyzed to identify any new relevant citations.
	21	X-References of all backward PCT citations are also analyzed to identify any relevant reference.
Foreign Language Based Search (Add-on)	**22**	The key words identified are translated in respective languages
	23	Based on the native key words, search is conducted by in-house native searchers on the respective patent offices' websites
Non-Patent Literature Search	**24**	Non-patent literature search with the date limitation is conducted using various keyword combination in different databases/ search engines such as Google, Google Scholars, Google Book, IP.com, IEEE, STN, Engineering Village, Springerlink, Citeseer, Science Direct, Clusty,

		PCworld, etc.
	25	**Dissertations & Thesis / Research Papers / University Portal** – We analyze websites of various universities/ research institutes leading in the target technology domain. The information related to leading universities is referred using patent and non-patent literature published by the university / research institutes. We are capable to perform dedicated search on online repositories related to thesis, academic research documents, dissertations, etc. For example, we can refer EBSCO, Ethos, ProQuest, OpenThesis, university websites such as Harvard, Stanford, NUS, Oxford, MIT, Cambridge, etc. **Conferences, Abstracts & Posters** – We search all major web portals of leading conferences and related organizations (CES, ComSoc, Oracle Openworld, Google Next, Augmented World Expo, Microsoft Academic, etc.) **Products / Whitepapers** – We also perform dedicated searches on web-portals of leading companies in the target technology domain. We scan through their blogs, whitepapers, product listings, datasheets, circuit diagrams, brochures, user manuals, news announcements related to new offerings/product launches, advertisements, etc. **Non-patents cited in the patents** – We also identify non-patent literature(s) cited in the potential and relevant patents in the target technology of interest. **Web-Archive (Wayback machine)** – leads generated in the abovesaid steps are passed through web-archive platforms such as way-back machine, to identify relevant evidences before the cut-off date.
	26	The key strings used for identifying NPL are incorporated into the search report in the desired format.

Standard as Prior Art (including Draft Submissions)	**27**	Background study to identify relevant standard versions and/or standard setting organization (SSOs) corresponding to the technical field of subject matter before the earliest priority date of the subject patent by performing searches on the in-house developed dataset.
	28	Identification of draft versions/submissions before the earliest priority date of the subject patent.
	29	Manual analysis of all the standards documents including the draft versions/submissions that are related to the subject matter technical field and are published before the search cut-off date (e.g. earliest priority date) considering the 1-year grace period for any submissions made by the patent owner.
Report Making	**30**	All the identified relevant patent citations are analyzed and mapped with color mapping in accordance with the relevant texts and are provided in the report in the desired format.
	31	All the identified relevant non-patent publications and standards are analyzed and mapped with color mapping in accordance with the relevant texts and are provided in the report in the desired format.
	32	Indexing the relevant texts in the search report is done.
	33	Highlighting the relevant text in the PDF references
	34	The list of keywords, search strategies, assignees, inventors, classes used in the search process are incorporated into the search report
	35	Key feature analysis of all prior art is provided
Quality Assurance	**36**	The citations identified are verified (technical relevancy and other limitations such as date criteria, assignee, etc.) by the project manager before mapping it into the report.
	37	Third Eye (verification of the project report) has to be done by the VP before delivering the search report with pdf references.

	38	Search comments may be incorporated by the VP (Optional)
	39	Senior VP crosschecks the report quality and adherence to SOPs during the search
	40	Client queries regarding clarification of the technical relevancy and mapping of the citations, if required
Report Delivery	**41**	A formal report is sent to the client with the details of the references and their pdfs. **Output file format:** PDF/ MS Word/ MS Excel

**This denotes our standard search strategy which is appropriately edited according to the scope of the search*

1.2 Search Keywords

Key words are extracted from the key features formed. A number of variations and synonyms of the key words are also identified and used in the search.

The following key words and their logical variations were used for conducting prior art search:

Antenna	Display	Equipment
Channel	Screen	Apparatus
Transceiver	LCD	PDA
Aerial	Crystal	Telephone
MIC	Transmitter	Store
Catalog	Investment	Sell
Chart	I-Pad	Send
Client	Item	Server
Communication	Laptop	Several

A detailed report of the search criteria formed by the researchers is provided. This helps the client in verifying the effectiveness of the search.

1.3 Search Strings

a. Patent Search Strings

The following set of search techniques such as nested Boolean search, phrase search, synonyms and truncation search, patent classification search, citation search etc. are executed on following databases:

1. **Orbit FAMPAT** (DZ, AP, **AT**, AU, BY, **BE**, BA, **BR**, BG, **CA**, **CN**, CO, CR, HR, CU, CY, CZ, CS, **DK**, DO, EC, EG, SV, EE, EA, **EP**, **FI**, **FR**, **DE**, GR, GT, GC, HU, HK, IS, **IN**, ID, IE, IL, IT, **JP**, KG, KE, KP, **KR**, LV, LT, LU, MW, MY, MT, MD, MC, MN, MA, NI, NL, NZ, NO, OAPI, PA, **PCT**, PE, PH, PO, PT, RO, **RU**, Serbia and Montenegro, SG, SK, SI, ZA, **ES**, **SE**, **CH**, **TW**, TJ, TR, UA, **GB**, **USA**, **U.S.S.R**, UY, VN, YU, ZM, ZW);***(Full-text included in FAMPAT in bold)***
2. **Thomson Innovation** (USG, USA, EPA, EPB, WO, JP, DEG, DEA, DET, DEU, GBA, FRA, KR, CN, CA and NPADOC);
3. **PAJ: JP**

Search Logic No.	Key Strings	Search scope	Number of Hits
Orbit Search Strings			
L1	(((VIRTUAL OR ELECTRONIC????? OR ON_LINE OR INTERNET OR NET) 5D (SHOP???? OR STORE???? OR TRAD???? OR LAPTOP? OR ??PAD? OR PC OR ((DIGITAL OR ELECTRONIC) 2D DIARY)) AND (TEXT??? OR IMAGE? OR PHOTO????? OR PICTURE? OR INFORMAT???? OR DATA))/BI/SA/CLMS) AND PRD <= 199x-xx-xx	**Databases:** FAMPAT	97
L2	((((VIRTUAL OR ELECTRONIC????? OR ON_LINE OR INTERNET OR NET) 3D (LIST???? OR CATALOG???? OR DISPLAY? OR BULLETIN?????? OR CHART?)))/NOMT/CLMS AND ..... AND (((IMAGE? OR PHOTO????????? OR PICTURE? OR TEXT???? OR DATA? OR INFORMAT????) 8D ((PLURAL??? OR MULTIPL????? OR DUAL OR MANY OR NUMEROUS OR SEVERAL OR VARIOUS) 4D (???PRODUCT? OR ITEM? OR STOCK? OR GOOD?)))))/NOMT/TX AND ((TRANSFER OR SEND???? OR TRANSMI?????? OR RECEIV????? OR UPDAT???? OR COMMUNICAT????))/NOMT/TX) AND PRD <= 199X-XX-XX	**Databases:** FAMPAT	154
L3	(TELECOMMUNICATION NEAR6 (SOFTWARE OR	**Databases**:	129

	APPLICATION)) AND (RECEIV* OR ACCEPT)/NOMT/SA/CLMS) AND PRD <= 199X-XX-XX	FAMPAT	
L4	(MOBILE*1 OR CELLULAR OR CELL OR RADIO* OR (WIRELESS OR HAND*1HELD) NEAR2 (DEVICE*1 OR APPARATUS*1 OR TOOL*1 OR EQUIPMENT*1 OR PHONE*1)) AND ((TRANSMIT*3 OR COMMUNICAT*3 OR SEND*3 OR RECEIV*3 OR TRANSCEIV*3) NEAR4 (DATA OR INTERNET OR WEB OR WAP OR VOICE OR AUDIO OR SOUND))/NOMT/SA/CLMS) AND PRD <= 199X-XX-XX	**Databases**: FAMPAT	493
L5	Mobile/BI AND PRD <= 199x-xx-xx	**Databases**: FAMPAT	16123**
L6	((SHOP???? OR BID???? OR BUY??? OR SELL??? OR PURCHAS???? OR MERCHAN????? OR AUCTION???? OR ORDER????))/BI/SA AND ((G06F+)/IC OR (715+)/PCLO) AND PRD <= 1996-03-22	**Databases**: FAMPAT	68233**
L7	**L5 and L6**	**Databases**: FAMPAT	324
Thomson Search Strings			
L8	UC=((438680* OR 438681* OR 438682* OR 438683* OR 438684* OR 438686* OR 438618*)) AND PRD<=(199xxxxx) AND AIC=(H01L0021* AND C23C*);	**Databases:** USG, USA, EPA, EPB, WO, JP, DEG, DEA, DET, DEU, GBA, FRA, KR, CN, CA and INPADOC	548
L9	UC=((438680* OR 438681* OR 438682* OR 438683* OR 438684* OR 438686*) AND 438618*) AND PRD<=(199xxxxx);	**Databases:** USG, USA, EPA, EPB, WO, JP, DEG, DEA, DET, DEU, GBA, FRA, KR, CN, CA and INPADOC	27
PAJ Search Strings			
L10	CTB=(TITANIUM OR SILICIDE OR SALICIDE) AND (PRECURSOR OR TETRACHLORIDE OR “TDMAT” OR TETRADIMETHYL) AND (NITRIDE AND TUNGSTEN) AND PD<=1997-08-21	**Database: PAJ**	9

L11	CTB=("CVD" OR "PCVD" OR "PACVD") AND (TITANIUM OR SILICIDE OR SALICIDE) AND (NITRIDE AND TUNGSTEN) AND PD<=1997-08-21	**Database: PAJ**	71

Hits mark in (**) has not been analyzed but used in combination of strings to reduce irrelevancy.

Note: *In addition to above queries, webbing (intelligence from backward and forward citations of the subject patent and other relevant patents) is also done.*

b. Non-Patent Search Strings

The following key strings were used for conducting non-patent literature search on **IEEE,Google, Google scholar, Google books, Scirus** databases/ search engines.

Search Logic No.	Key Strings/Keywords	Database(s)/Search Engine(s)
NPL1	VENDOR COMPUTER VIRTUAL PRODUCT CATALOG SOFTWARE	**IEEE, Google, Google Scholar, Google Books, Scirus**
NPL2	DISPLAY PRODUCT SCREEN IMAGE TEXT SELECT* (REMOTE COMPUTER) (VENDOR OR SELL)	
NPL3	(PRODUCT OR GOODS) (MENU OR LIST OR INVENTORY OR DISPLAY) (SCREEN OR VIEW) (SOFTWARE) (PICK OR COMPAR*)	
NPL4	CUSTOMER PRODUCT REVIEW SCREEN COMPARISON INVENTORY (SOFTWARE OR SYSTEM)	
NPL5	(COMPUTER) AND (TEXT OR IMAGE OR PROFILE OR PICTURE) AND (BUYER OR CUSTOMER) AND (REVIEW OR PREVIEW OR COMPARE OR WATCH)	
NPL6	(ONLINE OR WEB OR CONNECTION OR NET) AND (INVENTORY OR ITEMS OR MENU OR CATALOG OR CATEGORY) AND (PRODUCT OR GOODS OR MERCHANDISE)	
NPL7	(INVENTORY OR ITEMS OR MENU OR CATALOG OR CATEGORY) AND (SOFTWARE) AND (BUY OR SELECT)	
NPL8	HIERARCHICAL MENU PRODUCT CATEGOR* (COMPUTER OR SOFTWARE OR PROCESSOR)	

1.4 Classification Based Search

The search was conducted on the following IPCs (International Patent Classifications), and US Classes:-

1. International Patent Classification (IPC):

Sr. No.	Class	Description
1.	D06F	Textiles; paper; treatment of textiles or the like; laundering; flexible materials not otherwise provided for; laundering, drying, ironing, pressing or folding textile articles
2.	D06F-035	Textiles; paper; treatment of textiles or the like; laundering; flexible materials not otherwise provided for; laundering, drying, ironing, pressing or folding textile articles; Washing machines, apparatus, or methods not otherwise provided for
3.	H04B000138	Transmission; Details Of Transmission Systems, Not Covered By A Single One Of Groups H04b 00300-H04b 01300; Details Of Transmission Systems Not Characterised By The Medium Used For Transmission- Transceivers, I.E. Devices In Which Transmitter And Receiver Form A Structural Unit And In Which At Least One Part Is Used For Functions Of Transmitting And Receiving
4.	H04M000100	Telephonic Communication; Substation Equipment, E.G. For Use By Subscribers

2. US Classification:

Sr. No.	Class	Description
1.	68/23.1	Textiles: Fluid Treating Apparatus; Machines Combined; With Liquid Extractor; Centrifugal Extractor (E.G., Centrifuge); With Means To Control Or Isolate Vibration
2.	379/179	Telephonic communications; Poly station line system (i.e., party line); Call alerting (e.g., ringing)
3.	379/252	Telephonic communications; Centralized switching system; With generating of call associated substation signal; For alerting signal at called station (e.g., ringing)

1.5 Assignee Name Based Search

The search was conducted for the following Assignee names

- LG Electronics
- Samsung
- Panasonic
- Toyota
- IBM
- Intel
- Sumitomo
- Benz
- Ranbaxy
- Mitsubishi
- Suzuki

Assignee and inventor based searches help to cover the limitations (if any) of a key word based search

1.6 Inventor Name Based Search

The search was conducted for the following Inventor names -:

- Uhlin, Göran
- Kim, Jae Sin
- Chang, Jae Won
- Ito, Michiaki
- Kim, Jin Soo
- Lee, Hyun Moo

Appendix II – Country Codes

AD	Andorra	GH	Ghana	NE	Niger
AE	Arab Emirates	GI	Gibraltar	NF	Norfolk Island
AG	Antigua And Barbuda	GL	Greenland	NG	Nigeria
AI	Anguilla	GM	Gambia	NI	Nicaragua
AL	Albania	GN	Guinea	NL	Netherlands
AM	Armenia	GP	Guadeloupe	NO	Norway
AN	Neth. Antilles	GR	Greece	NP	Nepal
AO	Angola	GT	Guatemala	NZ	New Zealand
AR	Argentina	GY	Guyana	OM	Oman
AT	Austria	HK	China, Hong Kong S.A.R.	PA	Panama
AU	Australia	HN	Honduras	PE	Peru
AW	Aruba	HR	Croatia	PF	Fr. Polynesia
AZ	Azerbaijan	HT	Haiti	PG	New Guinea
BA	Bosnia And Herzegovina	HU	Hungary	PH	Philippines
BB	Barbados	ID	Indonesia	PK	Pakistan
BD	Bangladesh	IE	Ireland	PL	Poland
BE	Belgium	IL	Israel	PT	Portugal
BG	Bulgaria	IN	India	PW	Palau
BH	Bahrain	IQ	Iraq	PY	Paraguay
BM	Bermuda	IR	Iran	QA	Qatar
BN	Brunei	IS	Iceland	RO	Romania
BO	Bolivia	IT	Italy	RU	Russian Federation
BR	Brazil	JM	Jamaica	SA	Saudi Arabia
BS	The Bahamas	JO	Jordan	SB	Solomon Islands
BW	Botswana	JP	Japan	SD	Sudan
BY	Belarus	KE	Kenya	SE	Sweden
BZ	Belize	KG	Kyrgyzstan	SG	Singapore
CA	Canada	KH	Cambodia	SI	Slovenia
CC	Cocos Islands	KN	Saint Kitts And Nevis	SK	Slovakia
CD	Democratic Republic Of Congo	KP	North Korea	SL	Sierra Leone
CH	Switzerland	KR	South Korea	SM	San Marino
CI	Ivory Coast	KW	Kuwait	SN	Senegal
CK	Cook Islands	KY	Cayman Islands	SR	Suriname
CL	Chile	KZ	Kazakhstan	SU	U.S.S.R.
CM	Cameroon	LA	Laos	SV	El Salvador
CN	China P.Rep.	LB	Lebanon	SY	Syria
CO	Colombia	LC	St. Lucia	SZ	Swaziland

CR	Costa Rica	LI	Liechtenstein	TC	Turks And Caicos Islands
CS	Czechoslovakia	LK	Sri Lanka	TD	Chad
CU	Cuba	LR	Liberia	TH	Thailand
CY	Cyprus	LT	Lithuania	TN	Tunisia
CZ	Czech Republic	LU	Luxembourg	TR	Turkey
DE	Germany	LV	Latvia	TT	Trinidad/Tobago
DK	Denmark	LY	Libya	TW	Taiwan
DM	Dominica	MA	Morocco	TZ	Tanzania
DO	Dominican Repl.	MC	Monaco	UA	Ukraine
DZ	Algeria	MD	Republic Of Moldova	UG	Uganda
EC	Ecuador	MG	Madagascar	UY	Uruguay
EE	Estonia	MH	Marshall Islands	UZ	Uzbekistan
EG	Egypt	MK	Macedonia, Former Yugoslav Rep.	VA	Vatican City State
ES	Spain	ML	Mali	VC	St. Vincent/ Grenadines
ET	Ethiopia	MM	Myanmar	VE	Venezuela
FI	Finland	MO	Macau	VG	Virgin (British) Islands
FJ	Fiji	MQ	Martinique	VN	Viet Nam
FK	Falkland Islands (Malvinas)	MR	Mauritania	VU	Vanuatu (New Hebrides)
FO	Faroe Islands	MT	Malta	YE	Yemen
FR	France	MU	Mauritius	YU	Yugoslavia
GA	Gabon	MW	Malawi	ZA	South Africa
GB	United Kingdom	MX	Mexico	ZM	Zambia
GD	Grenada	MY	Malaysia	ZW	Zimbabwe
GE	Georgia	NA	Namibia		
GF	French Guiana	NC	New Caledonia		

About TT Consultants

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Dr. Nirmal Basi, CEO

Dr. Nirmal S. Basi has a PhD in Biochemistry and is an entrepreneur, inventor, as well being a registered patent agent for the United States Patent and Trademark Office (USPTO).

He has also worked as a Patent Examiner for over 13 years. He is assisting clients across the globe in their IP research related matters and he is redefining the way IP Research and Analytics are performed.

Komal Sharma Talwar, Founder

A serial entrepreneur in the field of patents and Founder and Director of a leading International Intellectual Property, Technology Consulting, and Analytics Firm – TT Consultants. She is also a co-founder of XLSCOUT – a Product company which is a technology search and analytics tool having the world's largest and most intelligent technology database.

Jitin Talwar, Founder

Experienced Patent Attorney, globally recognized entrepreneur and technology leader led early adoption of AI/ML and Deep Learning that led to founding of multiple start-ups including XLSCOUT.

He is Leading the use of Artificial Intelligence for Innovation, Machine Learning for Ideation and Blockchain in Innovation management.

TT Consultants is an International patent search and analytics company serving **900+ clients** around the world with accolades and credibility certifications from different known organizations. TTC has an experience of **9500+ client engagements** for several Fortune 100 Companies and top IP Law Firms across the globe. We have been working with major US law firms and corporations on litigation and IPR cases, helping them in patent protection and portfolio development, patent monetization and licensing, R&D activities and patent litigation & IPRs to knock out threatening patents.

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OUR OFFICES

INDIA

502-503 A- Tower A, 5th Floor,
Bestech Business Sector- 66 Mohali,
Punjab,

India-160055.

USA – WASHINGTON D.C

1701 Pennsylvania Avenue,
Suite 200, NW,
Washington DC. 20006, USA.

USA – SUNNYVALE

440 N Wolfe Rd
Sunnyvale, CA 94085, USA

TAIWAN - TAIPEI

Hun, CIT, No.1, Yumen St.,
Zhongshan Dist., Taipei City 104,
Taiwan

SCAN
TO FOLLOW US

CONTACT DETAILS

EMAIL US:

projects@ttconsultants.com

j.talwar@ttconsultants.com

nirmal.basi@ttconsultants.com