MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS—1963—A
CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

I/We (a) INSTITUT FRANCAIS DU PETROLE hereby apply for the grant of a (c) patent/patent of addition for an invention entitled (d) METHOD FOR MANUFACTURING SENSITIVE ELEMENTS HAVING A PERMANENT ELECTRIC POLARIZATION AND DEVICE FOR PERFORMING THE SAME, which is described in the accompanying (c) provisional/complete specification.

I/We request that the term of the patent of addition be the same as that of the patent for the main invention or so much of the term of the patent for the main invention as is unexpired. This application is a Convention application and is based on the following application or applications for a patent or patents or similar protection made in the following country or countries on the following date or dates:

No. (g) 76/20.698 in (h) France on (i) July 5 1976.

No. (g) ...................................... in (h) .............................................................. on (i) ..............................................................

No. (g) ...................................... in (h) .............................................................. on (i) ..............................................................

My/Our address for service is care of CLEMENT HACK & CO., Patent Attorneys, 14a William Street, Melbourne, Victoria, 3000, Australia.

(j) Dated this 28TH JUNE 1977.

INSTITUT FRANCAIS DU PETROLE
AUSTRALIA PATENT DECLARATION FORM  
(CONVENTION OR NON-CONVENTION)

(NOTE: This is a comprehensive form, and parts inappropriate to a particular case must be deleted. This declaration must be signed by the applicant(s), if an individual, if applicant is a company, this declaration must be signed by a person on its behalf and the Company seal or stamp should not be applied.)

Forms 7 and 8

COMMONWEALTH OF AUSTRALIA  
Patents Act 1962-1962

DECLARATION IN SUPPORT OF A CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

In support of the application No. (a) .............................................................. made by (b) ......... INSTITUT FRANCAIS DU PETROLE .............................................................. for a patent/patent of addition for an invention entitled (c) .............................................................. METHOD FOR MANUFACTURING SENSITIVE ELEMENTS HAVING A PERMANENT ELECTRIC POLARIZATION AND DEVICE FOR PERFORMING THE SAME .............................................................. Roger-Paul CONCOURT ..............................................................

of (e) ............ 9, avenue de Bois-Praeu 92350 RUEIL MALMAISON  ..............................................................

du solemnly and sincerely declare as follows:

1. (f) I am/we are the applicant(s) for the patent/patent of addition  to make this declaration on its behalf.

2. The basic application(s) as defined by Section 141 of the Act was/were made in the following country or countries on the following date(s) by the following applicant(s) namely:

in (i) ......... France .......... on (j) ......... July 5 ......... 1976

by (k) ......... INSTITUT FRANCAIS DU PETROLE  ..............................................................

in (i) ......... France .......... on (j) ......... 19

by (k) ......... INSTITUT FRANCAIS DU PETROLE  ..............................................................

3. (m) Jean-Claude DUBOIS  .............................................................. Alain DELAUNAY  ..............................................................

of (n) ........... 9, Allee du Chant de l'Alouette, Le Pief, 17200, ROYAN France  .............................................................. A l'Ancienne Forge de Lugon, Lieudit "Le Gabaron" 33240 LUGON, France  ..............................................................

3. We are the actual inventor(s) of the invention and the facts upon which the applicant(s) is/are entitled to make the application are as follows:

as regards entitlement under Section 34 of the Act: (o) the said INSTITUT FRANCAIS DU PETROLE is the assignee of the said inventors  ..............................................................

as regards entitlement under Part XVI of the Act: (q) ..............................................................

4. The basic application(s), referred to in paragraph 2 of this Declaration was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.

Declared at RUEIL (France) this 6th day of June 1977
1- A method for manufacturing a sensitive element consisting of placing said element in an enclosure wherein prevails a rarefied atmosphere and imparting thereto a permanent electric polarization by electronic bombardment, characterized in that said element is contacted in said enclosure with a liquid of very low saturating vapor pressure whose dielectric strength is higher than that of rarefied air.

4- A device for carrying out the method according to claim 1, comprising a tight enclosure intermittently communicating with a pumping system, means for imparting to the element a permanent electric polarization and means for supporting said elements, characterized in that it comprises means for depositing on the element, after polarization, a film of said liquid, contained in a vessel placed in the enclosure.
 COMPLETE SPECIFICATION
(ORIGINAL)

FOR OFFICE USE:

Application Number:
Lodged: 

Complete Specification Lodged:
Accepted:
Published:

Priority:

Related Art:

Name of Applicant(s):
INSTITUT FRANCAIS DU PETROLE

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Actual Inventor(s):
Jean-Claude DUBOIS
Alain DELAUNAY

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414 Collins Street
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Complete Specification for the invention entitled:

"METHOD FOR MANUFACTURING SENSITIVE ELEMENTS HAVING A PERMANENT ELECTRIC POLARIZATION AND DEVICE FOR PERFORMING THE SAME"
This invention relates to a method for manufacturing sensitive elements having a permanent electric polarization and to a device for carrying out this method.

The sensitive element is made of a material of the "electret" type obtained for example by polarizing a strip of a thickness from 8 to 25 microns, made of dielectric plastic material of such a type as polypropylene, polytetrafluoroethylene, polyethylene terephthalate, etc... This polarization can be effected for example by bombardment of the dielectric strip with an electron beam of sufficient energy level. The strip as well as the electron gun is usually placed within an enclosure in which a high vacuum has been effected.

When a normal pressure is progressively restored in the enclosure after the polarization operations, the dielectric strength first decreases according to the Paschen law, passes to a minimum value for a pressure of a few Torrs and then, regularly increases until the pressure attains the atmospheric pressure value. The charges accumulated in the electret strip produce a high electric field which ionizes the air particularly when the pressure attains the value corresponding to the minimum value of the dielectric strength. The ionization of the rarefied atmosphere surrounding the strip tends to depolarize it.

A known method for passing from ultra-vacuum to a normal pressure consists of producing a very quick pressure change so as to limit the duration of the ionization phenomena and accordingly, the degradation of the electric charge accumulated in the treated strips. This known method suffers from the drawback that the obtained results are often heterogeneous.
Known methods for making in a continuous manner sensitive elements to which is imparted a permanent electric polarization, comprise also the winding of the polarized strips on a drum. When the strip is wound dry, the turns cannot shift laterally with respect to one another as a result of the strong adhesive power of the electrets. This results in a bad setting of the strip, further disturbed by numerous folds.

The method of the invention has for object to avoid the above-mentioned drawbacks.

It consists first to place the element to be polarized in an enclosure containing a rarefied atmosphere and imparting thereto a permanent electric polarization by electronic bombardment. The element is then contacted, inside the enclosure, with a liquid of very low saturating vapor pressure whose dielectric strength is higher than that of the rarefied air.

At the moment where a normal pressure is restored in the enclosure, the polarized element is in contact with an electrically rigid liquid which protects it against both ionization phenomena and degradation of the electric charge. Thus, the passage of the highly charged electrets from ultra-vacuum to the pressure may be conducted without noticeable damage.

Another characteristic of the invention consists in the fact that the liquid exhibits lubricating properties. The presence of lubricating liquid on the sensitized element makes possible a winding without folds and a good setting of the turns over the take-up reels. The capacity of the latter may thus be used more completely.

Other advantages of the method as well as characteristics
of the device for performing the same will be made apparent from the following description of non-limitative embodiments given with reference to the accompanying drawings wherein:

- figure 1 shows a first embodiment of the device;
- figure 2 shows a second embodiment of the device;
- figure 3 shows a first variant of the first embodiment;
- figure 4 shows a second variant of the first embodiment, and
- figure 5 shows a third variant of the first embodiment.

The device shown in figure 1 comprises a tight enclosure communicating through an opening with a vacuum pump of a known type, not shown. The enclosure comprises a tubular portion in which is placed an electron gun 4. A focusing system provides for the concentration of the electron beam in a plane where is placed the element to be sensitized. A system of deflecting coils 6 controls the deflection of the beam according to a predetermined deflection law.

The strip to be sensitized is wound up on a delivering reel 7. It is transferred to a take-up reel 8, driven in rotation by a friction roller 9, after passage over two rollers arranged in such a manner that the strip is displaced perpendicularly to the electron beam and in the focusing plane thereof.

The strip passes over a driving capstan 11 which determines the unwinding speed and then over a roller 12 maintained immersed in a vessel or tank containing a coating fluid, consisting for example of a special oil for ultra-vacuum operations, whose saturating vapor pressure is very low and whose dielectric strength is smaller that that of the rarefied air.
There is used preferably a silicone oil whose vapor pressure is $10^{-7}$ torr. More generally, it is convenient to make use of a liquid whose vapor pressure is at most equal to $5 \cdot 10^{-7}$ torr.

A heating system, comprising for example electric resistors 14, is immersed in the tank 13. The strip is wound up on the take-up reel 9, after immersion in oil. A metallic pressing roller 20 is arranged near the point of application of the strip on the take-up reel 8. By experience, it has been observed that this pressing roller is very useful for improving the setting of the turns over one another.

Before the step of sensitizing the strip, a preliminary step is conducted during which the coating fluid is fed to the tank and a very high vacuum is established in enclosure 1. The fluid is heated so as to remove gas therefrom, at a temperature of about 60°C, for example until the residual pressure in the enclosure becomes lower than $10^{-6}$ Torr. The fluid is then allowed to cool down and the strip-driving system is actuated. If a pressure increase above $10^{-6}$ Torr is observed in the enclosure, the unwinding of the strip is discontinued until a new gas removing cycle has been performed.

When the gas removal is sufficient, i.e. when no pressure increase is observed after the starting of the unwinding operation, the strip to be polarized is subjected to the electronic bombardment.

When a sufficient amount of the strip has been sensitized, the inside of the enclosure is progressively put in communication with the external medium at atmospheric pressure and the take-up reel is disengaged and taken off from the enclosure.
The transition time between rarefied atmosphere and the external pressure is not critical and does not result in a substantial depolarization of the sensitized strip.

According to the embodiment of figure 2, the take-up reel 8 is immersed at least partly in a tank containing the lubricating coating fluid.

The variants of the first embodiment illustrated in figures 3 to 5, concern three different systems for coating the sensitized strip 15 before its winding up on the take-up reel.

According to the first variant the tank 13 containing the lubricating fluid is placed above the strip 15. The fluid is conveyed through pipe 16 from the tank 13 to a pad 17, for example of felt, in frictional engagement with the strip 15.

According to a second variant, the tank 13 is placed below the strip 15 and the friction pad 17 is fed by capillarity through a wick 18.

According to the third variant, the sensitized element 15 is coated with lubricating fluid by contact with a roller 19 d. The oil is transferred to the latter by a roller 19 a dipped into the fluid of the tank, through two intermediary rollers 19 b and 19 c with which there are in contact.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1- A method for manufacturing a sensitive element consisting of placing said element in an enclosure wherein prevails a rarefied atmosphere and imparting thereto a permanent electric polarization by electronic bombardment, characterized in that said element is contacted in said enclosure with a liquid of very low saturating vapor pressure whose dielectric strength is higher than that of rarefied air.

2- A method of manufacture according to claim 1, characterized in that said liquid exhibits lubricating properties.

3- A method of manufacture according to one of claims 1 and 2, characterized in that said liquid is used for coating the element after polarization.

4- A device for carrying out the method according to claim 1, comprising a tight enclosure intermittently communicating with a pumping system, means for imparting to the element a permanent electric polarization and means for supporting said elements, characterized in that it comprises means for depositing on the element, after polarization, a film of said liquid, contained in a vessel placed in the enclosure.

5- A device according to claim 4, characterized in that the liquid contained in the vessel is a lubricating liquid.

6- A device according to claim 5, characterized in that the vessel comprises means for heating the liquid contained therein.

7- A device according to claim 6, characterized in that the support means comprises a driving system for unwinding the strip in front of said polarization means between a delivering reel and a take-up reel.
8- A device according to claim 7, characterized in that the means for depositing a thin film of liquid is placed between the delivering reel and the take-up reel.

9- A device according to claim 8, characterized in that it further comprises a roller for pressing the element against the take-up reel, said roller being placed in the vicinity of the point where the element comes in contact with the take-up reel.

10- A device according to claim 8, characterized in that said means for depositing a thin film of liquid on the element comprise a pad and means for feeding said pad with lubricating liquid.

11- A device according to claim 10, characterized in that the means for feeding the pad comprises duct means communicating with a tank of lubricating fluid.

12- A device according to claim 10, characterized in that the means for feeding the pad comprises a wick.

13- A device according to claim 8, characterized in that said means for depositing a thin film of liquid on the element comprises an assembly of intercontacting rollers, one of them being dipped in the lubricating liquid of the tank, another one being in contact with said polarized element.

14- A device according to claim 8, characterized in that the take-up reel is immersed at least partly in the tank containing the lubricating fluid.

15- A device according to one of claims 8 to 14, characterized in that the lubricating liquid consists of silicone oil.

DATED THIS 28TH DAY OF JUNE, 1977

INSTITUT FRANCAIS DU PETROLE
By Its Patent Attorneys
CLEMENT HACK & CO;
Fellows Institute of Patent Attorneys of Australia