RUSSIAN FEDERATION

PATENT
for invention
No. 2233578

ANTICYCLONE CIRCULATION DERANGEMENT METHOD AND IMPLEMENTATION DEVICE

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Application No. 2003121612

Priority of invention: 16 July, 2003

Filed in the State Register of Inventions of the Russian Federation on the 10th of August, 2004

Date of expiry: 16 July, 2023

Head of the Federal Service for Intellectual Property, Patents and Trademarks.
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Official seal: Russian Agency of Patents and Trademarks.

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RUSSIAN FEDERATION
Federal Service for Intellectual Property, Patents and Trademarks

Subject of invention to patent

(19) **RU** (11) **2233578** (13) **C2**

(21) Registration number of the patent application: 2003121612

(22) Date of application: 16.07.2003

(43) Date of publishing of the application details: 20.12.2003, bulletin No. 22

(24) Time origin of the patent: 16.07.2003

(51) МПК[7] **A 01 G 15/00**

(54) ANTICYCLONE CIRCULATION DERANGEMENT METHOD AND IMPLEMENTATION DEVICE

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(56) **List of documents quoted in the search report**: RU 2090057 C1, 20.09.1997. RU 2115296 C1, 20.07.1998. RU 2105463 C1, 27.02.1998. RU 2107428 C1, 27.03.1998. RU 2060639 C1, 27.05.1996. US 3456880, 22.07.1969. GB 216837, 29.01.1925.

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(57) Subject of invention

1. Anticyclone circulation derangement method

ANTICYCLONE CIRCULATION DERANGEMENT METHOD AND IMPLEMENTATION DEVICE

Application

This invention relates to applied meteorology and can be used in agricultural sector and for the improvement of environmental conditions in case of atmospheric stagnation that may occur as a result of continued anticyclone.

Background

Draughts are known to be a very frequent natural phenomenon that systematically causes harm to cultural crops. Moreover, draughts favor the initiation of fires that eliminate forests in large areas every year. In spite of the permanent efforts, fighting this dangerous phenomenon remains inefficient.

The usual meteorological prerequisite for draughts is persistent anticyclones. The most efficient method of eliminating anticyclones is creation, in their domination areas, of artificial fleecy clouds that reduce the solar radiation transparency of atmosphere and the overall radiation balance of the earth surface thereby reducing the volume of descending air flows that hinder natural cloud formation processes (L.G. Kachurin, Physical Principles of Atmospheric Process Correction, Leningrad, Gidrometeoizdat, 1990, p. 404-407). This intervention is aimed at reducing earth surface layer temperature and hence shortening the life of the anticyclone. It has been suggested to create fleecy clouds by releasing water vapor supersaturated with moisture as compared with the atmosphere using specially humidified aircraft jets or special airborne steam generators. Application of crystallization nuclei or surfactants is recommended for some atmospheric layers.

Disadvantage of said anticyclone (and hence draught) elimination methods is that they require the use of aircraft fleet and other expensive airborne facilities and reactants. Naturally, these methods cannot find general application. Another tangible disadvantage of the fleecy cloud creation method is that said method would only be efficient after an anticyclone has already passed through its peak phase. Furthermore, this method is only hypothetical and has never been tested in practice.

Most of the other known technical solutions used for anticyclone elimination are based on the creation of cumulonimbus clouds over a local area followed by the artificial initiation of precipitation (rain). Known is a group of cloud creation methods based on heating a local area of the underlying earth surface as compared with the surrounding area thus initiating convective air flows, cloud formation and precipitation, provided the moisture content in the atmosphere is sufficient. In particular, the arid zone precipitation initiation method according to the RU 2071243 Russian Patent is based on the use of black coverage applied onto the underlying earth surface and additionally heated by solar radiation directed to that area with a set of large mirrors. The overheating of the underlying earth surface should initiate ascending hot air flows that undergo adiabatic volume expansion and reduction to cause water vapor condensation in the form of cumulonimbus clouds followed by artificial precipitation over the required area. These cloud creation methods require expensive equipment and/or large quantities of paints.

Another important group of cumulonimbus cloud creation and precipitation initiation methods is based on electrically influencing the atmosphere. These methods are being currently developed intensely. The convection initiation method used therein is based on atmospheric air ionization that generates ascending electrical particle flows followed by the formation of atmospheric volume charge that favors moisture condensation and precipitation

(see, e.g. the RU 2042318, 2098942 and 2161881 Patents).

Obviously, the closest counterpart of the atmospheric anticyclone circulation derangement method claimed herein is the cloud field and precipitation initiation method based on the formation of atmospheric convection cells in accordance with the RU 2090057 Patent. According to the known method, an ascending air flow is initiated with a flow of light unipolar hydrated ions. Compared with the other technical solutions of this group, said method provides for the formation of a relatively stable air flow that can reach high altitudes in the atmosphere even with strong horizontal wind (5 m/s or greater) or in the presence of trapping atmospheric layers. Air flow stability is achieved due to the selective ionization of atmospheric air gas molecules, primarily, its oxygen components, i.e. atomic oxygen, oxygen molecules and ozone molecules. Precipitation (and maximum daytime earth surface temperature reduction) with the known method may have good results in draughty regions, provided, however, favorable atmospheric conditions exist in the area. Moreover, the desired result is not guaranteed because ascending air flows that are used for the formation of atmospheric convection cells produce relatively closely spaced descending air flows. This convection pattern reduces the probability of large cloud field formation.

The known anticyclone elimination methods described above also have the common disadvantage consisting in that the influence on atmosphere produced with said methods has a local pattern. However, local correction of atmospheric conditions cannot lead to any radical change in the macroscopic scale meteorological conditions. Therefore, the result of using said methods is not reliable. One can additionally point out that the known technical solutions use ascending air flows for influencing atmosphere for quite different, often contradictory purposes, such as cloud formation in order to initiate precipitation or, on the contrary, dispersion of clouds and/or mist. These opposite applications

clearly show that the use of ascending air flows for influencing atmosphere has a limited, local pattern. The local pattern of this influence is due to the fact that ascending air flows do not have sufficient power and stability and that the influence is interrupted during the passage of a cloudless air region.

Said ionized ascending air flow atmosphere influencing methods for cloud formation and precipitation initiation are implemented with atmospheric air ionizing devices. Currently, various designs of said devices are known, the basic element of them being the ionic generator. Normally, an ionic generator is an electrode or a set of electrodes to which high voltage is supplied to provide corona discharge on the current conductors and appropriate electron emission. The electrons emitted from the electrodes ionize the air gas molecules that in turn create an ascending atmospheric ionic flow due to the repulsion by the negative field of the Earth. However, air flows cause the flow of ionized molecules to disperse at small heights to form volume electric charge.

Under the closest counterpart of the invention claimed herein (RU 2090057 Patent) ascending air flows are created with an ionic generator that comprises an air ionization device in the form of an electron emitter for the ionization of gas molecules with an electron affinity of 0.4-2.2 eV. The electron emitter is a current conductor connected to the negative pole of a power source. Said conductor is connected in parallel with a grounding conductor. Both conductors are spatially arranged as a set of working cells. When voltage sufficient for corona discharge is supplied to the electrodes, electron emission from the ionizing electrode is initiated. The electrical parameters of the device are set to limit the ionization energy by the energy that is sufficient for the ionization of oxygen molecules or other oxygen bound air components (O^- and O_2^-) that are capable of forming the so-called light ions with a high mobility in electrical fields. Said ions being brought in contact with atmospheric water vapor molecules, heating energy is released causing heated air flows to rise

upwards. Said ascending air flows produce a low atmospheric pressure region that moves upwards rapidly to provide for a stable overall ascending air flow. The selective action of the known ionic generator which is based on the energy advantage of ionizing oxygen molecules as compared with other molecules allows creating stable ascending air flows that are capable of overcoming a significant dispersing potential of horizontal winds (5 m/s or greater). The stability of ascending air flows is further increased by equipping said ionic generator with an ion flow humidifier and an electron and ion outflow accelerator (extractor). The extractor can be made, for example, in the form of an electrostatic device, i.e. an electric conductor.

Although the structure of said generator allows creating stable ascending air flows, it has a disadvantage consisting in that the ionizing electrode of the electron emitter has an arbitrary spatial distribution, i.e. it can be horizontal in some sections while tilted or vertical in others. This disadvantage is due to the fact that if ionizing electrode sections are vertical, the electron emitter conductor portions located beneath in fact hinder electron emission from the above portions, thereby reducing the total power of the ion flow. Ion flow is the most intense if ionizing conductors are horizontal, but this ion flow is insufficiently stable because such ion extractor design cannot provide for efficient functioning. Moreover, this design is space consuming. Ionizing conductor location in an arbitrary tilted plane offsets the above vertical and horizontal design disadvantages to some extent, but the location of the ionizing conductor and the ion extractor for this design is uncoordinated and therefore this improvement is not valuable either.

The advantages of said ionic generator are limited to its basic function, i.e. the formation of a convection cell above the required earth surface area by creating a series of ascending and descending air flows. However, as noted above, the presence of descending air flows hinders natural cloud formation.

Therefore, for example, instead of expected precipitation one can obtain the opposite results for an area above which an ascending air flow was created. In fact, the creation of convective cells is another local method of lower atmospheric layer influence.

Disclosure of the Invention

Precipitation is initiated in the known methods mainly in the presence of clouds above the required area or if clouds with the required moisture level can be produced artificially. However, in some areas, clouds that would be a sufficient source of precipitation may be absent for many weeks. Even if one succeeds to initiate short rain in such areas, this would be impossible for a long time thereafter due to the absence of sufficient moisture in the atmosphere.

More reliable anticyclone elimination approach can be methods based on the elimination of the overall anticyclone related conditions because it is persistent and usually cloudless anticyclones that often initiate large draughts.

The invention disclosed herein solves the technical task of anticyclone elimination by eliminating regional scale anticyclone related conditions and the task of providing a device for creating ascending ionized air flows that capable of correcting these meteorological conditions.

The technical result of the anticyclone circulation derangement method claimed herein is change in the weather conditions consisting in the creation of clouds and artificial initiation of precipitation in a persistent anticyclone area.

The technical result of the device claimed herein is creation of a low atmospheric pressure region in an upper part of the anticyclone that is sufficient for forming a cyclonic eddy in the upper part of the anticyclone.

In the anticyclone circulation derangement method claimed herein, said technical result is achieved by influencing the atmosphere in an anticyclone area

with a stable ascending ionized air flow, wherein a low atmospheric pressure region being created in an upper part of the anticyclone that produces an upper atmospheric layer cyclonic eddy. In the preferred embodiments of the method, the ionized air flow is directed to the highest atmospheric moisture concentration region or to a relatively low atmospheric pressure region of an anticyclone area, with a roughly 100-500 km diameter low atmospheric pressure region being created in an upper part of the anticyclone area, and the created ionized air flow parameters being adjustable depending on the stage of low atmospheric pressure region formation in the anticyclone area.

With the stable ionized air flow creation device claimed herein, said technical result is achieved provided the device comprises at least one ionic generator further comprising an ionizing electrode and an ion extractor, wherein said ionizing electrode is positioned around said ion extractor forming a tilted surface that becomes narrower towards the bottom part of said ion extractor.

In the preferred embodiment of the invention claimed herein, said ionic generator comprises an ionizing electrode positioned on the side surface of a geometrical body the apex of which oriented downwards, such as a cone, a pyramid or a paraboloid, hyperboloid etc. surface; alternatively, the ionizing electrode is positioned on the side surface and the smaller base surface of a truncated geometrical body of said type the apex of which oriented downwards.

In the preferred embodiment, said device comprises a device for concentrating the ionic outflow, said device being in the form of, for example, an electromagnetic coupling positioned above ionic generator.

List of Drawing Figures

The invention disclosed herein will be further illustrated with drawing figures.

Figure 1 shows schematic of the ionic generator longitudinal section,

Figure 2 shows the general view of the ionic generator with the ionizing electrode positioned on the surface of a downwards oriented truncated geometrical body, Figure 3 shows schematic of ionized air flow formation causing the formation of a cyclonic eddy and Figure 4 shows schematic experimental setup of the upper atmospheric air cyclone creation.

Detailed Description of the Invention

The device for creating a stable ascending ionized air flow comprises one or multiple ionic generators 1. Each ionic generator 1 comprises a high direct voltage source 2 the negative pole of which is connected to the ionizing electrode 3 serving as the electron emitter and the positive pole is connected to the grounded conductor 4 and the extractor 5, the latter being an electrode that accelerates electron outflow from the ionizing electrode 3 and the formation of an ascending atmospheric ion flow. The ionizing electrode 3 is an small section electrical conductor positioned on the side surface of a geometrical body the apex of which oriented downwards, such as a cone, a pyramid or the surface of a paraboloid, a hyperboloid etc.; alternatively, the ionizing electrode is positioned on the side surface and the smaller base surface of a truncated geometrical body of said type the apex of which oriented downwards. The electrical conductor of the ionizing electrode 3 is made from a highly electron emitting material.

Generally, there is no difference between the types of the geometrical bodies on the surface of which the ionizing electrode is positioned. What is important is that the apex of said geometrical body is oriented downwards to the earth surface, i.e. said surface forms a funnel becoming narrower downwards or an open umbrella turned upside down. The transverse section of said geometrical body may be a polygon, a circle, an ellipse or another geometrical figure. The extractor 5 is a conductor positioned basically along the axis of the

geometrical body on the surface of which the ionizing electrode is positioned, i.e. the extractor is the “umbrella handle’ in relation to the figure formed by the ionizing electrode 3. The electron emitter is thus positioned basically along the tilted surface becoming narrower towards the bottom part of the extractor.

In the preferred embodiments of the invention the surface on which the ionizing electrode is positioned is the side surface and the smaller base surface of a truncated geometrical body of said type the apex of which oriented downwards.

The grounding conductor 4 is basically a conductor positioned on a surface that is parallel to the one on which the ionizing electrode 3 is positioned.

Electromagnetic coupling type device 6 positioned above the ionic generator is used for concentrating the negative ion current emitted by the ionic generator.

The overall structure is assembled with connectors 7 and insulators 8 on the posts 9.

Electric potential of sufficient magnitude being supplied to the electrodes 3 and 4, the electrode 3 starts to produce a corona discharge and emit electrons. The grounded extractor 5 provides for a permanent outflow of electrons emitted by the emitter 3 and thus provides for the maximum possible electron emission from the emitter. Most of the electrons emitted by the emitter 3 repelled by the negative background potential of the earth surface tend to rise upwards in the atmosphere to produce a permanent flow. Said electrons, being brought in contact with air molecules, form negatively charged ions which immediately start to attract atmospheric moisture molecules. As is well known, the presence of said atmospheric moisture molecules favors the accelerated flow of the ionized molecular complexes formed in the atmosphere.

The formation of the ionized molecular complexes is an exothermal process that causes adiabatic expansion of the surrounding air volumes,

therefore the air rises upwards and cools down to condensate the comprised water vapor under appropriate conditions. The low atmospheric pressure region is filled with new portions of surrounding air that are also ionized by the permanent ion flow, heated due to the exothermal formation of new molecular complexes and rise upwards. Thus, a stable ascending ionized air flow is created in the atmosphere. As the ion flow direction is controlled by the earth surface charge, and the air flow direction is controlled by the atmospheric pressure gradient, the overall direction of said air flow, under favorable conditions (e.g. in the absence of strong horizontal winds, typical for anticyclone areas) will be basically vertical. Dispersion of this air flow in the bottom tropospheric layers will be insignificant but increasing towards upper tropospheric layers.

The high stability of the ascending air flow is accounted for by the ionic generator design features. The positioning of the emitter ionizing electrode 3 on a surface around the ion extractor 5 tilted towards its bottom part allows for the optimum control of device operation to substantially increase the power of the ion flows and the stability of the ascending air flows generated by the device. In this case, the vertical ion extractor 5 is in fact positioned along the axis line of the surface on which the ion emitter 3 is positioned and is at different distances from the ionizing electrode at different heights. This relative positioning of the electrodes 3, 4 and 5 does not hinder reduce the efficiency of electron emitter portions located at different heights and, on the other hand, allows for the optimum utilization of its surface, thus providing for the maximum output of electrons from the ionizing electrode and a specific synergetic phenomenon showing itself in drastic increase in the power of the ion flow and a higher stability of the ascending ionized air flow created by the ionic generator.

Furthermore, the ionic generator design suggested herein is less space consuming and more practical in use.

The efficiency of the ionic generator increases if the surface on which

the electron emitter 3 is positioned is the side surface of a truncated cone, paraboloid, hyperboloid or pyramid oriented towards the bottom of the extractor 5. This allows avoiding ionic generator interference occurring in the area where the emitter 3 and the extractor 5 are brought closer. The electromagnetic coupling positioned above the ionic generator concentrates the forming ion flow.

A device comprising even only one ionic generator as described above provides for an ascending ionized air flow that is capable of reaching the upper region of an anticyclone. The ascending ionized air flow is gradually dispersed in low pressure atmospheric layers (i.e. at greater altitudes). As the flow ascends, it favors even greater reduction in the pressure of the air in the space occupied by it, thus forming a conical low atmospheric pressure region the diameter of which increases upwards (Figure 3). According to experimental data, ionized air flow can reach altitudes corresponding to atmospheric pressures of 300-400 mBar. Air density inhomogeneity and disturbances produced in the low atmospheric pressure region disturb the internal stability of the anticyclone region. At these altitudes that usually correspond to the upper anticyclone layers, air masses with a low internal stability are subject to Coriolis forces, and a cyclonic eddy is produced as a result. Cyclonic eddy formation deranges the circulation of anticyclone air masses in its upper part. Cyclonic eddy gradually expanding occupies lower parts of the atmosphere in anticyclone region, thus deranging anticyclonic circulation. The cyclone provides for the accumulation of clouds followed by precipitation.

In the preferred embodiment of the anticyclone circulation elimination method disclosed herein, large altitude cyclone is formed by providing an ascending air flow the power of which is sufficient for the formation of a 100-150 km diameter low atmospheric pressure region at specified altitudes.

To accelerate the disturbance of anticyclone circulation or increase the reliability of the method disclosed herein, it is recommended to use favorable

atmospheric conditions as determined by meteorological study. For example, analysis of isobaric maps allows detecting natural low pressure regions (valleys) in order to direct ionized air flows thereto. To increase the efficiency of the method disclosed herein, one can install multiple ionic generators 1 on the earth surface corresponding to the low atmospheric pressure region. The number of the generators, the distance between the generators and operation modes of each individual generator depend on multiple factors, including anticyclone status, anticyclone isobaric structure and local orographic pattern, and therefore it should be selected individually on a case by case basis. One option of ionic generator layout for specific conditions is shown in Figure 4. To coordinate the operation of individual ionic generators 1, one can provide for their common control from a control point (not shown).

Another possibility of increasing the efficiency of the anticyclone circulation disturbance method disclosed herein is to select a higher humidity region in an anticyclone, where the probability of air-mass cumulus cloud formation is higher. For this option, appropriate region or regions are preliminarily detected in the anticyclone structure by meteorological measurements, and ionized air flows generated by the device disclosed herein comprising one or multiple ionic generators are directed to said regions.

Claim

1. Anticyclone circulation disturbance method comprising influencing the atmosphere in an anticyclone area with a stable ascending ionized air flow, wherein said ionized air flow produces a low atmospheric pressure region in the upper part of the anticyclone, resulting in the formation of a large altitude cyclone.

2. Method according to Claim 1 wherein said ionized air flow is directed to an anticyclone region with the highest atmospheric humidity content.

3. Method according to Claim 1 wherein said ionized air flow is directed to an anticyclone region with a relatively low atmospheric pressure.

4. Method according to any of Claims 1 through 3 wherein the diameter of said low atmospheric pressure region is 100-150 km.

5. Method according to either of Claims 3 or 4 wherein the parameters of said ionized air flow are adjustable.

6. Method according to Claim 5 wherein said ionized air flow parameters are adjusted depending on the low pressure region formation stage in the anticyclone region.

7. Device for the creation of a stable ascending ionized air flow comprising at least one ionic generator further comprising an ionizing electrode and an ion extractor, wherein said ionizing electrode is positioned around said ion extractor forming a tilted surface that becomes narrower towards the bottom part of the ion extractor.

8. Device according to Claim 8 wherein the surface on which the ionizing electrode is positioned is the side surface of a geometrical body such as a cone, a pyramid, a paraboloid or a hyperboloid.

9. Device according to Claim 7 wherein said surface on which the ionizing electrode is positioned is the side surface and the smaller base surface of a truncated geometrical body such as a cone, a pyramid or the surface of a paraboloid or a hyperboloid.

10. Device according to any of Claims 7 through 9 wherein said device is equipped with an ion flow concentrator.

11. Device according to Claim 10 wherein said ion flow concentrator is in the form of an electromagnetic coupling.

Abstract

The invention relates to anticyclone condition elimination methods and devices for their implementation. The anticyclone condition elimination method claimed herein consists in the creation of a low atmospheric pressure region in the upper part of an anticyclone with an ascending ionized air flow, resulting in the formation of a cyclonic eddy. The method is implemented with a device comprising at least one ionic generator further comprising an ionizing electrode and an ion extractor. The ionizing electrode is positioned around the ion extractor on a tilted surface that becomes narrower towards the bottom of said ion extractor. The surface can be the side surface of a geometrical body such as a cone, a pyramid, a paraboloid or a hyperboloid, or the side surface and the smaller base surface of truncated geometrical bodies of the above types. The device may also include an ion flow concentrator.

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