Oct. 8, 1968 L. M. ROBERTS 3,404,513

MOBILE ELECTROSTATIC PRECIPITATOR

Filed Feb. 1, 1965 3 Sheets-Sheet 1

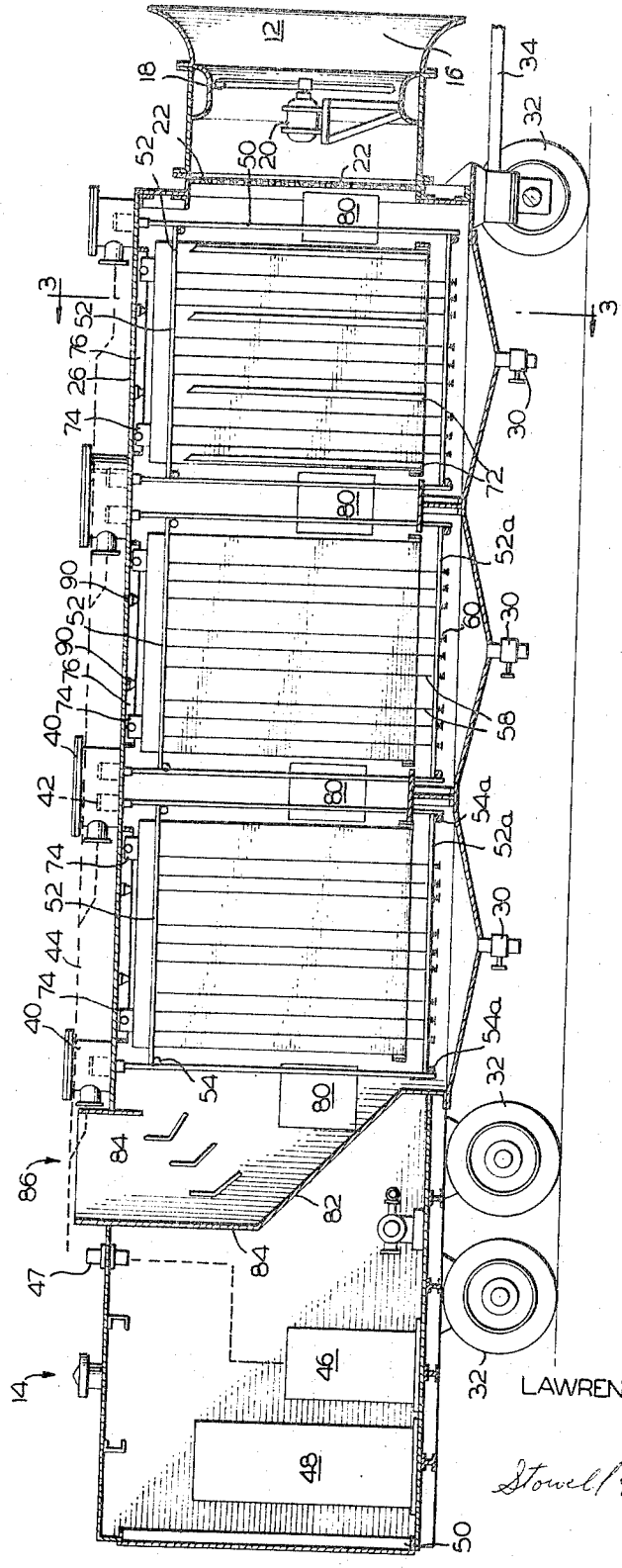


FIG 1.

INVENTOR
LAWRENCE M. ROBERTS

Stowell & Stowell

ATTORNEYS

Oct. 8, 1968 L. M. ROBERTS 3,404,513

MOBILE ELECTROSTATIC PRECIPITATOR

Filed Feb. 1, 1965 3 Sheets-Sheet 2

Fig. 3.

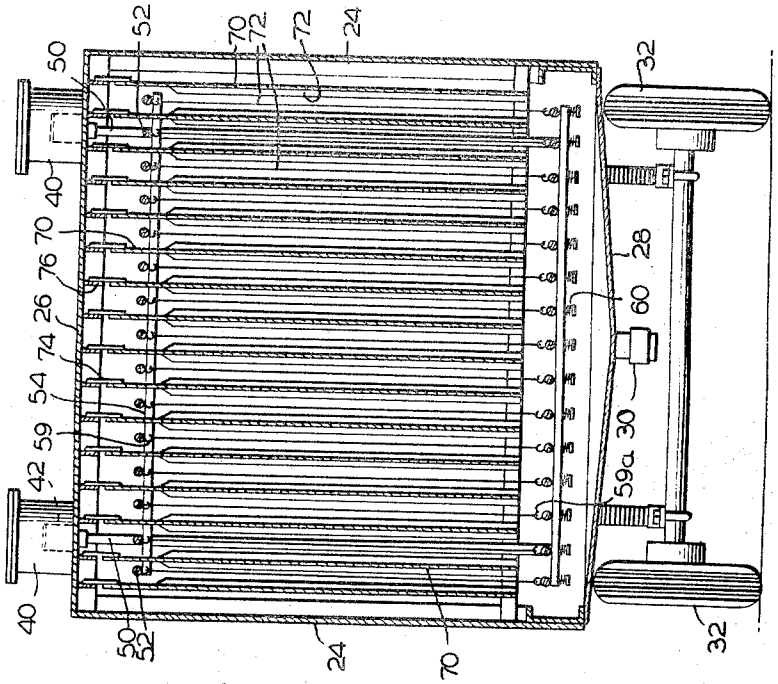
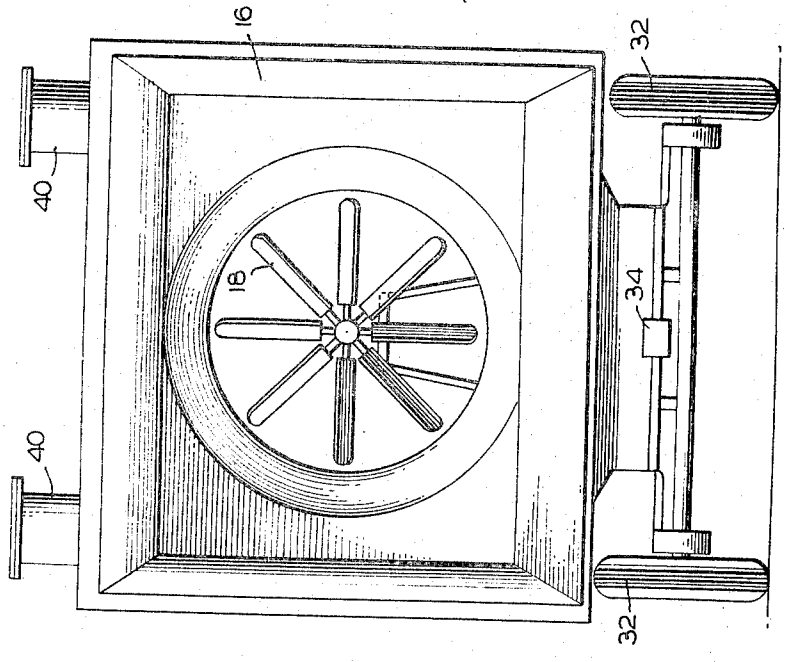


Fig. 2.



INVENTOR
LAWRENCE M. ROBERTS

BY Stowell & Stowell

ATTORNEYS

Oct. 8, 1968 L. M. ROBERTS 3,404,513

MOBILE ELECTROSTATIC PRECIPITATOR

Filed Feb. 1, 1965 3 Sheets-Sheet 3

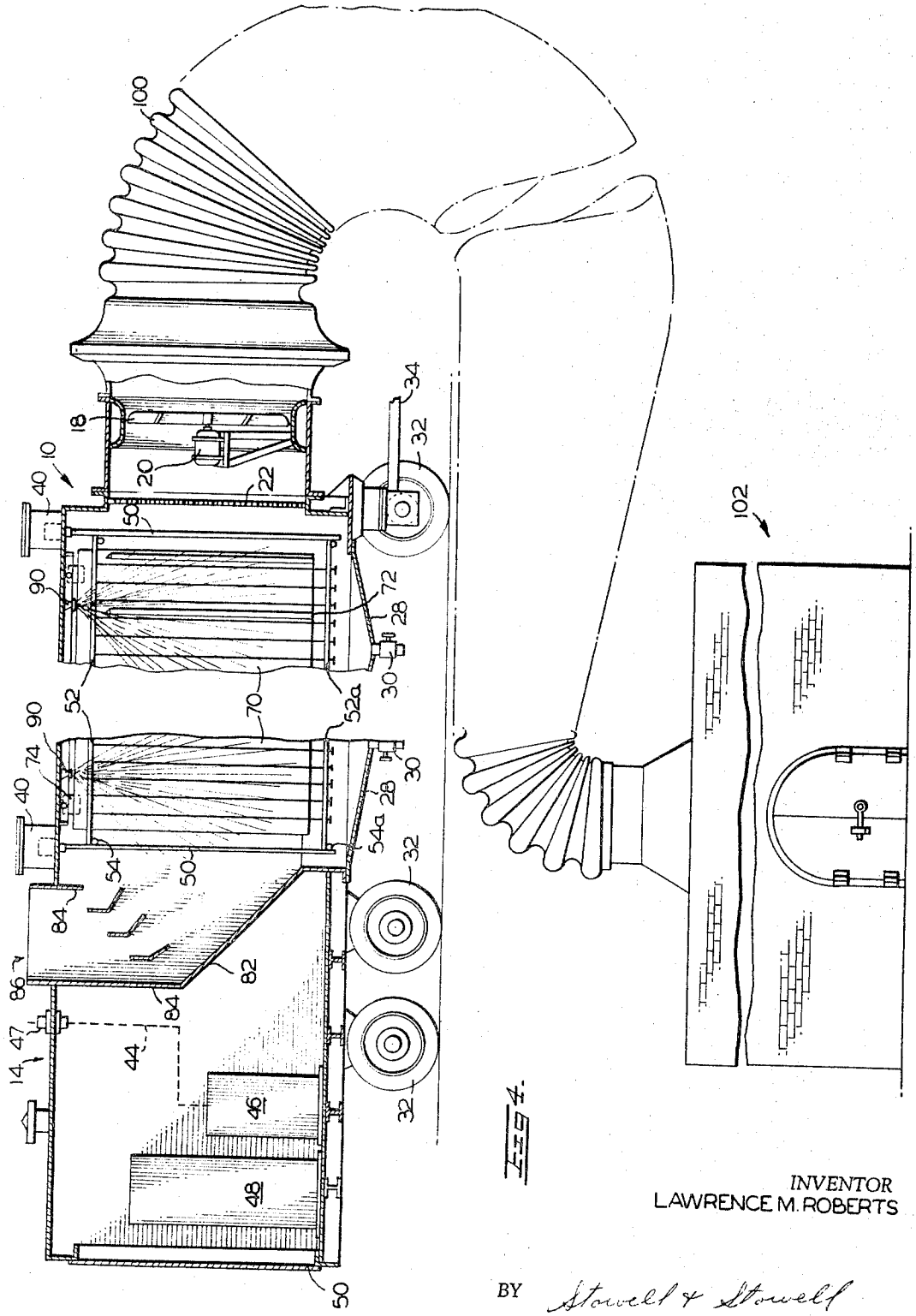


FIG 4.

INVENTOR
LAWRENCE M. ROBERTS

BY Stowell & Stowell

ATTORNEYS

United States Patent Office 3,404,513 Patented Oct. 8, 1968

3,404,513

MOBILE ELECTROSTATIC PRECIPITATOR

Lawrence M. Roberts, Wickenburg, Ariz., assignor to Research-Cottrell, Inc., Bridgewater Township, N.J., a corporation of New Jersey

Filed Feb. 1, 1965, Ser. No. 429,288
2 Claims. (Cl. 55—107)

ABSTRACT OF THE DISCLOSURE

Apparatus for removing fog from roadways and runways which comprises a mobile percipitator trailer adapted to be moved along the roadway to be cleared of fog and dispelling the moisture free air generally upwardly to reduce the relative humidity of the air in the zone of the fog.

This invention relates to an electrostatic precipitator and more particularly to an ambulatory mobile electrostatic precipitator in the general form of a vehicle which may be towed by a prime mover.

As is well known to air travellers, the presence of fog at an airport can cause delays up to several hours and, if the fog is particularly severe or long lasting, can completely defeat any efforts to land a plane at such an airport, unless the airport is provided with the most expensive and up-to-date navigational devices. Certain types of mists or fogs which may be defined as a type of colloidal suspension are known to exist in more or less discrete clumps or volumes, much as in the case with many types of clouds. In such instances, it is possible to considerably improve visibility conditions by breaking up or dispelling the fog, since its removal would not be accompanied by an ever present replenishment of the fog.

Of the variety of means propounded for defeating fog conditions at airports, the present apparatus is very attractive because of its practical solution to the problem.

According to this invention, an apparatus for removing certain types of fogs and mists from landing strips at airports comprises an electrostatic precipitator adapted to be moved over or along a runway or runways. Further, according to another practice of the present invention, an electrostatic precipitator is employed to remove particulate material from dirty gases at incinerators, foundries, and the like, especially when the latter are used on a not too frequent scheduling basis. As an example of this latter utility exhibited by the present invention, a suburban incinerator adapted to be employed only one or two days a week may be serviced by the ambulatory electrostatic precipitator of this invention, and thus circumvent the need for the otherwise expensive provision of the incinerator with electrostatic gas cleaning means.

It is, accordingly, an object of the present invention to remove fogs and mists of certain types from the vicinity of airport runways by moving an electrostatic field through the mist or fog on the runway to thereby break down the suspension of water droplets in the air which give rise to the fog.

It is a further object of the present invention to provide a mobile electrostatic precipitator which may be moved along the runways of an airport to thereby dispel fogs and mists so that the operator of an airplane will be able to clearly see the runway surface when the aircraft is just above the runway.

It is a further object of the present invention to provide a mobile electrostatic precipitator trailer having a fan and motor attached thereto to thereby provide a forced flow means to thereby increase the efficiency of the electrostatic precipitator unit carried thereby.

It is a further object of the present invention to provide a mobile electrostatic precipitator trailer having forced

flow means therein in combination with means for collecting water for subsequent discharge to waste.

It is a further object of the present invention to provide a mobile electrostatic precipitator trailer including an electrostatic precipitator in combination with a forced convection means together with means for directing the cleaned air substantially vertically upwardly to thereby assist in dispelling fog from an adjacent runway at an airport.

These and other objects and advantages from the practice of the present invention will be apparent from the following description.

In the drawings:

FIG. 1 is a side elevational view of the mobile precipitator trailer of this invention;

FIG. 2 is an end elevational view taken from the foot of the trailer;

FIG. 3 is a view taken along line 3—3 of FIG. 1; and

FIG. 4 is a partially schematic side elevational view showing the mobile precipitator trailer of this invention coupled to a foundry, incinerator, or the like by means of a flexible hose or other coupling.

Referring now to FIGS. 1, 2 and 3 of the drawings, the numeral **10** denotes generally the mobile precipitator trailer of this invention and includes a front intake portion denoted by the numeral **12**, and a rear portion **14**.

A generally rectangular and outwardly flaring continuous lip **16** functions as an intake orifice with a rotating fan **18** driven by motor **20** located generally centrally of the intake. The numeral **22** denotes a perforated screen such that the combined area of the perforations therein is substantially equal to the combined area of the imperforate portions thereof to allow an opening ratio of approximately 50 percent. The numeral **24** denotes the sides of the trailer having a top portion **26** and bottom portions **28**, with the latter having generally sloping sides and terminating each in a valve or tap **30**. As will be observed from FIG. 1, there are three such sets of sloping bottoms **28** each terminating in a tap, each set corresponding to a bank of electrostatic precipitators.

The mobile precipitator trailer is provided with a plurality of wheels **32** conventionally mounted on the underside thereof with the front portion of the trailer provided with a tow bar **34** adapted to be attached to a mobile vehicle for pulling. The vehicle, however, may have its own prime mover and steering means offset to one side or positioned at the rearward end thereof.

The numeral **40** denotes any one of the plurality of upper access conduits generally cylindrical in form and covered by top closure plates. Each of such access ports surrounds an upstanding electrical terminal **42**, with the intermediate access units **40** each containing two such terminals while the outermost units contain a single such terminal. A high tension line **44**, denoted by a dashed line, is led from a high voltage transformer **46** through a suitable insulator **47** in the top portion **26** of the trailer and is coupled to terminals **42**, there being three connections, one for each bank of electrostatic precipitator units. The transformer output is controlled by a switchboard assemblage **48** and suitable voltage control means.

Each terminal **42** communicates with a downwardly extending metallic support rod **50** extending into the bottom portions of each of the electrostatic precipitator banks. In each bank there are a plurality of horizontally disposed cross-rods **52**, two of which are secured as by welding to the rods **50**. As illustrated at FIG. 3 of the drawings, each horizontally disposed rod **52** is secured to end horizontal rods **54** extending at right angles thereto, also as by welding or the like. Rods **52** carry, at the bottom portions thereof, hooks **59***a* which engage the lower ends of a plurality of vertically extending high tension discharge electrodes or wires **58**. The upper ends of

the wires engage hooks **59**. Hooks **59** are secured to a plurality of horizontally extending bars **52***a*. The lower hooks **59a** have straight body portions which extend through apertures in the lower rods, with the extending portions of the hooks surrounded by compression springs **60** to thereby provide a tension of approximately two pounds on the high tension lines **58**.

The high tension lines are situated between and generally parallel to a plurality of collecting plate-type electrodes **70**, each of which is provided, at spaced longitudinal points, with outwardly flaring angular portions **72**. These angular portions **72**, extending or flaring on both sides of plates **70**, function to impart desired flow characteristics to gas passing through the electric precipitator bank. Such flared portions are shown and described in U.S. Patent 2,826,262 to Byerly. As will be observed from FIG. 1, only the first (right-most) electrostatic precipitator bank is provided with the angular flaring portions **72**.

The upper portions of plates **70** are coupled, as by welding, threaded fasteners, or any other convenient fastening means, to intermediate fastening plates **74**, with the upper portions of the latter being also suitably coupled to downwardly extending tab portions **76** fixed to the underside of top or roof portion **26**.

It will be observed that, except for the flared portions or vanes **72** of the first electrostatic precipitator bank, all of the electrostatic precipitator banks are identical in construction.

A plurality of access doors **80** are provided at one side **24** of the trailer. The rear portion of the internal flow passageway through the trailer is provided with a biased conduit portion **82** and an upwardly extending conduit portion **84** to thereby define an exit port or orifice **86** for the discharge of the cleaned gas. The numerals **90** each denote any one of a plurality of nozzles suitably coupled to a pump **92** for the injection of a fluid to clean the particular gas being treated or for the discharge of a suitably charged dust or other small particulate material to assist in the cleaning process.

In operation, after suitable adjustment of the controls of switchboard **48**, transformer **46** is energized and the trailer **10** is towed by means of tow bar **34** through an area of fog. The motor **20**, also energized, turns fan **18** causing an ingress of fog into the flow path defined by the major interior portion of the trailer **10**. Any large particulate matter or any trash, papers or the like will be stopped by screen **22** with the remainder of the fluid stream passing between the interplate spaces of the electrostatic precipitator banks. The high tension wires **58** are preferably negatively charged, with the ground from transformer **46** being suitably secured to the metallic frame of the trailer. The water droplets which constitute the fog are thereby given a negative charge and the positively charged plates **70** draw the droplets thereto. Upon striking plates **70**, the water droplets become separated from the air with the water from the droplets falling downwardly on the sides of plate **70** and onto the bottom portions **28** of each of the banks and then outwardly through taps **30**. The air which has been freed from the water droplets exits from the trailer through orifice **86**. This exiting air, now much dryer, is directed upwardly through port **86** and assists in clearing the runaway area, by both absorbing moisture from the atmosphere immediately above the runway and by blowing the fog upwardly.

The overall length of the mobile precipitator trailer illustrated at FIG. 1 is approximately 27 feet. Other parameters such as the spacings between the plates **70**, the particular potential employed in transformer **46**, etc., are well within the purview of those skilled in this art and further description thereof will not be given.

Referring now to FIG. 4 of the drawings, the mobile precipitator trailer **10** according to this invention is provided with a large flexible conduit **100** having one end secured to the input end **12** of the trailer and having its other end secured to the outlet of an incinerator, a foundry, or the like, denoted generally by the numeral **102**. In many industrial installations, as well as in many smaller residential areas, there is a definite need to periodically dispose of, by way of burning, trash or the like. Unless the burning is on a continuous basis, as would be the case in a large metropolitan area, the need for and consequently the expense of electrostatic precipitator action is not justified and a unit such as the mobile precipitator trailer of this invention in combination with a large flexible conduit such as **100** provides an ideal solution for this problem. Accordingly, at scheduled times, the mobile precipitator trailer is pulled to the vicinity of an incinerator **102** or the like, with the flexible coupling **100** being made. In the event that **102** is an incinerator or the like, giving off rather large proportions of particulate matter, a fluid spray through nozzles **90** is generally desirable.

What is claimed is:

1. A mobile electrostatic precipitator trailer including, a housing unit having an intake fan positioned and mounted at one end thereof, a perforated screen positioned between said fan and said housing unit, said housing unit containing an electrostatic precipitator defined by a plurality of vertically disposed ionizing and collector electrodes, nozzle means positioned above said electrodes for supplying a gas treating fluid into said unit, the bottom portion of said housing unit which is below the said electrodes being downwardly sloped and terminating, at its lowest point, in an outlet adapted to discharge precipitated liquid, an exhaust conduit in fluid flow connection with the other end of said housing unit, said exhaust conduit having a horizontal intake portion adapted to receive flow of gas from said fan and electrodes and a vertically disposed outflow portion, said exhaust conduit having a plurality of flow directions changing vanes within it, means for supplying and controlling high voltage to said electrostatic precipitator, said means being positioned on the side of said exhaust conduit remote from said fan.

2. The mobile electrostatic trailer of claim **1** including a plurality of said housing units in tandem relationship to each other.

References Cited

UNITED STATES PATENTS

1,357,466	11/1920	Moller	55—2
1,944,976	1/1934	Hamilton	55—356
1,982,470	11/1934	Franks	55—2
2,049,561	8/1936	Grave	55—2
2,440,455	4/1948	White	55—2
2,756,842	7/1956	Chamberlin et al.	55—126

HARRY B. THORNTON, *Primary Examiner.*