March 1, 1960 K. OSWALD 2,926,749

SEPARATOR-ELECTRODESYSTEM FOR ELECTROFILTERS

Filed Jan. 28, 1957 2 Sheets-Sheet 1

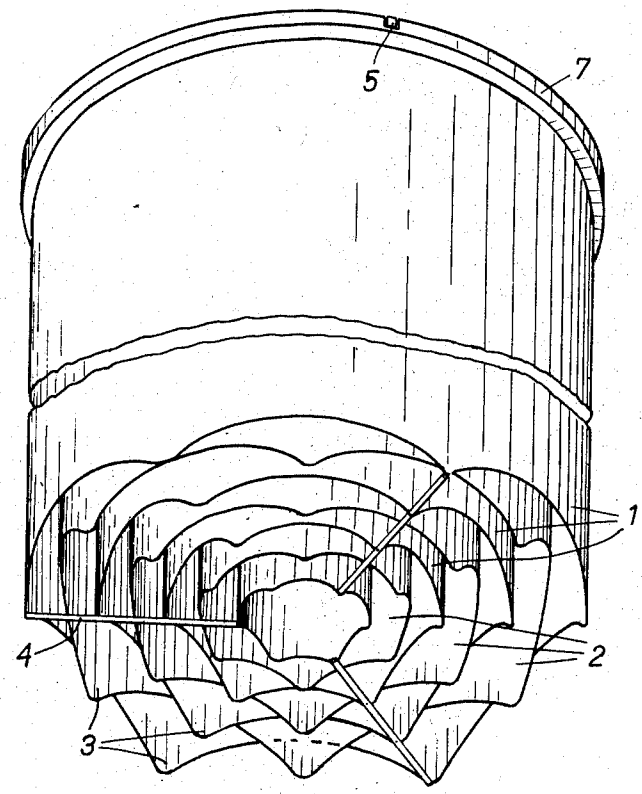


Fig. 1

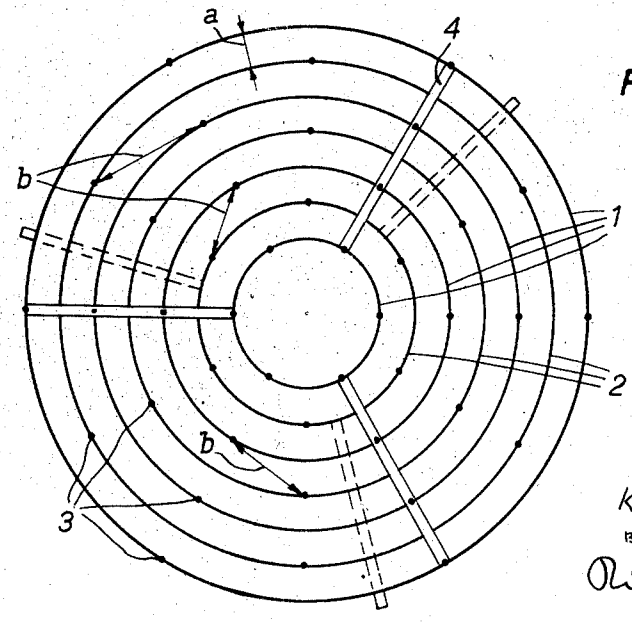


Fig. 2

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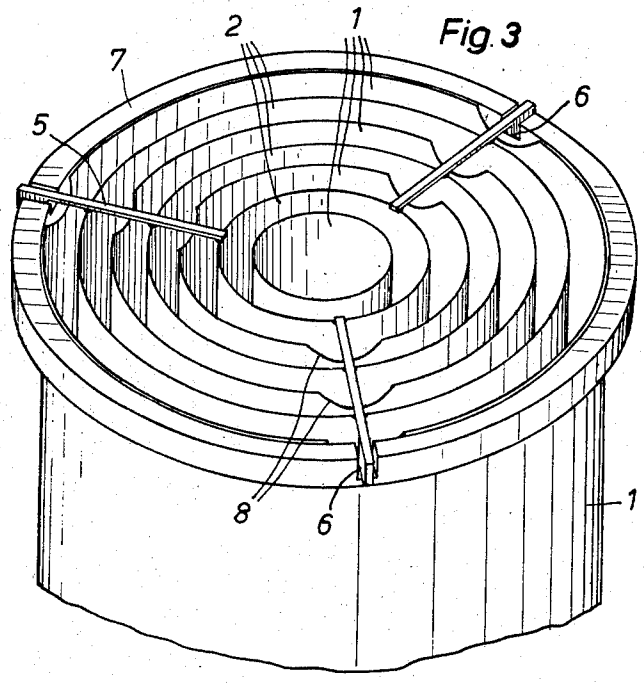
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2 Sheets-Sheet 2

Fig. 3



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United States Patent Office 2,926,749 Patented Mar. 1, 1960

2,926,749

SEPARATOR-ELECTRODESYSTEM FOR ELECTROFILTERS

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Application January 28, 1957, Serial No. 636,753

Claims priority, application Switzerland January 27, 1956

5 Claims. (Cl. 183—7)

The present invention relates to a separator-electrodesystem for electrofilters adapted to separate liquid particles from a gas current, the electrodes being constituted by two groups of metal cylinders vertically arranged with their inlet side at the top and disposed co-axially with equal radial interval in alternate succession.

In electrofilters of this type it is desirable to keep as small as possible the potential to be applied to the separator electrodes. Thereby it is attained, on the one hand, that the energy consumption of the filter is low and, on the other hand, that the occurring of corona-discharges is prevented. As is well known the latter may lead in many cases to bridgings and consequently to the break-down of the separating field. As with a given length of the filter a determinated field-strength is necessary for a perfect separating of the liquid particles, for example water droplets, from a gas current the interval between the electrodes must accordingly be rather small if a small voltage is used. Now it has been found that this distance had to be held rather great in heretofore known separators as the separated liquid collects in form of drops at the lower electrode rim leading with increasing drop dimensions to conductive bridges between the electrodes. As the lower electrode rims lie in a common plane, the said drops may collect at any point of the periphery of the electrode rims the interval between the latter being always equal to the interval between the cylinders. For this reason this last-mentioned interval had heretofore always to be superior to the one necessary to attain the optimal field-strength for a given potential as the possibility of formation of relatively voluminous drops had always to be considered. The present invention has for its prime object to avoid this disadvantage.

For this purpose the separator-electrodesystem according to the present invention is characterised by the fact that the lower rim of the metal cylinders is provided with axially extending projections tapered towards their free end, and by the fact that the projections of adjacent metal cylinders are stepped with respect to each other in circumferential direction in such a manner that the distance separating the free end of each rim projection of a metal cylinder from the free ends of the nearest rim projections of an adjacent metal cylinder is superior to the radial distance separting two metal cylinders.

By these lower rim projections provided at the metal cylinders, it is attained that the drops of the separated liquid cannot collect at any point of the circumference but forcibly collect at the lowermost points of the metal cylinders i.e. at the free ends of the projections. The distance between these free ends of the projections must now be chosen such that the drops collecting at the projections of adjacent metal cylinders cannot form bridges. The radial distance between the cylinders is smaller than the said distance between the ends of the projections so that the potential to be applied for the same field-strength may be smaller than it would be in a similar separator not provided with such projections. As compared with a separator of the last-mentioned known type, it is therefore possible to arrange more electrodes in a determined all-over diameter so that a greater electrode surface is obtained. For equal field-strength and flow quantity of the gas stream the degree of separation increases with increasing electrode surface so that this arrangement has an additional advantage over the heretofore known separators.

Other features and advantages of the invention will become apparent from the description now to follow of a preferred embodiment thereof, given by way of example only and in which reference will be made to the accompanying drawings, in which:

Fig. 1 is a perspective view of the electrode system showing the lower rim portions of the metal cylinders,

Fig. 2 is a bottom view of the electrode system and

Fig. 3 is a view showing the upper portion of the electrode system.

The represented separator-electrodesystem comprises two groups of co-axial metal cylinders 1 and 2, inserted into one another in such a way that seen in radial direction, a cylinder 1 of one group is followed by a cylinder 2 of the other group. All cylinders 1, 2, present the same relative radial interval *a* (Fig. 2) between each other. The lower rim of the cylinders 1 and 2 is corrugated or scolloped or ragged so as to provide over the whole circumference of the cylinder a plurality of equally spaced axial projections 3 tapered towards their free ends. In the illustrated embodiment, the ends of the projections 3 are slightly rounded, but they could as well end in a point. The projections 3 (marked with a dot in Fig. 2 in order to improve clarity) of adjacent metal cylinders are stepped in circumferential direction in such a way that the interval *b* (Fig. 2) between the free end of a projection 3 of a cylinder 1 or 2 and the free end of the nearest projections of adjacent metal cylinders 2 or 1, respectively, is always superior to the relative radial distance *a* separating the cylinders 1 and 2. As shown by Figs. 1 and 2, the metal cylinders 1 forming the one electrode group are connected with each other at their lower front side by three webs 4. In turn, the metal cylinders 2 forming the other electrode group and inserted from the top between the cylinders 1 are connected at their upper front side by three webs 5. The webs 5 extending beyond the outermost metal cylinder 1 are arranged in recesses 6 of a ring 7 of insulating material rigidly arranged at the outer side on the upper rim of the outermost metal cylinder 1. Thus the cylinder group 2 is supported in freely suspended arrangement by the cylinder group 1.

As a consequence of the described arrangement and construction of the electrodes a plurality of co-axial cylindrical ports for the gas current are provided within the electrode system. This gas stream passes these ports from the top downwardly in axial direction. In electrode systems with straightly cut cylinder electrodes it has been found that a bridge formation by collecting drops occurs not only at the lower but also at the upper end of the electrode system, i.e. at the inlet thereof. If the content of droplets of the gas stream to be cleaned is great, a portion of the droplets deposits on the web 5 interconnecting the electrode cylinders 2. The deposited droplets have difficulties to flow out so that they may attain on the webs 5 such dimensions that in view of the small interval between the webs and the upper rims of the metal cylinders of the other electrode group, the formation of bridges may occur, leading to a break-down of the field in the separator. In order to avoid this drawback similar measures have been taken at the inlet side of the represented electrode system as at the outlet side, i.e. the rims of the metal cylinders 2 are provided in the zone of the webs 5 with recesses 8. The width and the depth of the recesses 8 is chosen such that the interval separating the webs 5 from the upper rim of the

metal cylinders 2 is sufficient to effectively avoid bridge formation by drops suspended from the webs. While it obviously would be possible to obtain the same result by a corresponding axial shortening of the cylinders 2 so as to bring their upper rim sufficiently far away from the webs 5 the described arrangement is preferred as it does not lead to any losses of effective electrode surface.

The aforementioned measures obviously permit to maintain very small the radial distance separating the metal cylinders. It has been found, however, that when liquid particles and more particularly water mist has to be separated, the formation of conductive bridges may also occur within the length of the electrode system as a result of drop formation. This is more particularly the case when the electrode system as has also been proposed already, has been treated with water-repelling means. The rapid flow-out of the separated liquid is thereby rendered more difficult, this leading to the formation of drops and consequently of conductive bridges. This disadvantage is prevented according to the present invention by treating the surface of the metal cylinders with a wetting agent or with another agent reducing the surface tension between the liquid and the metal cylinders. Of course other measures could be taken for the same purpose. It results therefrom that only small droplets collect at the cylinders so that the formation of conductive bridges is effectively prevented even with such small intervals between the cylinders.

The described measures are particularly appropriate for the separation of water mist. Permanent service tests have shown that water may be separated with smallest energy consumption and with a degree of separation of 98% even in concentrations corresponding to thickest mist.

I claim:

1. In a separator-electrode system for electrofilters adapted to separate liquid particles from a gas current, of the type comprising two groups of metal concentric cylinders forming the electrodes, said cylinders being arranged vertically with an inlet side at their top and an outlet side opposite thereof and disposed co-axially in alternate succession with equal radial interval, the improvement comprising, at the lower rim of said metal cylinders, projections extending axially and tapered towards their end opposite the cylinder rim, the projections of adjacent cylinders being staggered with respect to each other in circumferential direction of the cylinder so that the distance between the tapered end of each projection of a cylinder and the tapered end of the nearest projections of an adjacent cylinder is greater than the said radial interval separating two successive cylinders.

2. In a separator-electrode system for electrofilters adapted to separate liquid particles from a gas current, comprising two groups of metal concentric cylinders forming the electrodes, said cylinders being arranged vertically with an inlet side at their top and an outlet side opposite thereof and disposed co-axially in alternate succession with equal radial interval, the improvement comprising connecting webs for interconnecting the cylinders of one group, the cylinders comprising rim projections arranged in radia alignment, said webs being arranged radially at the outlet side of the cylinders and connected with each other by said rim projections, further webs being provided for interconnecting the cylinders of the other groups, said further webs being arranged radially in a common plane and secured to the metal cylinders of the second group at the upper rims thereof, the upper rims of the cylinders of the first group being also comprised in said common plane and provided in the zone of the said further webs with recesses in order to provide an interval, the lower rim of said metal cylinders being provided with projections extending axially and tapered towards their end opposite the cylinder rim, the projections of adjacent cylinders being staggered with respect to each other in circumferential direction of the cylinder so that the distance between the tapered end of each projection of a cylinder and the tapered end of the nearest projections of an adjacent cylinder is greater than the said radial interval separating two successive cylinders.

3. In a separator electrode system for electrofilters adapted to separate liquid particles from a gas current, of the type comprising two groups of metal concentric cylinders forming the electrodes, said cylinders being arranged vertically with an inlet side at their top and an outlet side opposite thereof and disposed co-axially in alternate succession with equal radial interval, the improvement comprising, at the lower rim of said metal cylinders, projections extending axially with respect to the cylinders and tapered towards their end opposite the cylinder rim, said end being rounded, the projections of adjacent cylinders being staggered with respect to each other in circumferential direction of the cylinder so that the distance between the tapered end of each projection of a cylinder and the tapered end of the nearest projections of an adjacent cylinder is greater than the said radial interval separating two successive cylinders.

4. In a separator electrode system for electrofilters adapted to separate liquid particles from a gas current, of the type comprising two groups of metal concentric cylinders forming the electrodes, said cylinders being arranged vertically with an inlet side at their top and an outlet side opposite thereof and disposed co-axially in alternate succession with equal radial interval, the improvement comprising, at the lower rim of said metal cylinders, projections extending axially with respect to the cylinders and tapered to form a point at their end opposite the cylinder rim, the projections of adjacent cylinders being staggered with respect to each other in circumferential direction of the cylinder so that the distance between the tapered end of each projection of a cylinder and the tapered end of the nearest projections of an adjacent cylinder is greater than the said radial interval separating two successive cylinders.

5. In a separator-electrode system for electrofilters adapted to separate liquid particles from a gas current, comprising two groups of metal concentric cylinders forming the electrodes, said cylinders being arranged vertically with an inlet side at their top and an outlet side opposite thereof and disposed co-axially in alternate succession with equal radial interval, the improvement comprising, at the lower rim of said metal cylinders, projections extending axially and tapered towards their end opposite the cylinder rim, the projections of adjacent cylinders being staggered with respect to each other in circumferential direction of the cylinder so that the distance between the tapered end of each projection of a cylinder and the tapered end of the nearest projections of an adjacent cylinder is greater than the said radial interval separating two successive cylinders, and means upon the surface of the metal cylinders for reducing the surface tension between the liquid to be separated and the metal cylinders.

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