

[54] **PASSING ATOMIZED LIQUID THROUGH MAGNETIC FIELD FOR IMPROVED SPRAY WASHING**

3,668,008 6/1972 Severynse 134/1

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[57] **ABSTRACT**

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[58] **Field of Search**..... 134/1, 37, 34, 42, 36; 15/1.5; 317/3, 2 R

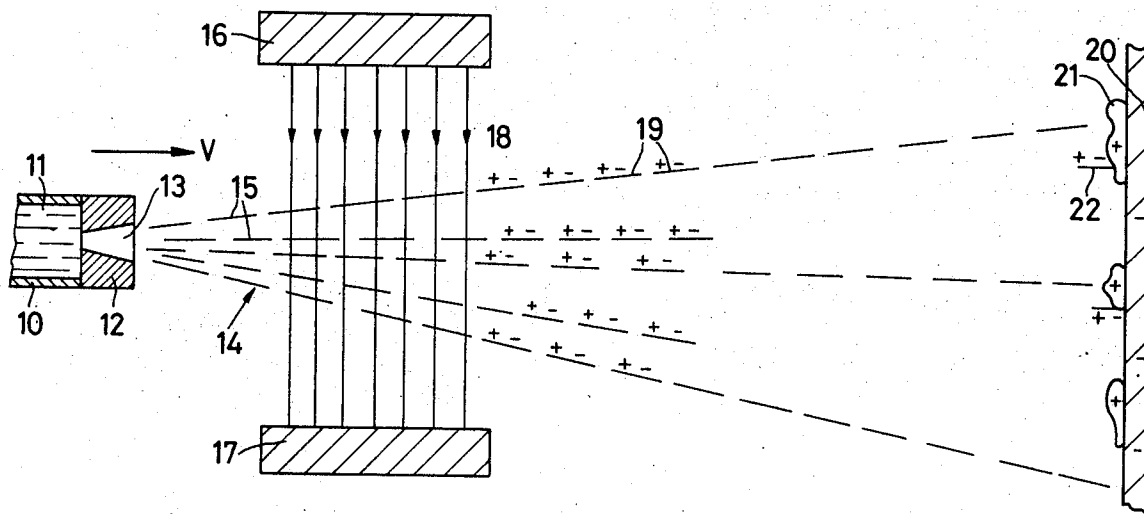
A method of cleaning objects such as surfaces of a vehicle and the like by passing a washing fluid, such as water, which may contain a washing agent, through an atomizing nozzle to form an atomized jet and then passing the atomized jet through a magnetic field which is preferably at right angles to the axis of the jet so as to induce voltages in the drops of the atomized jet and then impinging the jet against the surface to be cleaned so that the cleaning is more effective by equalizing the electrostatic charges bonding the dirt particles to the surface to be cleaned.

[56] **References Cited**

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10 Claims, 5 Drawing Figures



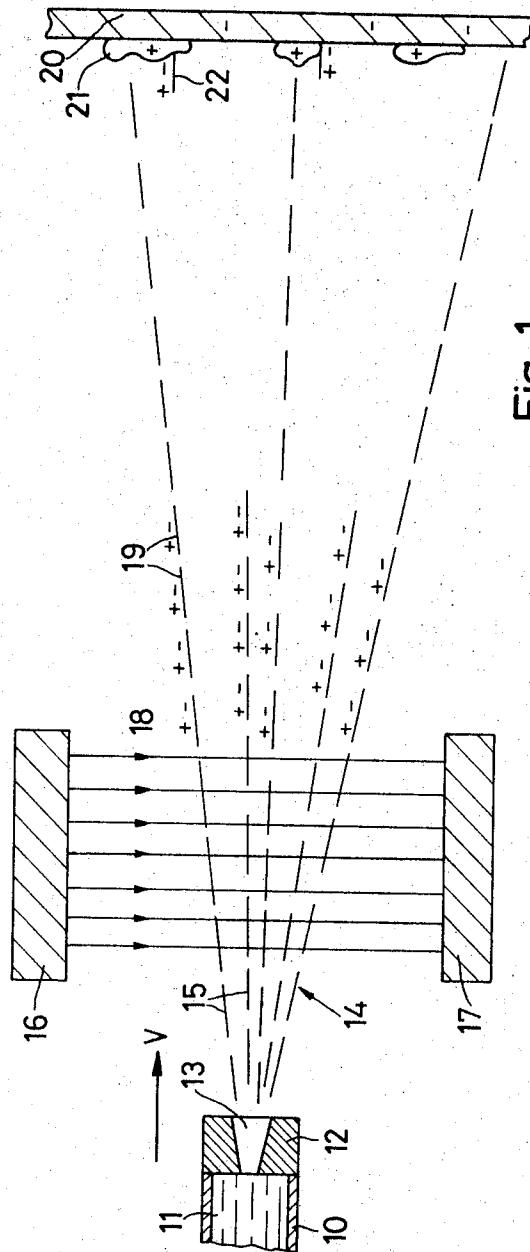


Fig. 1

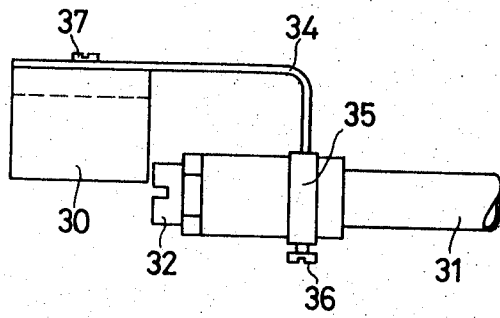


Fig. 2

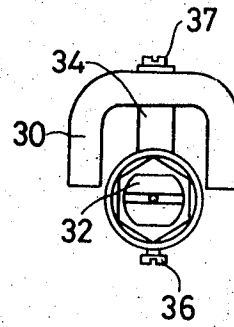


Fig. 3

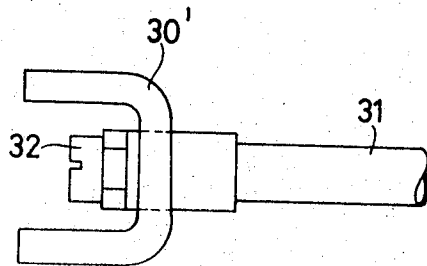


Fig. 4

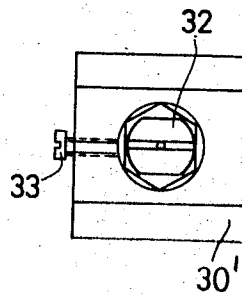


Fig. 5

PASSING ATOMIZED LIQUID THROUGH MAGNETIC FIELD FOR IMPROVED SPRAY WASHING

The invention relates to a washing process with at least one washing jet directed at the object which is to be cleaned, said jet being emitted through a nozzle which atomises it.

In known washing processes a washing agent is added to the washing jet and the washing liquid is preferably heated. With the addition of washing agents the washing action is improved in that greasy dirt particles are emulsified in a known manner by the additional washing agents.

This chemical process is not at all strong at a normal ambient temperature. For this reason the washing liquid is heated a certain amount since this can considerably shorten the period of reaction of the chemical process.

These known washing methods can only be used to a limited extent, in fact only if the objects to be cleaned are soiled in a normal way. If the objects are very soiled with firmly adhering dirt particles, the known washing processes are not sufficient.

A further limitation in the use of the known washing processes is that there must be means available for heating the washing liquid. This presupposes, in most cases however, an extra source of energy, for instance fuel, electric current or the like. Furthermore, because of the required heating means, the device for carrying out the known washing process is made considerably more expensive and is less reliable when in use.

Moreover, when using the known washing method, it is to be noted that many articles have to be washed without heat being used and without washing agent additions in order to prevent the surface of the article from being damaged.

In this connection it is only the cleaning of painted objects, for instance vehicle bodies, which is referred to. The layer of paint is in the first place attacked chemically by the added washing agents and the hotter the washing liquid is, the stronger this attack will be.

If the washing agent additions are not used and the washing liquid is not heated then the cleaning action will immediately be reduced so much that it will no longer be possible to obtain a sufficient cleaning effect with the known washing methods. This then becomes apparent when the dirt adheres firmly to the object which is to be cleaned, as is for example the case with vehicles with dead insects or the like which hit the windows and the body when the vehicle is driven fast and stick firmly. These particles of dirt are very difficult to remove fully from the object which is to be cleaned even with conventional washing methods and even if the washing liquid is heated and washing agents are added.

It is the object of the invention to improve the cleansing action of a washing process which involves at least one washing jet which is directed at the object to be cleaned and which is emitted by a nozzle which atomises it, in such a way that objects which are soiled to a normal extent can be cleansed without the washing liquid being heated and/or without washing agent additions, and so that with heated washing liquid and/or with added washing agents, firmly adhering dirt particles are removed in a considerably improved manner

and thus the time required for cleaning and the amount of washing liquid used can be considerably reduced.

The washing process according to the invention is characterised in that the jet of washing liquid passes through a magnetic field, the flux lines of which intersect the jet approximately perpendicularly.

Under the influence of the magnetic field, magnetic moments which are directed against this field are also induced in atoms without a fixed magnetic moment. As the electro-dynamic theory shows, these diamagnetic moments are proportional to the ordinal number of the element, the square of the radii of the path of electrons and the field strength.

If an electric conductor is moved in a magnetic field, then voltages are induced which are dependent on the speed of the conductor. The conductor must cut the magnetic field approximately at right angles in order to obtain maximum voltages.

If a jet of water is used as the electric conductor, the conductivity of which can advantageously be further increased through the addition of a washing agent or the like, and if the atomised water particles hit surfaces on which dirt particles are adhered, after the magnetic field has been crossed, then the dirt is removed more quickly and more thoroughly in a surprising way. It does not make any difference if the particles of dirt are adhered even more firmly to the surface, that is for example the windows of the vehicle, through electrostatic charges. This effect is produced by the diamagnetic moments of the individual drops of water which do in fact occur in all non-ferrous substances, for instance, crystals, liquids or gases.

Since a washing jet forms into a cone shape after it leaves the nozzle, an excellent degree of magnetisation is produced, even with a small, weak magnet arrangement, if the provision is made that the field lines of the magnetic field cross the jet emitted from the nozzle approximately perpendicularly, preferably in the region of the nozzle. The magnet arrangement can be constructed for this in such a way that the magnetic field is produced by two oppositely magnetised poles of a magnet arrangement, said poles surrounding the washing jet on at least two opposing sides. The magnetic poles can be formed by two oppositely magnetised single magnets or by the two oppositely magnetised poles of a single magnet.

According to a further development the magnetic field is produced by an annular magnet which fully encloses the washing jet, said annular magnet having suitably aligned magnetisation. The strength of the magnetisation is optimum because the drops of water in the atomised jet are subjected equally over the whole cross-section of the jet to the magnetic field.

The magnet arrangement can be constructed both as an electromagnet or electromagnets respectively or as a permanent magnet or magnets.

If the magnet arrangement is constructed as an electromagnet or magnets the cleansing action can be adjusted in a way which is not obvious by energising the electromagnet or magnets. This adjustment can be infinite or can be carried out in predetermined stages.

If the magnet arrangement is constructed as a permanent magnet or magnets the same effect can advantageously be obtained if the magnet or magnets are positioned so that they can be adjusted perpendicularly and axially to the washing jet.

The invention is explained by way of example in greater detail, on the basis of the drawings, in which

FIG. 1 is a diagrammatic representation showing the new washing process,

FIG. 2 shows, in side view, a pipe for the washing liquid capped with a nozzle, a U-shaped permanent magnet being secured on said pipe,

FIG. 3 shows the front view of the nozzle and of the permanent magnet shown in FIG. 2,

FIG. 4 shows in side view a nozzle with a magnet arrangement constructed in a different way, and

FIG. 5, shows the front view of the nozzle and of the magnet arrangement shown in FIG. 4.

As can be seen from FIG. 1, the washing liquid 11 is conducted, with or without a washing agent addition, through a pipe 10 to a nozzle 12 which is at the end of the pipe, the nozzle opening of said nozzle, 13 extending conically. The cross-section is made very much more narrow at the inlet of the nozzle aperture and through this the atomising effect, which is in itself known, is produced in the washing jet 14 which is emitted. The particles of water, indicated by 15 in the diagram, depend in quantity and size on the dimensions of the nozzle 12, of the nozzle opening 13 and on the pressure of the washing liquid and on the cross section of the pipe 10. The arrow V indicates the direction of the movement of the atomised water particles 15 and shows that these particles leave the nozzle opening 13 at a certain speed.

The washing jet 14 which is split up into the drops of water 15 now passes through a magnetic field 18 which is produced by the two poles 16 and 17, of opposite magnetisation of a magnet arrangement. The flux lines of this magnetic field 18 are perpendicular to the centre axis of the washing jet which widens out conically. In order for the magnetisation effect to be efficient, the magnet arrangement is positioned so that it is connected directly to the nozzle opening 13. This has the advantage that the distance between the poles can also be kept small because the cross section of the jet is still small in this region, and this considerably increases the strength of the magnetisation, as is well known. Moreover, almost all the drops of water 15 cross the magnetic field approximately at right angles and this again has a favourable effect on the size of the induced voltages. The effect of the magnetic field 18 on the water particles is characterised by the induction of voltages, as indicated by the drops of water 19 marked with the polarity signs "+" and "-".

The charged drops of water 19, hit a surface 20 which is to be cleaned and on which the dirt particles 21 adhere firmly. These particles of dirt 21 may also be held firmly through electrostatic charges, as given by the polarity signs "-" in the object to be cleaned and "+" in the dirt particles 21. Through the water particles 19 which hit the surface, the electrostatic charges are equalised and thus the additional holding force of the dirt particles 21 is broken.

A magnetic moment is also induced in the water particles 15 under the action of the magnetic field 18. These moments are directed against the magnetic field and are the cause of the diamagnetism. These diamagnetic moments are proportional to the ordinal number of the element, the square of the radii of the path of electrons and the field strength, according to the electro-dynamic theory. This diamagnetism is not dependent on temperature and it exerts on the water particles

the action which leads to a more effective removal of firmly adhering dirt particles.

A pipe 31 for the washing liquid is shown in FIGS. 2 and 3, the end of said pipe being terminated with a nozzle 32. This nozzle 32 is preferably screwed on or into the washing liquid pipe 31. The nozzle opening discharges into a transverse slit so that the jet which is emitted is given a rectangular cross-section where one measurement can be very small in relation to the other measurement. A sleeve 35 is secured so that it is axially adjustable by means of a retaining screw 36 on the nozzle 32. An L-shaped curved piece of metal 34 is fixed on the sleeve 36 and projects with its free arm into the region in front of the nozzle opening. A U-shaped permanent magnet 30 is screwed on this arm as indicated by the screw 37. The two poles of the permanent magnet 30, which are of opposite magnetisation, surround the washing jet emitted by the nozzle 32 on two opposing sides so that the jet lies directly in the area of the magnetic field with the densest flux line distribution. The lines of flux which run between the poles of the permanent magnet 30 cross the water jet perpendicularly, and directly after it passes out of the nozzle 32.

As can be seen from the embodiment shown in FIGS. 4 and 5, the U-shaped permanent magnet 30 can also have means for receiving the nozzle 32 in the bar itself and can be secured directly on the nozzle 32 by means of an adjusting screw 33. The poles of the permanent magnet 30 are in this case aligned to the broad sides of the washing jet. In this magnet arrangement also the lines of flux run perpendicular to the washing jet.

The magnet arrangement can of course also be formed out of single, opposed, permanent magnets where a further possibility for adjustment is provided, diagonally to the direction of the washing jet.

Electromagnets can also be used instead of permanent magnets, the energisation of these being infinitely adjustable or adjustable in predetermined stages.

I claim:

1. A method of cleaning an object comprising passing a washing liquid through a nozzle to form an atomized jet of the washing liquid, passing the atomized jet of washing liquid through a magnetic field, the flux lines of which are substantially perpendicular to the axis of the atomized jet, to induce a voltage in the droplets of said atomized jet, and finally passing the atomized jet against the object to be cleaned whereby the object is more effectively cleaned.

2. A method as claimed in claim 1 wherein the magnetic field is disposed closely adjacent the nozzle and is perpendicular to the axis of the atomized jet.

3. A method as claimed in claim 1 wherein the magnetic field is produced by a magnet having opposed magnetic poles disposed on at least two opposite sides of the atomized jet.

4. A method as claimed in claim 1 wherein the magnetic field is produced by two magnets having opposite polarity disposed on opposite sides of the atomized jet.

5. A method as claimed in claim 1 wherein the magnetic field is produced by at least one permanent magnet.

6. A method as claimed in claim 1 wherein the magnetic field is produced by at least one electromagnet.

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7. A method as claimed in claim 6 wherein the at least one electromagnet may be variably energized.

8. A method as claimed in claim 1 wherein the position of the magnetic field with respect to the nozzle may be adjusted along the axis of the atomized jet.

9. A method as claimed in claim 1 wherein a plurality

of atomized jets are passed through a single magnetic field.

10. A method as claimed in claim 1 wherein the washing liquid includes water and a washing agent.

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