Jan. 11, 1955 E. J. COURTS 2,699,403

MEANS AND METHODS FOR CLEANING AND POLISHING AUTOMOBILES

Filed May 24, 1952

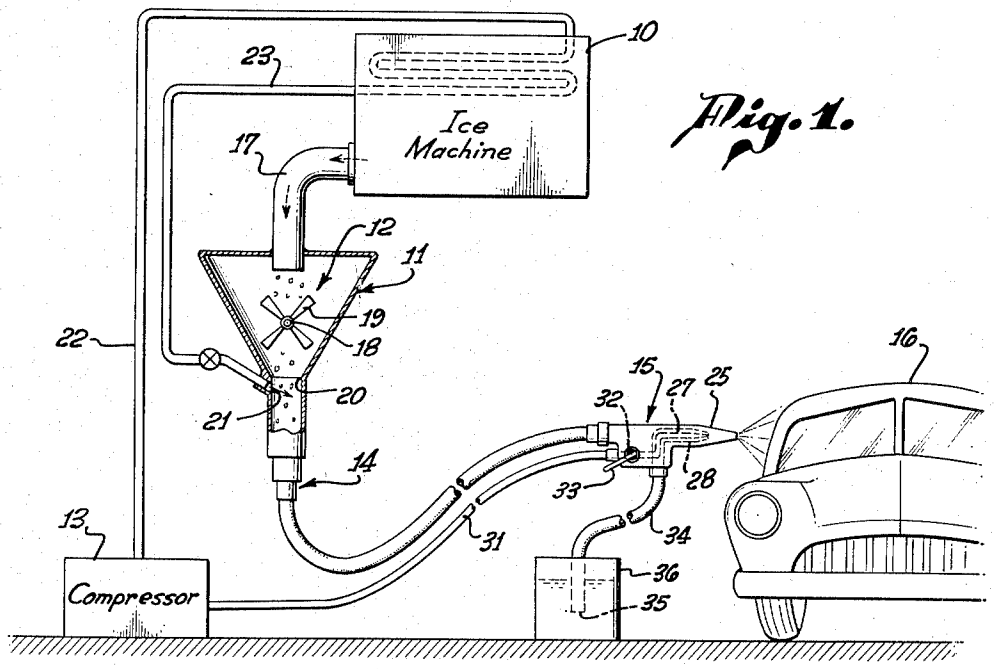

Fig. 1.

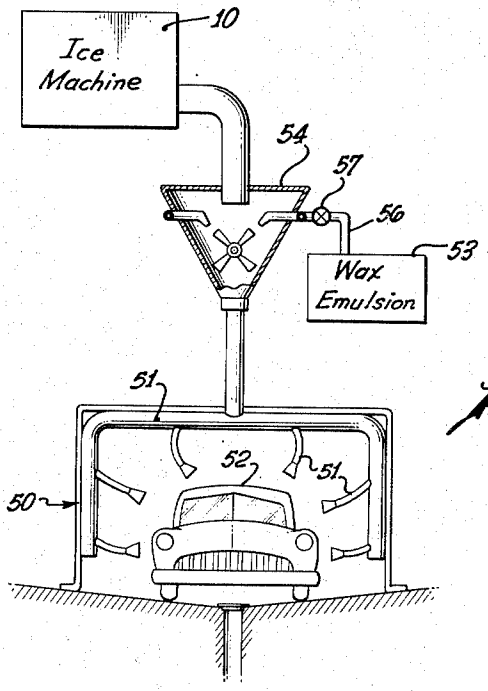

Fig. 3.

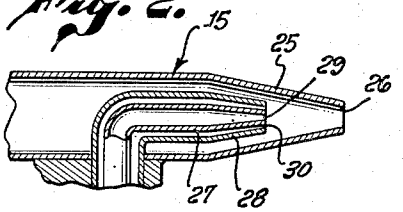

Fig. 2.

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2,699,403

Patented Jan. 11, 1955

2,699,403

MEANS AND METHODS FOR CLEANING AND POLISHING AUTOMOBILES

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Application May 24, 1952, Serial No. 289,831

9 Claims. (Cl. 117—47)

This invention relates to means and methods for washing vehicles and more particularly to a method of cleaning, washing and polishing automobiles by bombarding the surface thereof with soft, virtually discrete particles of ice.

Prior-proposed means and methods for washing vehicles have included the bombardment of the surface of the vehicle by soft small particles of cotton, cloth, sponge, rubber or other suitable soft, compressible nonabrasive, absorbent materials. Such prior-proposed means included complex, expensive equipment for propelling such particles of absorbent material through duct means and nozzles and for reclaiming and disposing of such material after use. The duct means for conducting flow of such soft absorbent material were not self-cleaning, and as a result, the ducts through which the particles of such material passed were subjected to clogging and jamming. Reclaiming of particles of soft material employed with such prior-proposed vehicle washing machines required rewashing and re-treating of the soft particles so that when they were again projected upon the surface of the vehicle, grease, road grime, or other dirt dicked up by the soft particles in their prior use would not streak or mar the surface of a vehicle upon which they were projected. As a result, the reclaiming operation was required to be carefully, thoroughly accomplished and inspected. Such thorough cleaning necessitated expensive reclaiming equipment, and as a result, the prior-proposed machines for washing vehicles in the manner of bombarding the surface with soft particles of absorbent materials were commercially not practical.

This invention contemplates a novel method and means for washing, cleaning and polishing vehicles which obviates the disadvantages of using a soft particle of absorbent compressible material. In this invention, matter which is capable of being changeable in its state or phase such as water, is used in a solid phase so as to provide virtually discrete, flake-like particles which each afford a virtually absorbent slushy non-compressible mass capable of providing a scrubbing action when impinged against the surface of a vehicle so as to remove dirt and foreign matter therefrom without scratching or marring the surface thereof. The invention contemplates means and methods for furnishing flake-like ice particles and for directing such ice particles in a stream upon a surface of an automobile. The invention contemplates introduction of an aqueous low-temperature emulsion containing dispersed or emulsified suitable waxes and appropriate emulsifying surface acting agents into the stream of ice particles for deposit upon the car surface. The deposited wax on the car surface is caused to be further spread upon and driven into bonding contact with the surface of the car by the bombardment of the stream of ice particles, such bombardment serving to provide a smooth, highly polished clean surface.

The simple effective means and method of this invention presents no reclaiming and disposal problem of the material used to clean and polish the car surface. After ice particles have contacted the car surface and have fallen upon the adjacent floor area, such particles will change from a solid phase to a liquid phase and the liquid therefrom may be drained away in suitable well-known manner.

The primary object therefore of this invention is to design and provide a novel means and method for effectively cleaning and polishing a finished surface such as on automobiles or the like.

Another object of this invention is to provide a novel method of washing a car surface which utilizes matter capable of transition from a solid to a liquid phase in normal temperature ranges.

Another object of this invention is to provide a novel method of washing finished surfaces wherein water in its solid state as ice and in flaky form is suspended in a cool air stream for projection upon a finished surface, the mass of the flaky ice particles becoming somewhat slushy upon impingement under pressure against the surface and being capable of scrubbing and wiping foreign matter from the car surface.

Still another object of this invention is to provide a novel method for washing and polishing a car surface wherein suitable aqueous wax emulsions or dispersions are introduced into a stream of flaky ice particles for deposit upon a car surface and for polishing by said flaky ice particles when deposited upon said surface.

A further object of this invention is to design and provide means for accomplishing the above-described methods of washing and polishing a car surface so that the washing and polishing operation may be quickly and conveniently performed in a manner adaptable to commercial practices.

A still further object of this invention is to design and provide means for washing and polishing a car surface wherein means for producing flaky ice particles are associated with compressed air of relatively cool temperature whereby the flaky ice particles are suspended and moved in a cool air stream without melting or approaching a fluid state.

Generally speaking, this invention contemplates novel means and methods for cleaning, washing and polishing finished surfaces on automobiles. The invention comprises an ice-making machine capable of producing ice particles in selected flake size. Compressed air means are associated with the ice-making machine so as to convey said flaky ice particles in a stream for projection upon a car surface through nozzle means. The nozzle means includes dual injection orifices associated with separate passageways for introducing an auxiliary compressed air stream into said stream of ice particles and for also introducing at the same point a low-temperature aqueous wax emulsion or a suitable emulsifying surface-active agent which may be projected upon the car surface in the cleaning thereof, whereby the aqueous wax emulsion is deposited upon such clean surfaces for providing a thin, polishable protective coating for the car surface.

Other objects and advantages of this invention will be readily apparent from the following description of the drawings.

In the drawings:

Fig. 1 is a diagrammatic view of a system embodying the means and methods of this invention.

Fig. 2 is an enlarged view of a nozzle means employed in the system shown in Fig. 1.

Fig. 3 is a diagrammatic view of a different system embodying this invention.

This invention contemplates the use of incompressible matter such as water which is utilized primarily in its solid phase or ice. The character of the ice utilized in this invention is in the form of virtually discrete flaky particles which are maintained at temperatures slightly below the melting point of ice. Such ice particles in flaky form are relatively soft and when propelled in a cool air stream against a finished surface and impinged thereagainst under pressure the impact of such an ice particle causes a slight increase in temperature in the particle. This temperature increase upon impact raises the ice particle virtually to its melting point wherein the mass of the flake-like particle begins to undergo transition from a solid phase to a liquid phase and results in a slightly slushy condition of the flake at the surface being treated. This incompressible slightly slushy ice flake is capable of a scrubbing action on the finished surface which will effectively and readily remove foreign matter therefrom without marring or scratching the surface. This scrubbing and cleaning action is facilitated by the partial transition of the ice flake particle into the liquid phase, the latter affording some lubrication for the solid mass and

wetting of the surface being cleaned while the solid mass forms a slushy incompressible body to effectively scrub, absorb, and carry off foreign particles from said surface.

In Figs. 1 and 2 is illustrated an exemplary system for providing a means for utilizing the method of this invention. The system generally includes an ice making machine **10**, a hopper **11** for temporarily receiving ice flake particles, an agitator **12** in the hopper, an air compressor **13**, and duct means generally indicated at **14** leading from the hopper to a suitable nozzle means **15**. The duct means **14** in this embodiment is illustrated as being flexible and it is contemplated that a single nozzle means be employed for selective actuation and directional manipulation by an operator to project the ice particles upon the surface of a car generally indicated at **16**.

The ice making machine **10** may be of well known manufacture and the particular structure thereof does not form a part of this invention. Such a well known ice machine may comprise a refrigerated rotatable metal drum adapted to be partially immersed in water so that water clinging to the drum forms an ice crust thereupon. At a different point of rotation of the drum, means are provided for removing the ice crust by cutting or shredding the crust into flaky particles of selected size. The ice particles which are cut from the drum are moved by gravity or by other suitable means such as air through an insulated passageway **17** for discharge into a suitable hopper **11**.

The funnel-shaped hopper **11** is suitably enclosed and insulated so that the ice particles are not subjected to an appreciable change in temperature. Adjacent the narrow bottom portion of the hopper an agitator **12** is provided for stirring the particles and for maintaining them in virtually discrete relation. The agitator **12** may comprise a shaft **18** having a plurality of suitable agitating blades **19** carried thereon for gently stirring the ice particles. The shaft **18** may be connected to any suitable driving means not shown. While normally the ice particles are used immediately after their formation by the machine **10**, in the event the cleaning operation is temporarily stopped, the hopper provides a temporary storage for the normally continuous flow of ice particles from the ice machine **10**.

Particles discharged through the bottom opening **20** of the hopper are conveyed through duct means **14**, by means of a cool air stream entering duct means **14** at an inlet port **21** adjacent to the bottom of hopper **11**. The cool air stream is provided by a compressor **13** of well known manufacture, the outlet port of the compressor being connected by pipe **22** to the interior of the ice machine so as to pass the compressed air stream in suitable coils through the ice machine for cooling thereof. A pipe **23** carries the cooled compressed air stream from the ice machine **10** to inlet port **21** of the duct means. The introduction of the cool air stream at the point adjacent to the bottom of the hopper tends to suck and pull ice particles from the hopper into the duct means and to propel the ice particles through the duct means.

The duct means in this embodiment is preferably a suitable flexible hose covered with lightweight insulation. The duct means **14** may be of any suitable desired length so that the nozzle means **15** may be positioned at various points about a car being washed. The duct means may be of a selected diameter, as for example 2 to 4 inches.

The nozzle means **15** is illustrated in Fig. 2 and may comprise a nozzle head **25** having a discharge end portion **26** generally fan-shaped and outwardly flaring so as to discharge the ice particles in a relatively thin flat stream of suitable width. The nozzle head is removably attached to the end of the duct means **14** in well-known manner. The nozzle means **15** includes an outer main orifice **26** adapted to eject the stream of ice particles. Within the nozzle head **25** are coaxially aligned dual inner auxiliary nozzle members **27** and **28** providing concentric orifices **29** and **30**, respectively, spaced inwardly from orifice **26**.

The nozzle member **27** is connected by a suitable flexible tube **31** to the compressor **13** for injecting, as desired, additional compressed air into the stream of ice particles for their final projection upon the car surface. The air nozzle member **27** is provided with a suitable, selectively operable valve means **32** actuatable by a suitable pivoted control lever or trigger **33**.

The nozzle member **28** encircles the forward portion of nozzle member **27** and is connected to a flexible hose **34** of suitable length having an open end **35** positioned within an adjacent container or tank **36**. The tank **36** may contain a suitable aqueous emulsion or dispersion of suitable wax such as carnauba wax or montan wax. The arrangement of nozzle members **27** and **28** is such that when compressed air is ejected through nozzle member **27**, the aqueous wax emulsion in tank **36** is aspirated into the auxiliary stream of air and into the stream of ice particles. Such injection into the ice particle stream causes the wax emulsion to be projected upon the car surface in the form of a relatively fine mist or fog and, at the same time, serves to coat the ice particles in the stream thereof as they are projected against the car surface.

The container **36** may hold in addition to the aqueous wax emulsion appropriate emulsifying surface active agents of the anionic and cationic group as for example water soluble amines, sulphonated oils, sulphonated fatty alcohols and fatty alcohol sulphates and certain hydroxyalkylamine esters such as esters of triethanolamine. These surface active agents assist in the removal of dirt from the car surface and may be held in a container separate from tank **36** if desired for selective introduction into the ice particle stream.

In the operation of the apparatus described above, ice machine **10** is normally operated only when ice particles are required for washing a car, such an ice machine having the capacity to rapidly produce a sufficiently desired quantity of ice particles. When the ice machine has been started and the production of ice particles has commenced the operator may spray selected surface areas of the automobile by operation of the nozzle means **15**. Preferably the stream of ice particles ejected by the nozzle means is directed against the car surface at a selected angle so that the ice particles will tend to wipe and scrub the surface of the car. The cool air stream together with the insulated duct means **14** prevents any appreciable change of temperature of the individual discrete ice particles. Upon impingement against the car surface the pressure at which the ice particles strike the surface causes the temperature of the individual ice particles to slightly increase so that the ice particles enter the melting point zone or begin the transition from a solid phase to a liquid phase. The result is a soft slushy ice particle acting upon the surface of a car capable of wiping and scrubbing the car surface for absorbing and carrying away foreign particles on the car surface.

At selected intervals the nozzle means **15** may be operated by the lever **33** so that the aqueous emulsion in tank **36** is introduced into the stream of ice particles and ejected from the nozzle means in the form of a fog or mist spray as above described. The impingement of the aqueous surface active agents against the car surface simultaneously with the ice particles tends to facilitate removal of road grime such as oil and grease which may have been deposited upon the car surface. Likewise, the aqueous wax emulsion in the fog spray is deposited upon the surface being cleaned and provides a thin protective polishable coating on the car surface. Action of the cold ice particles upon deposited wax emulsion will not tend to wipe off the wax emulsion but will tend to pound and spread the minute particles of the wax emulsion on the car surface and to cold polish the surface. The virtually simultaneous cleaning and polishing operation on the car surface by the bombardment thereof by the ice particles results in a clean, smoothly finished and polished surface.

In the system illustrated in Fig. 3 substantially the same method is used as described above. In Fig. 3 a suitable frame **50** is provided for supporting a plurality of adjustably mounted nozzle means **51** for projecting ice particles on a car surface as the car **52** is advanced by suitable well known means not shown through the spray area covered by the plurality of nozzles.

In this modification the wax emulsion and surface active agents may be introduced into the stream of ice particles as they pass through the hopper by spraying the virtually discrete ice flakes. The ice particles are thus provided with a thin coat of wax emulsion and/or surface active agents which are carried by the ice particle through duct means and projected upon the car surface for simultaneous cleaning and polishing of the car surface.

A container or tank **53** for the wax emulsion and/or

surface-acting agent may be mounted adjacent the hopper **54** and connected thereto by suitable pipe means **56**, said pipe means including several spray nozzle means projecting within the hopper to spray with a fine mist the ice flake passing therethrough. A valve means **57** in the pipe means **56** affords selective introduction of the wax emulsion into the stream of ice flakes. The tank may be maintained under pressure so that opening of the valve will cause flow of emulsion. The valve means **57** may be controlled from a point near the car and frame **50** so that an operator may readily control the use of the emulsion.

It is understood that separate containers may be used for the aqueous wax emulsion and the emulsifying surface-active agents. These emulsions may be used simultaneously or may be used sequentially. In the latter method the car surface may first be sprayed with ice particles and surface-acting agents and then sprayed with ice particles and wax emulsion. It is understood that bombarding of a car surface with a stream of ice particles only will serve to efficiently and effectively clean the surface, the introduction of surface-acting agents facilitating and quickening the cleaning operation.

It is understood that various means may be used to make and convey ice particles of flaky form or other forms to a suitable nozzle means for projection against a car surface. In some circumstances it may be desirable to use pump means for facilitating the conveying of the ice particles.

All such modifications and changes coming within the scope of the appended claims are embraced thereby.

I claim:

1. A method of cleaning and polishing finished surfaces which comprises: bombarding a finished surface area with virtually discrete particles of flaky ice at slightly below melting point and suspended and moved in a cool air stream; selectively introducing an aqueous low temperature wax emulsion in said stream for deposit on said surface area; and polishing the deposited wax emulsion by bombardment of said deposited wax with said ice particles.

2. A method as claimed in claim 1 which includes the step of introducing an emulsifying surface-active agent in said stream for cooperation with said ice particles for cleaning said surface area.

3. A method of cleaning a surface which comprises forming a supply of small ice particles, mixing said ice particles with a stream of air, discharging said mixed stream of air and ice through a nozzle against an area of the surface, said particles of ice being at virtually the transition zone temperature from a solid phase to a liquid phase, said surface being at a temperature higher than the melting point of the ice particles whereby said ice particles afford a virtually slushy mass upon contact with the surface to be cleaned for scrubbing and wiping said area.

4. A method of cleaning a surface which comprises controllably directing at a selected angle a stream of particles of ice at virtually the transition zone of said particles of ice from a solid phase to a liquid phase upon a surface area to be cleaned whereby said particles of ice afford a virtually slushy mass upon contact with the surface area to be cleaned for scrubbing and wiping said area, and selectively introducing an emulsifying surface-active agent in said stream of ice particles.

5. A method of cleaning a surface which comprises directing at a selected angle a stream of particles of ice at virtually the transition zone of said particles of ice from a solid phase to a liquid phase upon a surface area whereby each particle affords a virtually slushy mass for scrubbing and wiping said area, and selectively introducing an aqueous low-temperature wax emulsion into said stream of particles.

6. In an apparatus for cleaning and polishing finished surfaces of automobiles, the combination of: means for producing virtually discrete ice particles of flaky nature; receptacle means for receiving and holding a selected quantity of ice particles; duct means connected to said receptacle means for directing said ice particles along a selected path; compressed air means in heat exchanging relationship with said ice particle producing means for providing cool compressed air, said compressed air means being connected to said duct means at the receptacle means for propelling said ice particles in a stream along said path; nozzle means at the discharge end of said duct means for selectively directing the stream of ice particles against a surface of the automobile; said nozzle means including a nozzle member for introducing additional compressed air at said nozzle means into the stream of ice particles; means including a supply of low-temperature aqueous emulsion of wax and a second nozzle member adapted to inject said wax emulsion into said stream of ice particles; and valve means for said nozzle means for selectively injecting said wax emulsion into said stream of ice particles for depositing a protective wax coating on said automobile.

7. In an apparatus for cleaning and polishing finished surfaces of automobiles, the combination of: means for producing virtually discrete ice particles of flaky nature; a hopper for receiving ice particles from said producing means; duct means connected to said hopper for directing said ice particles along a selected path; compressed air means in heat exchanging relationship with said ice particle producing means for providing cool compressed air, said compressed air means being connected to said duct means at said hopper for propelling said ice particles in a stream along said path; nozzle means at the discharge end of said duct means for selectively directing the stream of ice particles against a surface of the automobile; said nozzle means including a nozzle member for introducing additional compressed air at said nozzle means into the stream of ice particles; and means including a supply of low-temperature aqueous emulsion of wax and a second nozzle member adapted to inject said wax emulsion into said stream of ice particles.

8. In an apparatus for cleaning and polishing finished surfaces, the combination of: means for producing virtually discrete ice particles of flaky nature including a hopper for said particles; duct means connected to said hopper means for directing said ice particles along a selected path; compressed air means in heat exchanging relationship with said ice particle producing means for providing cool compressed air, said compressed air means being connected to said duct means at said hopper for propelling said ice particles in a stream along said path; nozzle means at the discharge end of said duct means for selectively directing the stream of ice particles against a surface to be cleaned; and said nozzle means including a nozzle member for introducing additional compressed air at said nozzle means into the stream of ice particles.

9. A method of cleaning and polishing a surface area comprising the steps of: conveying particles of flaky ice in a cool air stream; directing said stream at a selected angle against a surface area to be cleaned for bombarding the surface area with said particles; selectively introducing an emulsifying surface-active agent into said stream of particles; then selectively introducing an aqueous low temperature wax emulsion into said stream of particles; and then polishing the deposited wax emulsion by bombardment theerof with said ice particles.

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