

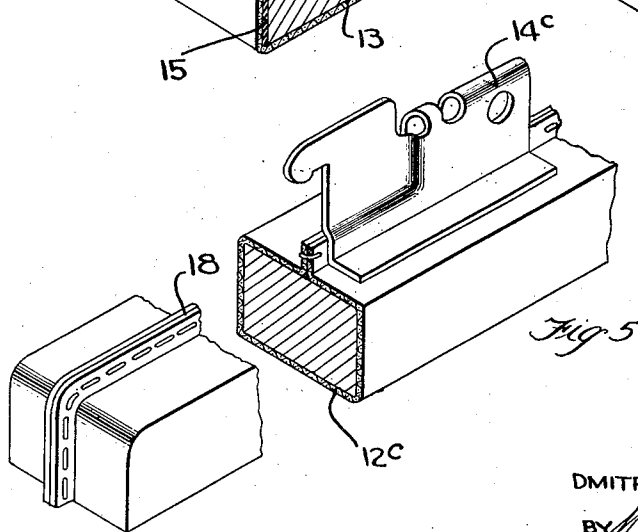
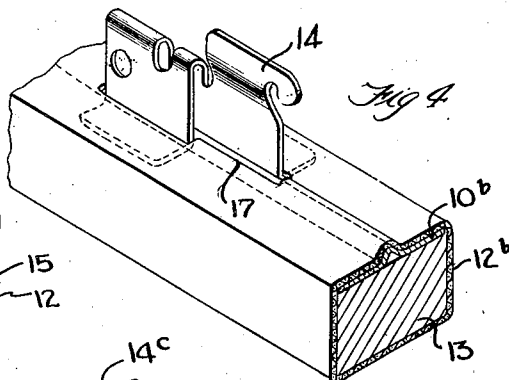
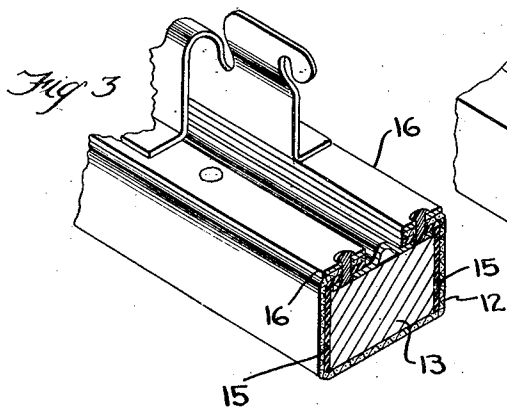
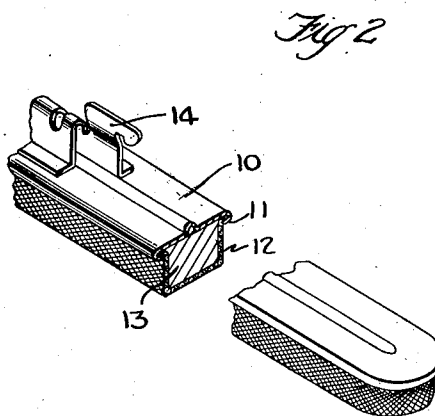
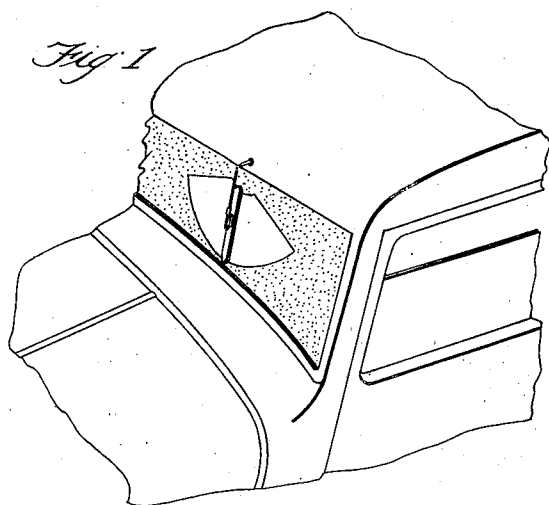
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This invention relates to a wiper for sleet, frost and the like, especially to a wiper adapted for use in automatic window or windshield cleaning devices.

5 In my prior Patent No. 2,009,377, dated July 30, 1935, I have disclosed a wiper adapted to remove sleet and frost from windows and similar surfaces.

10 One of the great problems in the design and construction of satisfactory sleet wiping blades of the type covered by my present patent is the control of the rate of dissolution of the soluble anti-freeze material. In the example described in my first patent I used particularly a combination of salt and glycerine and I disclosed 15 among other coverings the use of paper with the interstices partially closed by hydration of the fibers, i. e., a semi-parchment paper, to control the rate of solution. The glycerine which is present in such case wets the paper and reduces the surface tension of the solution and thereby facilitates the passage of water through the facing, and thus the use of hydrated cellulose in the semi-parchment paper to control the rate of dis- 20 solution could be more satisfactory than were a solid anti-freeze material alone is used.

I have now found that the control of the rate of dissolution is best effected by eliminating partially or entirely the washing effect of water 30 which actually passes through the facing material and into contact with the supply of anti-freeze material and relying substantially entirely upon diffusion through the part of the face of the material which is under pressure between the 35 anti-freeze material and the surface being wiped; but that this should be effected without making the facing repellant to water.

I have found that such washing away of the anti-freeze material at a rate in excess of that 40 which can be used for sleet dissolving purposes may result first from excess permeability of the facing material, especially of the sides thereof, and secondly, and very important, from any rocking or kneading of the anti-freeze material 45 during operation of the device. If the anti-freeze material is allowed to rock appreciably, from side to side it results in a "pumping" action in which first one side is subjected to pressure while the other is subjected to suction and then 50 vice-versa, with a tendency to pump water from one side to the other through the facing and thereby to wash away the anti-freeze material. Similarly if a loose or more or less plastic mass of anti-freeze material is provided, and especial- 55 ly if the covering is allowed to become slack, as

it will when the anti-freeze supply is partially exhausted, the back and forth movement of the device over the surface against which it is pressed may result in a kneading of the anti-freeze material with a pumping action similar to that already described. 5

The object of the present invention is to provide a device for dissolving sleet, frost and the like by chemical means in which the chemical is used with economy and the device thereby gives 10 a long, useful life. This object I accomplish by a recognition and correction of the conditions above referred to, which tend to an excess washing away of the water-soluble material.

In the first place, I have found it very desirable to use a substantially rigid stick or block of solid antifreeze material with a flat face which conforms to the surface over which it is to be wiped, so that when pressed thereagainst it will in itself avoid any tendency to rocking or 20 kneading and will on the contrary seek to maintain its conformity to the surface against which it is pressed.

This rocking is advantageously further controlled by the use of a substantially rigid connection with the wiper arm or motor so that the 25 device as a whole has no tendency to rock or "flop" in operation.

In the second place, I have found it desirable to use a tightly woven fabric for the facing material. This I have found preferable to other 30 methods of reducing the permeability of the facing because in this way I am enabled to retain the wetting tendency of the clean absorbent fibers of the cloth and thereby to facilitate the 35 desired diffusion through the cloth while at the same time controlling the rate of diffusion by the tightness of the weave, i. e., by controlling the size of the interstices between the fibers.

Thirdly, I have found it desirable to reduce, at 40 least to some extent, the permeability of the sides of the device to the passage of water, either by reducing the permeability of the fabric itself along the side or by adding a less permeable material on the outside or the inside of the fabric. 45

In the accompanying drawing I have illustrated a preferred embodiment of my invention and several modifications thereof. These I have chosen with a view to illustrating my invention and the principles involved therein so that others 50 skilled in the art may be fully enabled to apply the invention. It should be understood that these are not intended to be exhaustive or limiting of the invention, but on the contrary to enable others to apply the invention in innum- 55

erable forms according to the requirements of each particular application.

In the drawing:

Fig. 1 is a view in perspective of a wiper embodying my invention operating on the windshield of an automobile.

Fig. 2 is a view in perspective and section of a preferred wiper blade embodying my invention.

Figs. 3 to 5 are views in perspective and cross-section similar to Fig. 2 showing modified forms of my invention.

Referring first to Figs. 1 to 3 inclusive, the blade there shown comprises a sheet metal back 10 which is substantially rigid and which, on the face toward the anti-freeze material, is flat except for the shallow rim formed by the edges 11 which are crimped over the edges of the facing material 12 to form a closed bag within which a rigid block or stick 13 of salt or other solid anti-freeze material is held. The rim 11 is so shallow that it does not contact with the glass until substantially the entire block 13 has been dissolved away.

On the middle of the back 10 is secured, e. g., by spot welding, a connector device 14 by which the entire blade may be connected to the wiper arm of an ordinary windshield wiper mechanism in place of the usual squeegee. This connector is designed to fit closely on the end of an ordinary wiper arm so as to be moved and pressed thereby without tendency to rock or "flop."

The facing 12 as already described above is advantageously made of a tightly woven fabric, e. g., of cotton, linen or similar fibers, which are readily wetted by water. The fiber in the fabric is preferably free from any oily or gummy substances which would reduce the absorbent quality of the fiber, that is to say its tendency to be wet by water, and the weave and thickness of the cloth are chosen so that once the cloth is wet it will diffuse the salt solution at a sufficient rate when wiped in its usual arc over the surface of a block of ice at 20° F. to maintain a wet film of salt solution on the surface of the ice, but not at much lower temperatures, e. g., 10° F., and especially 0° F. I have found, for example, that under average conditions encountered for windshield wipers the cloth used for this purpose should have a permeability such that it will pass approximately 50 cubic cm. of water per square centimeter of area per hour under a one-inch head. This may be varied between 37 and 62 cc./sq. cm./hr. or even 30 to 70, depending upon other conditions such as the solubility and nature of the anti-freeze material, the pressure exerted on the device, the minimum temperature of operation, the quantity of sleet, etc., to be melted, etc. As an example of such cloth, I may use a thoroughly washed cotton drill of 135 to 143 N 40/2 warped and 41 to 58 picks 60/2 filling. This is preferably in the form of a paste with the center portion which is to be over the base of the pad having about 15 to 30 percent less warp than the portions on either side.

I have already referred to reduction of permeability at the sides of the device as compared with that of the face. This may be best achieved in the same way as has been just discussed—namely, by using a tighter weave in the fabric at the sides than in the part which forms the face. I have achieved this very simply by using a tape of suitable width with the warp threads much closer in the parts which form the sides than in the central part which forms the face of the finished device.

In the manufacture of the device it is sometimes desirable to have a stiff fabric capable of holding its form to some extent during the assembly process. It is ordinarily advantageous to obtain this stiffness by tight spinning and weaving without use of starch or other extraneous stiffeners. When this is not practicable, and especially when, because of the physical form or chemical nature of the anti-freeze material, a more permeable fabric is desired the stiffening may be effected according to my invention by impregnating the fabric with water soluble materials, preferably thermoplastic or fusible materials so that the fabric can be given shape by hot pressing, and these materials advantageously serve also as the water-soluble impregnants to assure action of the device on cold ice without preliminary wetting. As example of materials which may be used for this purpose are the sugars e. g., arabinose, dextrine, dextrose, diacetyl glucose, lactose, mannose, raffinose and sucrose and mixtures of them. They may also be softened somewhat by mixing with a small amount of glycerine.

For the salt block, I preferably use a compressed finely divided salt, e. g., technically pure sodium chloride of size to pass a 45 to 60 mesh screen, molded under a pressure of 7500–10,000 lbs. per square inch. The exact size of the salt particles used is not essential, however, and in fact the block may be made by fusing and casting or by sintering or moistening and recrystallizing as well as by compression. However, if a denser anti-freeze block is used, as for example a casting or a block molded of finer material or under greater pressure, the facing may advantageously be correspondingly more pervious, whereas if a more open and porous block is used a correspondingly less pervious facing should be used.

In order to avoid rocking so far as possible it is important that the block should have a surface substantially conforming to that of the surface which is to be wiped and of sufficient width to withstand any possible tendency toward rocking. In general I have found it desirable to use a block which is at least as wide as it is thick. I have found a block which is square in cross-section and about $\frac{3}{8}$ or $\frac{1}{2}$ inch width and thickness to be a desirable size. From this point of view also it is important that the block 12 should be sufficiently compressed, cemented, or crystallized, etc., so that it will not disintegrate during use.

In Fig. 3, I have shown a modified form of the invention in which solution of the salt at the side, by diffusion into the flow of excess water scraped up along the leading edge of the blade, is prevented by use of relatively impervious strips 15, advantageously of rubber sheet, which extend only to, or preferably slightly short of, the face of the block 13 of anti-freeze material. These rubber strips may be mounted either outside or inside of the fabric facing 12; but I have found it advantageous to place them inside, because in this position they are held by the fabric against flapping out away from the block 13, and furthermore because this permits any water scraping up beside the advancing blade, when it is first put in use, to be absorbed along the fibers and, therefore, more quickly to wet the facing between the salt block 13 and the surface being wiped. If an efficient squeegee were used outside the fabric, it would be essential to have the fabric at all times impregnated with glycerine or salt or other material which would assure its immediate action even before the fabric becomes

wetted, or else the fabric would have to be wet especially with water before being put into use. Ordinarily such precautions are not necessary, but even with the blades as shown in the drawing they may become important in sleet storms at relatively low temperature, where the water freezes immediately upon striking the cold surface.

In Fig. 3, I have also shown separate clamping strips 16 used in place of the turned over rim 11 as shown in Figs. 2 and 3. The function and operation of these are substantially the same as the edges 11, and no special description, therefore, is required.

In Fig. 4, I have shown another modification in which the backing member 10b is placed within a tubular facing 12b.

The facing material in this case is made in the form of a braided or sewn cloth tube 12b, the ends of which are sewn together or otherwise closed to form a bag for the block 13 of anti-freeze material. A slit 17 is provided for the connector 14, or if desired the connector may be riveted or otherwise secured to the back with the cloth of the tube 12b between it and the back 10b. In any case, the back 10b is advantageously placed within the tube before the salt block 13 is inserted. The latter may either be preformed and slipped into the bag after the metal back is in place or it may be cast in situ in the bag by pouring fused salt into the bag, preferably within a suitable mold, while the metal back is in place therein. In order to avoid slippage of the back on the block 13 it is desirable to provide holes in the back which may be countersunk from the outside so that the salt will flow therein and be keyed to the back when it solidifies. This, however, is not necessary and, especially if the back is made of a metal which is corroded to some extent by the damp salt so that the two become engaged by chemical interaction.

I have described above a number of ways of controlling the rate of solution of the anti-freeze material without excessively delaying the first effective action of the anti-freeze material on the ice. These may advantageously be used together but they will still have advantage in themselves when used separately. Thus, for example, even if the blade is allowed to rock so as to give a pumping action, this may be controlled by use of a very tight weave and with the use of an absorbent fiber free from water-repellent materials the advantage of quick action can be retained.

It will be observed that in all these forms as shown in Figs. 1 to 5 inclusive and discussed above the substantially rigid and flat pressure distributing back is provided according to the

invention described in the claims in my said prior patent. In the modification illustrated in Fig. 5, a separate back is not provided, but the rigid block of anti-freeze material itself serves this function. In this case the block of anti-freeze material is entirely covered with a jacket 12c of the facing material which is seamed along the back as shown at 18. Onto this seam I have clamped the connector device 14c so that it serves to exert pressure against the block of anti-freeze material and to transmit lateral force for moving the wiper over the surface to be cleaned of sleet and frost, etc. It is an advantage of this form that the connector 14c is flexibly connected to the device so that any rocking tendency which may be exerted by the motor device or its connection is not transmitted to the block of anti-freeze material. It is a disadvantage of this form, however, that its useful life is terminated as soon as the block of anti-freeze material is broken and, therefore, it is impossible to use the entire supply provided within the bag. Since it is in any case impossible to use this entire supply it is advantageous with this form of the device to impregnate the back of the block to a small depth with a strengthening material, such as for example a resin, which may be applied in solution or in molten form to the back of the porous block. In this case, of course, the back part of the block 13, whether impregnated or not, serves as and performs the functions of the rigid back member.

I claim:

1. A device for dissolving sleet, frost and the like from window surfaces, which comprises a stiff pressure distributing back, a solid stick of water-soluble anti-freeze material with its back adapted to engage the pressure distributing back and its face approximately flat and parallel to the back, a flexible bag adapted to hold said stick on said back and having a pervious water absorbent facing adapted to permit solution of the stick by diffusion therethrough, and means for connecting said back to the wiper arm of a conventional wiper mechanism, said connecting means being adapted to transmit to the device pressure directed toward the surface being wiped and driving force in a transverse direction.

2. A device for dissolving sleet, frost and the like as defined in claim 1 in which the stick of anti-freeze material is a compressed finely divided water-soluble solid at least 80% of the pieces of which are of diameter sufficiently small to pass a 60 mesh screen, and the cloth at the face is of permeability adapted to pass approximately 50 cc. of water per square centimeter per hour under one inch head, and sides of the bag adjacent the face are no more permeable than the face.

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