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(54) **MELANGE NON CORROSIF A BASE DE REBUTS, DE
CONCENTRES DE REBUTS LIQUIDES OU SECHES EN
PROVENANCE DES INDUSTRIES VINICOLE ET DE LA
DISTILLATION, ET PROCEDE POUR DEBARRASSER LES
SURFACES DE ROULEMENT DE GLACE ET DE NEIGE**
(54) **NON-CORROSIVE MELTING AND ROUGHENING MIXTURE
BASED ON WASTES AND WASTE CONCENTRATES AND/OR
DRIED PRODUCTS OF THE FERMENTATION INDUSTRY,
DISTILLING INDUSTRY AS WELL AS WINE INDUSTRY AND
A PROCESS FOR MAKING ROAD SURFACES FREE OF
SNOW AND ICE**

(57) The invention relates to a melting mixture for making surfaces, particularly roads free of snow and ice, said mixture optionally containing urea as an agent lowering the freezing point of water, and, if desired, other additives, which comprises alcohol distillation residue and/or fermentation dregs of the alcohol and/or wine industry, which may be present optionally in a concentrated form, e.g. in a form dehydrated on a filter press or in a centrifuged or optionally powdered form; wherein the total dry substance content of the residue and dregs amounts to at least 40 % by weight of the total weight of the aqueous melting mixture, and at least 15 % by weight of this dry substance content originates from a non heat-treated substance. The melting mixture of the invention contains, if desired, additives, e.g. urea and/or surface active and/or flavouring agent(s). The main advantage of the invention is that the melting mixture is free from chloride ions therefore, it does not cause corrosion and is environment-friendly.



NON-CORROSIVE MELTING AND ROUGHENING MIXTURE BASED ON
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THE FERMENTATION INDUSTRY, DISTILLING INDUSTRY AS WELL AS
WINE INDUSTRY AND A PROCESS FOR MAKING ROAD SURFACES FREE
OF SNOW AND ICE

5

Abstract

10

The invention relates to a melting mixture for making surfaces, particularly roads free of snow and ice, said mixture optionally containing urea as an agent
15 lowering the freezing point of water, and, if desired, other additives, which comprises alcohol distillation residue and/or fermentation dregs of the alcohol and/or wine industry, which may be present optionally in a concentrated form, e.g. in a form dehydrated on a filter
20 press or in a centrifuged or optionally powdered form; wherein the total dry substance content of the residue and dregs amounts to at least 40 % by weight of the total weight of the aqueous melting mixture, and at least 15 % by weight of this dry substance content originates from a
25 non heat-treated substance.

The melting mixture of the invention contains, if desired, additives, e.g. urea and/or surface active and/or flavouring agent(s).

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30 melting mixture is free from chloride ions therefore, it does not cause corrosion and is environment-friendly.

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The invention relates to a non-corrosive melting
and roughening mixture based on wastes and waste
10 concentrates and/or dried, especially spray-dried
products of the fermentation industry, distilling industry
and wine industry, as well as a process for making road
surfaces free of snow and ice.

It is known that the road network is incapable to
15 follow the dynamical development of the public road
traffic. Thus, the road network constitutes a bottle-
neck in the traffic, causes, especially in the winter
season, blocks in the peak hours and risks of accidents.
Consequently, in the winter cleaning of roads in addition
20 to the mechanical removal of snow chemical methods are
also required for making the road surfaces free of ice
and slipperiness, too. Most of the known substances used
for freeing the roads from slipperiness contain chloride
ions such as sodium chloride, magnesium chloride and
25 calcium chloride, used alone in liquid or solid form, or
in admixtures with sand and/or other granular materials.
These substances exert highly harmful effects on the en-
vironment, which are as follows.

1) The soil is damaged, its physical properties are
30 deteriorated; it becomes alkaline; its ion-binding
capacity and humus content are decreased.

2) The surface waters are damaged due to the high
salt concentration.

3) The vegetation is injured.

35 This latter injury arises from salts either getting

on the surface of the plant or absorbed through its root, respectively. This leads to the complete destruction of the vegetation along the public roads. This damage is chiefly caused by chloride ions accumulated in the leaves, specifically in the toxic effect of the chloride ions resulting in the withering of the leaves. The amount of the chloride ions is diminished even after 6 years following the salting only to 1.005 % from the value of 1.825 % measured immediately after salting. If the salting is practiced regularly, the width of annual rings of the trees is diminished to the tenth of the normal size and therefore, the vegetation is destroyed due to the deficiency of food and water supply. Besides, the photosynthesis is also inhibited by the large amounts of chloride ions.

It should distinctly be pronounced that melting-salts exert a corrosive effect causing worldwide severe losses through their actions on vehicles, concrete coatings, ferroconcrete engineering structures and underground metal objects (e.g. the hole corrosion of gas pipelines).

Of the substances recently most frequently used for melting the ice for melting 1 kg of ice at -6 °C the following amounts are required: 104 g or 112 g, respectively, of a solution containing NaCl, MgCl₂, respectively. Thus, chloride ions get to the environment in an amount of 63.17 g from the sodium chloride solution whereas in an amount of 83.5 g from the magnesium chloride solution.

From soil samples randomly taken from 50 sites previously treated with salt against slipperiness it was determined that the chloride ion content of the soil was 1000 to 2800 mg/kg just after salting, 1300 mg/kg in the months following the salting and 450-1300 mg/kg in the

samples taken in next May.

It is an other important fact that sodium chloride completely loses its melting effect at -7°C .

Aqueous electrolytes create the conditions of
5 corrosion of metals being in contact with the atmosphere or being under the ground. The solutions of salts used for making the roads free from the winter slipperiness play an important role in the corrosive injuries of metals contacting therewith. The corrosive en-
10 dangering of the bodies of cars, metal structures being in the open air, road accessories, bridge elements, underground pipe elements, cables, engineering structures and the like is significantly enhanced by the presence of chloride ions. The rates of corrosion, the cracking and
15 dilapidation of the objects are determined above all by the composition, salt- and oxygen-content of the electrolyte layer developing on the surfaces of the metals. From this point of view, mainly iron (steel), aluminum and zinc are endangered.

20 Further, melting salts and chemicals used against slipperiness possess an unfavourable effect on the concrete and ferroconcrete engineering structures, too. Water, pure or containing chemicals, freezing in the pores cannot expand and cracks the concrete; furthermore,
25 chloride ions bound to any of the cations getting in and binding to the components of concrete clinker increases the volume thereof; and swelling causes destruction. Besides, the cation being present in the salt used, i.e. K^+ , Mg^{2+} , Ca^{2+} also exerts aggressive effect on the
30 cement component. Therefore, it is a fundamental requirement that the chemicals used for making the roads free of ice must not be electrolytes.

According to the known art, only urea and a substance (to be discussed later in detail) disclosed in the
35 Canadian patent No. 1,275,796 (or in the equivalent US

patent No. 4,676,918) are known as substances useful for de-icing roads and not dissociating to ions and therefore not inducing corrosive processes. This is the base of the importance of urea which is the single non-corrosive
5 compound used in the practice, and this justifies the exclusive use of urea e.g. on airports in spite of its high price.

It should be noted that the application of dry salt cannot help anyway when the road conditions are critical.
10 Such conditions are: rime; the dry-slippery way as a consequence of icing; mirror-ice formed by freezing of sprinkle of rain or fog; the deeply cooled road coating; dry, iced snow and iced layer smoothed by the traffic. In these cases the dry salt is blown off from the road by
15 the effect of traffic. Consequently, the ice-freeing is to be achieved suitably by an other method.

A number of publications comprising solutions for the above problems may be found in the literature.

Hungarian patent No. 169,601 discloses the preparation of a melting mixture which can be incorporated into
20 the road coating during the road construction. According to this patent the melting mixture comprises halide and hydroxide $[Ca(OH)_2]$ particles surrounded by a coating prepared from oil and plastic. Thus, the mixture mentioned cannot occasionally be sprayed for freeing the
25 road from snow and ice at snowfall.

According to the US patent No. 4,108,669 an adhesion-promoting mixture is used, which is corrosive and damages the soil and the subsoil water.

30 According to the published German patent application DE-OS 3,002,328, friction-increasing granular substances are applied onto the road surfaces; however, these granular products do not possess any melting effect.

35 In the German patent No. DE 364,491 a melting mix-

ture is disclosed for inhibiting the agglomeration of bulk products. This mixture consists of a film-forming, hydrophobic, apolar hydrocarbon derivative containing carboxyl, sulfonic acid or phosphoric acid groups which
5 adheres to solid surfaces well; however, this hydrophobic mixture is not suitable for the de-icing of roads.

In the US patent No. 3,940,356 a mixture is described, which consists of alkylene glycol, water, alkanols as well as cross-linked polyacrylic acid and a
10 base for neutralizing the acid.

In the US patent No. 3,928,221 and Swiss patent No. 6,1133 mixtures comprising expensive, soil-damaging, toxic and inflammable alkylene glycols and methanol or, for the substitution thereof, a mixture comprising
15 corrosive and toxic salts are disclosed.

According to the US patent No. 4,153,473 calcium nitrite $[\text{Ca}(\text{NO}_2)_2]$ is used to remove the snow and ice layer of roads and bridges. It is commonly known that nitrite is harmful both to the health and the
20 environment.

In the British patent specification No. GB 1,463,401 alkaline metal, alkaline earth metal or ammonium nitrate or chloride, sodium benzoate, bichromate, hexametaphosphate, hydrogen phosphate, ferrocyanide, zinc
25 sulfate, glycine or an alkaline metal nitrite are suggested as anti-freezing agents.

Chemical agents used for de-icing roads are commonly known; CaCl_2 , MgCl_2 and NaCl have been used for several decades.

30 In Germany one million tons of commercial salt, at Budapest 15-17000 m^3 of commercial salt and 5000 m^3 of very corrosive 36 % MgCl_2 solution are annually used. Instead of these commonly known substances, e.g. ammonium sulfate, ammonium nitrate, ammonium chloride, glycerol,
35 urea and ethylene glycol are suggested, from which only

urea is not environmentally harmful, however, the costs of using urea are 30-times as high as those of using NaCl.

5 The possibility of using alcohols and glycols as commonly favourable freezing point lowering agents has arisen. Though these have no corrosive effects, they are highly expensive and some of them are incendiary.

Instead of NaCl, the highly environment-polluting NaNO_3 and sodium benzoate have also been proposed
10 (British patent No. GB 1,463,401]. Similarly, an admixture of calcium, magnesium and sodium chlorides mixed with NaOH and then mixed into the bitumenous road-making material is suggested as a melting and anti-freezing mixture (US patent No. 4,094,649).

15 There are processes and patents known (e.g. the US patent No. 4,153,473), according to which $\text{Ca}(\text{NO}_3)_2$ is added to the water of road-making concrete for preventing corrosion of the cement and inhibiting the icing.

Similarly, the commonly available composition
20 Frigant^R (BASF Co.) containing propylene glycol is an additive used in the upper layer of roads. This and the electrically heated road-coating are here mentioned only as theoretical possibilities because of the high expenses.

25 According to the DOS 2,364,491 a mineral oil distillation residue of 40-50 °C drop point and a hydrophobic component of -30 °C congealing point are used to inhibit the freezing and adhesion of coal- or ore-transporting waggons, vessels, wet surfaces and the like.
30 However, these hydrocarbon-based wastes are in themselves environmentally harmful, carcinogenic, etc. materials or, they become such because of cyclization during evaporation; thus, they are not useful for being applied to public roads, and are not suggested either for this purpose.
35

Therefore, a material is needed, which is useful for the cheap treatment of large surfaces on an industrial scale without any environment-damaging effect (inclusive both the effects exerted on nature and the corrosion, respectively).

Although a solution meeting the above requirements is known from the Canadian patent specification No. 1,275,796 (equivalent to the US patent specification No. 4,676,918) its practical utilization is limited by the unpleasant odour of the melting mixture due to the properties of the raw material employed. Namely, the principle of the solution according to the above patent consists in that alcohol distillation residue is used as the main component of the melting mixture and in addition, the melting mixture optionally contains chloride salts and/or urea and/or sand, pebbles, slag and/or saw dust or a mixture thereof, furthermore, if desired, a surface active agent. This mixture meets the requirements set, among others the requirements of water solubility, availability in large amounts, harmlessness in relation to corrosion and from the aspect of environment protection; besides, it is cheap and can be applied onto the roads by available equipments. However, this solution seeming to be favourable based on those said above, was not put to use for the past, nearly ten years since the main component thereof, namely the alcohol distillation residue has a rather characteristic, strong odour which is unwillingly accepted by the people on the roads and in settlements.

It has been recognized that the fermentation dregs of wine industry, substances similar in their character to the alcohol distillation residue and exerting alone a melting effect similar to that of the alcohol distillation residue, significantly reduce or essentially take away the characteristic unpleasant odour of the alcohol

distillation residue when used in the melting mixture. According to our supposition, without wanting to limit the invention to one theory, this phenomenon is due to the effect of enzymes of the yeast autolysate being

5 present in the dregs. By reducing the odour of the alcohol distillation residue to an acceptable level, the advantages of the above anteriority may also be utilized.

Further, it has been found that an effect similar to that of the wine dregs is exerted by the alcoholic
10 fermentation sediment of other carbohydrate-containing raw materials or by the sediment of alcoholic fermentation of hydrolyzed starch-containing materials, too. Hereinafter, these fermentation sediments will be referred to as "fermentation dregs of alcohol industry"
15 or briefly "alcohol dregs".

The melting mixture according to the invention contains alcohol distillation residue and/or fermentation dregs of alcohol industry or wine industry, which may optionally be in a concentrated form (e.g. dehydrated on a
20 filter press or centrifuged) or optionally in powdered form. The whole dry substance content of the alcohol distillation residue and alcohol and/or wine dregs amount to at least 40 % by weight of the total weight of the melting mixture; at least 15 % by weight of this dry
25 substance content i.e. at least 6 % of the total weight of the melting mixture arise from a non heat-treated raw material (non heat-treated dregs); and, if desired, the melting mixture may contain urea and/or a surface active substance and/or flavouring agent.

30 From the raw materials mentioned above, alcohol distillation residue usually means the substance (slop) obtained (as essentially sugar- and alcohol-free residue of about 10 to 15 % by weight of dry matter content) from the fermentation broth of fermenting different carbo-
35 hydrate containing raw materials by distiling out the

alcohol from them generally at 80 - 100 °C temperature. This material is in most cases concentrated to a dry substance content of 40-70 % under reduced pressure for reducing the transport costs.

5 The concentrated (e.g. dehydrated on a filter press or centrifuged) dregs of alcohol or wine industry are products of high protein and potassium tartrate content having a composition similar to that of the alcohol distillation residue above and may be applied according to
10 the invention alone or in an admixture with the alcohol distillation residue mentioned above. The dregs (sediment) or the concentrate or dried products thereof, respectively, obtained in the alcoholic fermentation of other carbohydrate containing raw materials, e.g. of
15 fruits or hydrolyzed starch-containing materials (e.g. hydrolyzed maize, potato and cassava) may equally be utilized as the dregs originating from the fermentation of grapes in wine industry.

 It should be noted that, though these base materials are capable both alone or in the form of their mixtures to produce the suitable melting effect, for the preparation of a melting mixture of appropriate quality (namely, with an acceptable odour) according to the above recognition of the invention, the mixture should contain
20 in all cases non heat-treated fermentation dregs of the alcohol and/or wine industry, too.

 The total dry substance content of the alcohol distillation residue and of the alcohol dregs and/or wine dregs amounts to at least 40 % by weight, preferably at
30 least 45 % by weight, more preferably at least 50 % by weight, most preferably at least 55 % by weight of the total weight of the melting mixture.

 At least 15 % by weight, preferably at least 25 % by weight, more preferably at least 30 % by weight, most
35 preferably at least 35 % by weight of the total dry

substance content originating from the alcohol distillation residue and from the alcohol dregs and/or wine dregs of the melting mixture originates from non heat-treated alcohol and/or wine dregs.

5 In the case when the melting mixture contains urea, too, the amount thereof is suitably at most 5 % calculated for the total amount of the melting mixture. It is also possible to employ a higher amount of urea, however, this is economically unuseful.

10 The amount of a surface active agent, if used in the melting mixture, is conveniently 0.0002 % to 0.001 % by weight but other amounts may also be used.

 The amount of a flavouring agent, if used in the melting mixture, is suitably 0.0001 to 0.005 % by weight, 15 preferably about 0.0002 to 0.001 % by weight, though other amounts may also be employed.

 The melting mixtures according to the invention may be formulated to a ready-for-use concentration or to the form of a concentrate which may be diluted to the desired 20 concentration with water before the use.

 The ready-for-use concentration of the melting mixture means a concentration range being already effective (with a dry substance content of about 40 %) but having yet a pumpable density (with a dry substance content 25 usually of about 60 % but this latter value varies depending on the pump, temperature and other parameters used).

 As flavour, e.g. pine oil may be used. By using this flavour in an amount of 2 ml/ton of melting mixture 30 (0.0002 %), the odour of the leaving gas is 20 odour units measured with a dynamic olfactometer with static dilution [the Environment Protection Administration (EPA) of USA considers 200 odour units for acceptable when measured by the method of static dilution].

35 The invention relates also to making road surfaces

free of snow and ice. According to the invention, the melting mixture of the invention is distributed on the surface to be treated in an amount of at least 20 g/m², preferably at least 30 g/m², more preferably 50 g/m², in
5 some cases in a significantly higher amount, e.g. in an amount of 100 or 150 g/m². The distribution is suitably carried out by spraying which may be achieved e.g. by using watering trucks commonly employed for the cleaning of roads.

10 According to a preferred embodiment of the invention, beside the distribution of the melting mixture of the invention on the road surface, a roughening material, e.g. sand and/or gravel, slag and/or sawmill refuse of at most 5 mm particle size may also be applied onto the road
15 surface. Due to the adhesion-promoting effect of the dry substance of the melting mixture, mainly of the protein content thereof, and to the beginning of melting, these roughening materials adhere to the surface better than in itself and will not be blown off therefrom. Suitably, the
20 solid roughening material is sprinkled from a device fastened to the back of a watering truck spraying forwards the melting mixture according to the invention.

In addition to the favourable ice-melting effect even under the above-detailed extreme circumstances, the
25 advantage of the solution according to the invention consists also in that the waste materials of the alcohol and wine industry instead of causing difficulties by their disposal can be transformed to necessary and valuable products which, beside making frozen and snowy
30 road surfaces fit for traffic are environment-friendly for roads and vehicles as well as for the living environment.

Concerning roads and vehicles the absence of chloride ions from the melting mixture of the invention bears importance; namely, as mentioned above, chloride
35 ions have a commonly known corrosive action both on the

roads and vehicles running thereon.

Furthermore, due to the protein content of the yeast autolysate component of the alcohol and/or wine industry dregs contained in the melting mixtures of the
5 invention these mixtures behave to a certain degree as protective colloids.

The raw material supply required for the preparation of the melting mixture according to the invention is based thereon that the alcohol distillation residue, the
10 so-called alcohol slop is worldwide formed in large amounts in the big-industrial alcohol production starting from carbohydrate-containing raw materials. Besides, dregs inclined to precipitation and sedimentation are formed in the clarification process of alcohol and wine
15 industry which dregs have to be removed after fermentation because their effect damages the quality and taste of the wine. These dregs generally are annihilated as useless wastes. Due to the bad quality of the brandy prepared from dregs, these are not significantly used to
20 this purpose; but the residue of the dregs brandy is also suitable for being used as raw material for the melting mixture according to the invention.

Based on the above recognition, a product with an acceptable odour is obtained by mixing on the one hand, a
25 concentrate formed by evaporation, concentration or, if desired, by drying (powdering) wastes of alcohol industry and wine industry origin and on the other hand, the alcohol industry and/or wine industry dregs not treated by heat and therefore possessing the activity of enzymes
30 of the yeast autolysate present therein, and exerting a deodorizing effect. The thus obtained product has an anti-corrosive effect because of the high protein content deriving from the chemical composition of the autolyzed yeast cells contained therein; it decreases the corrosive
35 character of other substances being possibly present;

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besides, its protein and amino acid content results in a certain inhibition of sliding and an increase in the adhesivity.

The surface roughened after wet application of the melting mixture of the invention by solid material [sieved slag, sand, gravel etc. with a particle size of preferably 0.2-5 mm, more preferably 0.2-0.5 mm sprinkled from a spreading device placed after the spraying part of the truck] stucked appropriately thereto prevents the sliding of vehicles and provides a safe traffic under any circumstances of the road.

In an experiment carried out at -15 °C temperature, a very good result was achieved by treating a snowy, iced road with spraying out a melting mixture of 50 % dry substance content and spreading sand on it.

On an other experimental road sector, at a temperature identical with the preceding one, 20378 m² of road surface were made fit for traffic in a plant-like experiment carried out with the Dutch Nido*spreader and watering truck with operating the truck with a speed of 5 km/hour and a spreading width of 8 m and applying 130 g of melting mixture per m² of road surface. The snowy surface became slushy, its slipperiness ceased, the traffic took up the iced area, therefore the surface causing sliding was gradually decreased. After about 30-40 minutes the ice could be removed by using a rubber-edged snow-plough and the road surface became clean after 3 hours.

A similar result was achieved on the removal of an ice-rib layer of a railway overpass at Pécs: the operation resulted in a black road coating here, too.

The amount of the mixture of the invention depends on the degree of icing but a consumption of 150 g/m² for ice-ribbed roads and 100-120 g/m² for roads coated by fresh snow proved to be satisfactory even under extremely

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unfavourable conditions.

As a result of the above composed effects, the danger that the solid material spread is blown away by the wind or by an air flow induced by vehicle traffic is decreased since the melting mixture of the invention fastens the individual granules onto the road surface. Thus, the solid material is to be used in a lower weight/road surface ratio whereby the use becomes more economical.

10 The invention provides also the advantage that the mixture of the invention can be used also below the temperature limit of the applicability of sodium chloride solution, it is transportable by pump even at -24 °C and has liquid consistency.

15 The comparison of the iron-corrosive effect of the melting mixture of the invention and that of the common salt solutions used for de-icing is possible on the basis of the following data (obtained under identical experimental conditions):

20 Corrosive solution	Weight loss of iron sample related to the original weight
10 % MgCl_2	9.14 %
10 % NaCl	13.3 %
25 10 % CaCl_2	10.2 %
Melting mixture of the invention	0 %

Further advantages of the melting mixture according to the invention reside in that: it can be used on any temperature, under any conditions of weather; it can accurately be portioned without any difficulty; on spraying, the solution immediately permeates into the frozen layer of snow or ice, therefore the melting procedure begins immediately on the whole surface sprayed; the distribution on the surface treated is substantially more

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uniform than the usual one. The melting mixture of the invention gradually melts the ice downwards from above; the cooling of the surface of coating is slow and steady; temperature deviations in vertical and horizontal directions are less than the deviations accompanying the usual treatments. The lower temperature deviation prevents the immediate cooling of the capillary water being present in the capillars of the unfrozen layer of concrete and the consequential "abrasion", destruction of the road surface, which is very frequent when the common chemicals are used, the main cause of this is the point-like, immediate heat abstraction. (This phenomenon mainly occurs on thick ice layers or on the melting of the ice-ribs formed by vehicles.)

An additional advantage of using the melting mixture according to the invention resides in the perfect protection of the environment, vegetation and the protection against corrosion. Besides, the spraying vehicle is capable to de-ice a longer road sector in one step; the speed of the vehicle during spraying may be substantially higher than with using the known melting agents (it can reach also the 50 km/hour speed); and the mixture can be stored practically in any available vessel.

The invention is illustrated in detail by the following non limiting Examples.

Example 1

1 ton of melting mixture concentrate with a dry substance content of 70 % by weight and 0.5 m³ of water were charged into the vessel of an UNICAR' 2/2 type machine, and the de-icing was carried out in a spraying width of 8 m by applying 10-15 g/m² mixture. The concentrate was a mixture of wine dregs and of the material remaining after distilling out the alcohol from the broth of fermented molasses; 25 % of the total dry substance content were of wine dregs and 75 % of distillation residue origin.

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The entire and uniform covering of the surface was well visualized by the light brown colour of the concentrate. 1.5 tons of pre-sieved river-sand were spread by a normal adhesive salt sprinkling technology by using a UN 15* type salt sprinkler fitted to the UNICAR* machine. Because of the melting effect the road became slushy; after removing the slush by ploughing a clean black road coating was obtained.

Similarly good results were achieved by following the above procedure, except that no solid material was spread out or when 5% of urea and 2 ml/ton fatty acid polyglycol ester, respectively, were added to the melting mixture.

Example 2

Example 1 was followed by using the Dutch Nido* type spraying and sprinkling machine in a plant-experiment, except that 20 g/m² of a melting mixture with a dry substance content of 50 % by weight were applied on a mildly iced road.

The melting mixture contained an alcohol distillation residue arising from the fermentation of potato mash and wine dregs in a 70:30 ratio by weight calculated on the dry substance content. A black road coating could be obtained with a very high efficiency.

Similar results were achieved by following the above procedure, except that the melting mixture contained the residue obtained by distilling out the alcohol from the broth of fermented maize mash and the dregs obtained by saccharification and fermentation of potatoes.

Example 3

The following series of experiments was aimed to investigate the use of concentrates of various dilutions.

After diluting the melting mixture concentrate of Example 1 with water to a dry substance content of 60 %

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by weight or 50 % by weight, respectively, the melting effect was examined on a road surface of 20378 m² without any additive on a snow layer of 9 cm at a temperature of -10 °C.

5 It was stated that the concentrate of 60 % dry substance content exerted its melting effect by 1.5 hours earlier than that comprising 50 % dry substance content.

Besides, the concentrate of 60 % dry substance content exerted a melting effect at -11 °C whereas the
10 melting effect of the salt mixture commonly used was completely retarded at -7 °C. This difference proved to be more significant at a temperature of -13.6 °C. The total analysis of costs of these plant experiments confirms the advantage in comparison to the costs of the
15 mixture of salt and sand.

Example 4

The corrosive effect was investigated on iron sheets dipped into a melting mixture concentrate with 50 % by weight of dry substance content according to the
20 invention or into sodium chloride solution of 20 % by weight, respectively. No change was observed on the former one after 14 months whereas the sheet dipped into NaCl solution became entirely rusted within 3 days.

The same examination was quantitatively carried out
25 in a salt-spraying chamber. During 72 hours, by using an 1 % by weight solution of NaCl, CaCl₂ or MgCl₂, respectively, the amount of rust calculated for the surface was 60, 50 or 40 g/m², respectively, whereas no rust appeared by using the melting mixture of the invention.

30 Example 5

Very positive results were obtained in the experiments carried out on the prevention of the winter congealing of railway switches or the freezing up of railway transports, e.g. coal transport.

CLAIMS :

1. An aqueous solution for melting a frozen form of water on a surface, wherein a solute in said solution comprises a water freezing point depression amount of a mixture comprising alcohol dregs, wherein said alcohol dregs comprise at least 40 dry weight percent of said mixture, and wherein at least 15 dry weight percent of said alcohol dregs are non-heat-treated alcohol dregs.
2. The aqueous solution of claim 1, wherein said alcohol dregs are selected from the group consisting of fermentation dregs of wine making, an alcoholic fermentation sediment of a carbohydrate-containing raw material, an alcoholic fermentation sediment of a hydrolyzed starch-containing raw material and a mixture thereof.
3. The aqueous solution of claim 1 or 2, wherein said mixture further comprises in addition to or as partial replacement for said alcohol dregs an alcohol distillation residue, wherein the amount of said alcohol distillation residue is such that the odour thereof is reduced to an acceptable level by said alcohol dregs.
4. The aqueous solution of claim 1, 2 or 3, wherein said alcohol dregs comprise at least 45 dry weight percent of said mixture, and wherein at least 25 dry weight percent of said alcohol dregs are non-heat-treated alcohol dregs.
5. The aqueous solution of claim 4, wherein said alcohol dregs comprise at least 50 dry weight percent of said mixture, and wherein at least 30 dry weight percent of said alcohol dregs are non-heat-treated alcohol dregs.

6. The aqueous solution of claim 5, wherein said alcohol dregs comprise at least 55 dry weight percent of said mixture, and wherein at least 35 dry weight percent of said alcohol dregs are non-heat-treated alcohol dregs.
7. The aqueous solution of any one of claims 1 to 6, wherein said mixture further comprises up to 5 dry weight percent urea.
8. The aqueous solution of any one of claims 1 to 7, wherein said mixture further comprises 0.0002 to 0.001 weight percent of a surface active agent.
9. The aqueous solution of any one of claims 3 to 8, wherein said mixture further comprises 0.0001 to 0.005 weight percent of an odour masking agent.
10. The aqueous solution of claim 9, wherein said mixture comprises 0.0002 to 0.001 weight percent of said odour masking agent.
11. The aqueous solution of claim 9 or 10, wherein said odour masking agent is pine oil.
12. Use of the aqueous solution of any one of claims 1 to 11, for melting frozen precipitation on a road surface.
13. A process for melting frozen precipitation on a road surface, comprising spraying the aqueous solution of any one of claims 1 to 11 on the road surface in an amount of at least 20 g/m².
14. The process of claim 13, wherein said amount is at least 30 g/m².

15. The process of claim 14, wherein said amount is at least 50 g/m².

16. The process of claim 15, wherein said amount is from 100 to 150 g/m².

17. The process of any one of claims 13 to 16, further comprising spreading a roughening material on the road surface.

18. The process of claim 17, wherein the roughening material has a particle size of at most 5 mm and is selected from the group consisting of sand, gravel, slag and sawmill refuse.

19. The process of claim 18, wherein the particle size is from 0.2 to 5 mm.

20. The process of claim 19, wherein the particle size is from 0.2 to 0.5 mm.

21. The process of any one of claims 17 to 20, wherein the roughening material is spread on the road surface after the aqueous solution is sprayed on the road surface.

22. Use of said mixture as defined in any one of claims 1 to 11, for preparing an aqueous solution for melting frozen water.
