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SYSTEM AND DEVICE FOR WEATHER-DATA-ASSISTED TEMPERATURE-CONTROL OF RAILWAY SWITCHES

The invention relates to a system and method for weather-data-assisted temperature control of railway switches, i.e. railway points, especially of the rails and movable linkages for railway points.

Conventional point heating systems are often equipped with weather sensors for local detection of the recent weather conditions near the respective point in order to heat the point by adequate heating elements via a local control.
Despite lots of advantages, these systems react comparably slowly. Only in case of a weather change, the respective point heating system is activated. However, this may be not sufficient in case of great and extreme weather changes like temperature drops, ice rain, snow resp. snow rain or huge amounts of new snow, especially with temperatures around 0 °C to avoid freezing of the movable point parts or their blocking by snow or ice.

The temperature control especially heating of railway points via weather data is already known from the state of the art. DE 197 42 085 B4 describes a point heating system with one or more locally separately arranged point heating systems which include heating elements for heating of a respective point of a rail line system and means for controlling the heating elements. This known point heating system has a weather forecast device which identifies weather forecast data relevant for point heatings for the respective point heating system and sends it to the system. In addition, heating element control means of the respective point heating system are controlling the respective point heating elements depending on the received weather forecast data. The disadvantage of this solution is the high energy consumption which is needed by the early heating via the additional control order “Heating” to the point heating system.

DE 43 38 750 A1 describes a snow melting device with electromagnetic inductance heating which includes a high-frequency power supply, a pair of conductive cables which are coiled at least in one winding around one segment of each rail through passage holes which are made into the sides of the rail whereby the seg-

ment of the rail between two passage holes is defined as well as one feeder cable connected to the power supply and the conductive cable by which the conductive cable is supplied with energy by the power supply whereby the rail is heated by the electromagnetic inducted current fed by the power supply. This electromagnetic inductance heating snow melting device shall avoid the situation that points freeze by ice formation on them and thus become immovable for switching.

DE 2 215 554 A relates to a point heating with electrical heating parts arranged on the rails with at least one temperature sensor and control with actuator assigned to the sensor for control of the heating current of the heating elements. The temperature sensor/s thereby is/are in contact with respectively one rail in the point blade area. By this, a device shall be created which enables safe and economical heating of the points.

Considering the aforementioned disadvantages of the state of the art, the invention has the task to provide a system and to indicate a method to control the temperature of railway points weather data based and thus timely and needs-based in that manner that the heating is realised with optimal energy input and the energy consumption can be planned and weather caused malfunctions can be reduced significantly.

This task is solved in one first aspect of the invention by a system (1) for weather data based temperature control of railway points (3) comprising:

- a processing unit (101) connected to a weather data provider (W) which is designed to call weather data from the weather data provider (W) for at least one railway point (3) in definable time intervals,

- at least one control unit (103) connected to the processing unit (101)

- at least one switching device (105) connected to the at least one control unit (103) and

- at least one point heating (107) for at least one railway point (3) connected to the switching device (105),

wherein the processing unit (101) is designed for constant calling of the weather data for at least one railway point (3), for analysing it continuously and for defining a temporal course (T1) of optimal set temperatures for the at least one railway point (3) resulting in a constant and weather dependent update of the set temperature of the railway point (3), and

wherein the control unit (103) is designed for controlling the at least one point heating (107) for the at least one railway point (3) in regular temporal intervals by means of the at least one switching device (105) on the basis of the temporal course defined by the processing unit (101) until the set temperature of the railway point is reached.

The aforementioned task is solved in a second aspect of the invention by a method for weather data based temperature control of railway points (3), comprising:

a) calling of weather data for at least one railway point (3) of a weather data provider (W) via a processing unit (101) which is designed to call weather data from the weather data provider (W) for at least one railway point (3) in definable time intervals,

b) analysing of the called weather data by means of an algorithm with maintaining of a temporal course (T1) of optimal set temperatures for the at least one railway point (3),

d) providing of the temporal course (T1) to a control unit (103) which is assigned the at least one railway point (3), and

e) controlling of a point heating (107) intended for the at least one railway point (3) on the basis of the temporal course (T1) by means of the at least one switching device (105),

wherein the calling of weather data and the method in step a) are carried out continuously, wherein the analysing of the called weather data in step b) is carried out continuously in definable time intervals and wherein the providing of the temporal course (T1) in step d) is carried out continuously in definable time intervals by which the set temperature of the railway point (3) is updated continuously and dependent on the weather, and

wherein the controlling of a point heating (107) in step e) is carried out continuously in periodic temporal intervals until the respective set temperature of the railway point (3) is reached.

The invention is described in detail in the following:

If method characteristics are described in connection with the inventive system (1), these refer especially to the inventive method as defined in the following. If objectional characteristics of the inventive method are described, these refer especially to the inventive system (1) as described in the following.

The invention refers to a system (1) for weather data based temperature control of railway points (3), especially of the rails and movable linkages of railway points (3). It comprises a processing unit (101) connected to the weather data provider (W), at least one control unit (103) connected to the processing unit (101), at least one switching device (105) connected to the at least one control unit (103) and at least one point heating (107) connected to the switching device for at least one railway point (3).

The processing unit (101) thus is designed for calling of the weather data from the weather data provider (W) for at least one railway point (3), for analysing it and for defining a temporal course (T1) of optimal set temperatures for the at least one railway point (3). The processing unit (101) is designed to call this weather data continuously, i. e. in periodic temporal intervals. The control unit (103) is furthermore designed to control the at least one point heating (107) for the at least one railway point (3) on the basis of the temporal course (T1) defined by the pro-

cessing unit (101) via the at least one switching device (105). This controlling is conducted in periodic temporal intervals.

In the invention, “weather data provider” (W) means an external service provider which is the data source of the weather information. Such service provider like Meteomedia or DWD can provide weather information needs-based for retrieving via the internet or a web service.

The processing unit (101) represents the logical core component of the system (1). It is especially CPU-based.

The control unit (103) is the subordinate control. It controls the point heating (107), i. e. individual heating elements, respectively via the respective switching device (105) with the temporal course (t1) transmitted to it until the respective set temperature of the railway point (3), i. e. of the respective rail/s and linkages is reached. Furthermore, the control unit (103) takes the control of the respective switching devices (105) in case of failure of the data transmission (DFÜ) to the processing unit (101) until the respective set temperature of the railway point (3), i. e. of the respective rails is reached.

A semiconductor switching device with or without regulation and monitoring device is termed as switching device (105) in the present invention. This device receives the respectively intended set temperature for the railway point (3) from the control unit (103) based on the temporal course (T1). The switching device (105) then controls the heating elements independently. The controlling is realised alternatively by the control unit (103).

A point heating (107) according to the invention comprises essentially one or more heating elements which are mounted to the railway point (3) in appropriate manner, i. e. to the fix and movable rails and linkages for the movable rails as well as a control for the heating elements.

A railway point (3) comprises inventively all types of points like simple points, diamond points, three-way points etc. Besides railway points (3), the invention is also

applicable to other track systems like track barriers, signals, special track sections or railway crossings where the temperature control of the rails and their linkages is realised by convection and heat radiation of tubular heaters for example.

Compared to the state of the art wherein a point heating reacts immediately to the incoming of a heating command ("switching signal") by beginning of heating, the inventive system (1) has the advantage that it does not operate dependently on the incoming signal of a weather data evaluation but the railway point (3) controls the temperature proactively and needs-based and thus determines the resulting need of energy proactively.

For this purpose, the weather data is called continuously according to the invention, these weather data are analysed continuously and a temporal course (temperature schedule) is determined continuously by which the set temperature of the railway points (3) resp. their rails is updated continuously and dependently on the weather. An inventive advantage thus is the adaption of the set temperature to the actual and expected weather conditions and therefore an energy saving by possible low set temperatures in case of mild weather as well as an energy planning for weather to be expected in future.

In a further development of the invention, the system (1) furthermore comprises at least one weather data recording device (109) connected to the processing unit (101) for the at least one railway point (3). The processing unit (101) thus is additionally designed to compare the temporal course (t1) to the actual weather data on the at least one railway point (3) recorded and transmitted by the weather data recording device (109) and to define an updated temporal course (T2) of optimal set temperatures for the at least one railway point (3). In addition, the control unit (103) is designed to control the at least one point heating (107) for the at least one railway point (3) by means of the at least one switching device (105) on the basis of the updated temporal course (T2) defined by the processing unit (101).

Sensor stations for the recording of air temperature, air humidity, amount of precipitation and precipitation type have to be part of the weather data recording device (109) according to the invention. This device transmits the recorded local

weather data via the control unit (103) to the processing unit (101). The recorded local weather data can be transmitted to the weather data provider (W), if desired. In this further development, the control unit (103) controls the point heating (107) respectively with the temporal course (T2) transmitted to it via the respective switching device (105) until the respective set temperature of the railway point (3) is reached. The switching device (105) receives the respectively intended set temperature for the railway point (3) from the control unit (103) on the basis of the temporal course (T2).

This further development has the advantage that the controlling of the point heating (107) for the at least one railway point (3) is controlled not only on the basis of the weather data, i. e. of forecasts but that actual weather data on site of the respective railway point (3) is considered for controlling.

The temporal course (T1) or the temporal course (T2) can also be termed as temperature schedules.

In one embodiment, the processing unit (101) forms a group level (G) and at least one control unit (103), at least one switching device (105) and at least one point heating (107) for at least one railway point (3) form a field level (F). The group level (G) provides an ideal place for the processing unit (101) whereas the field level (F) comprises the facilities which are arranged more or less directly next to the railway point (3).

Due to this, the calling of weather data, their analysis und the determining of the temporal course (T1) or of the temporal course (T2) can be separated clearly from the controlling of the point heating (107) on the one hand and several systems in field level (F) can be controlled by one group level (G) on the other hand.

The local separation of the group level (G) and the field level (F) has proven advantageously so the processing unit (101) can be replaced or revised problem-free in the group level (G) in a further development of the processing unit (101) without the need to access the field level (F) which is located further away.

The group level (G) and the field level (F) are not arranged locally separated in an alternative embodiment but are located relatively near. In some cases, the group level (G) and the field level (F) can be locally together.

The afore-presented embodiments enable the group level (G) to be connected with one, two or more field levels (F). Several point heatings (107) thus can be controlled by only one processing unit (101) via the respective switching devices (105).

The at least one field level (F) can be connected to the group level (G) via data transmission (DFÜ). The temporal course (T1) or the temporal course (T2) as well as the weather data of the weather data recording device (109) are transmitted to the control unit (103) in this way where it is processed consecutively time-controlled.

The processing unit (101) can also be connected to the weather data provider (W) via data transmission (DFÜ). The data source of the weather data provider (W) is located preferably in the internet so that an access for the processing unit (101) is created in the group level (G), e. g. by a UMTS/GSM modem or a DSL connection.

The aforementioned embodiments and preferations considering the inventive system (1) value respectively for the below described inventive method. The hereinafter described embodiments and preferations considering the inventive method also value respectively for the inventive system (1).

The invention refers to a method for weather data based temperature control for railway points (3) in a second aspect, The method comprises step a) calling of weather data via a processing unit (101). In step b), the called weather data is analysed by means of an algorithmic process by maintaining a temporal course (T1) of optimal set temperatures for the at least one railway point (3). A step d) forms the defining and providing of the temporal course to a control unit (103) which is assigned the at least one railway point (3). In a step e), a point heating (107) mounted to the at least one railway point (3) is controlled on the basis of the temporal course (T1) by means of the at least one switching device (105).

The weather data for at least one railway point (3) from a weather data provider (W) in step a) is called continuously, i. e. in periodic temporal intervals. By this, the consecutive steps b), d) and e) as well as possibly c) are also conducted continuously, i. e. in periodic temporal intervals.

Essentially, the inventive method has the same advantages as the inventive system. Furthermore, the inventive method does not operate with fixed scenarios as it is done the state of the art, for example if the command “Heating now for scenario A” is given in DE 197 42 085 B4. The inventive method rather operates floatingly according to the weather constellation and, considering the probability of this constellation, determines a timeline of temperature data which is important for safe functioning of the railway point (3) at optimal energy use, i. e. a temperature schedule is created. This data is transmitted once to the control unit (103) after calculation. No weather data is transmitted to the point heating (107) as in the state of the art.

A further development of the inventive method comprises furthermore a step c) between step b) and step d) wherein the temporal course (T1) is compared to the actual weather data at the at least one railway point (3) which is transmitted by a weather data recording device (109) maintaining an updated temporal course (T2) of optimal set temperatures for the at least one railway point (3). Thereby, the updated temporal course (T2) is given to the control unit (103) in step d) and the point heating (107) mounted to the at least one railway point (3) is controlled by means of the at least one switching device (105) based on the updated temporal course (T2).

This further development has the advantage that the controlling of the point heating (107) for the at least one railway point (3) is not only controlled on the basis of weather data, i. e. forecasts, but actual weather data on site of the respective railway point (3) is used for the controlling.

For an optimal controlling of the point heating (107), it has proven advantageously when the calling of weather data in definable time intervals and the method in step

a) are conducted again. By this, the controlling of the point heating (107) can be adjusted recently to changing weather conditions.

The definable time intervals can be adjusted to the external conditions of the railway point (3) and be between 5 minutes and 5 hours, preferably 15 minutes and 2 hours, especially between 30 minutes and 1 hour. The definable time intervals can thereby be adjusted to the recent weather situation so that e. g. in case of calm weather enduring for long time periods, the time intervals can be lengthened and in case of changing weather situations, the time intervals can be shortened.

It is preferred that the weather data includes the parameters air temperature, amount of precipitation, precipitation probability, dew point and/or sunshine duration.

The energy need for one or more future time periods is determined from the weather data and the temporal course (T2) and transmitted to the point heating (107) in another further embodiment of the inventive method. This enables a forecast and planning of the required energy consumption for a special time period by determining the energy need for a defined time period in the processing unit (101) for the environmental conditions to be expected and the determined temporal course of the set rail temperature.

Further goals, characteristics, advantages and application possibilities result from the following description of examples of embodiments not limiting the invention by means of the figure. All characteristics described and/or represented in figures thereby represent the subject-matter of the invention for themselves or in any combination, also independent from their summary in the claims or their references. It shows:

Fig. 1 a scheme of the inventive system 1 according to one embodiment of the invention.

A preferred embodiment of the invention is described with the scheme in Fig. 1. The inventive system 1 thereby can be divided basically into three levels: the weather data provider W, the group level G and the field level F.

The weather data provider W represents the data source of the weather information. An external service provider like Meteomedia or DWD provides needs-based weather information for retrieving via the internet or a web service.

The data transmission DFÜ via the internet provides the communication between the weather data provider W and the processing unit 101 (for example an industrial PC) operational for evaluation. Since the data source is in the internet in this embodiment, an access to the internet has to be provided. This can be realised for example via a UMTS/GSM modem or a DSL connection.

The group level G is separated locally from the field level F in this embodiment and is the ideal location for the processing unit 101 for weather data evaluation. The processing unit 101 can be termed as the logical core component of the weather data based point heating. It calls the weather information actively from the weather data provider W and analyses this considering the probability by an algorithmic method. The result by this algorithmic analysis is a temporal course T1 (i. e. a temperature schedule) of phased optimal set rail temperature per point heating 107 which is connected to this processing unit 101.

In case of a low probability, the calculated set rail temperature is for example -10 °C so that heating is not necessary at the moment. If the probability increases to 90 % in this case, a set rail temperature of +5 °C is calculated and defined. The rail set temperatures in-between correlate respectively with the probability.

The data transmission DFÜ between group level G and field level F transmits the provided temporal course T1 to the control unit 103 of the point heating 107 where it is then processed time-controlled.

The field level includes the control unit 103 and the switching device 105 for the point heating 107.

The control unit 103 compares the temporal course T1 transmitted to it to the actual weather data and controls the heating elements of the point heating 107 respectively by means of the switching device 105 until the respective set temperature of the rail/s of the railway point 3 is reached.

The switching device 105 receives the respectively intended set temperature of the railway point 3 from the control unit 103. The system 1 then controls the heating elements independently until the respective rail temperature is reached.

In one practical embodiment, the weather data provider W provides recently calculated weather data in periodic intervals, for example each hour, for the geographical coordinate of a special railway point 3 and makes it accessible via a web service. Thereby, especially the parameters air temperature, amount of precipitation, precipitation probability, dew point and sunshine duration are included.

The inventive system 1 is controlled by a time interval adjustable in the processing unit 101 for the data calling of the weather data from the weather data provider W. The weather data provider W is enquired in these periodic intervals and the recently provided weather data is transmitted to the system 1 via a data transmission DFÜ, especially via an internet connection. The enquiry includes the geographical coordinate of the railway point 3 with a point heating 107 which is stored in the system 1. The position of the system 1 is transmitted to the weather data provider by means of the geographical coordinate and the weather data dependent on the location is provided.

This data is evaluated by a defined algorithm after it has been transmitted to the processing unit 101. The data itself is transmitted from the data source (weather data provider W) to the system 1 into the group level G in a time series model. The raw data can be as follows and packed into an adequate data format like XML for transport.

The data “temperature” and “precipitation probability” and “precipitation type” and “amount of precipitation” are listed in Table 1 only as examples for a multiple of data. The algorithm of the evaluation defines which data is used for the evaluation.

Table 1 “Weather data from the data source”

Time stamp	Temperature	Precipitation probability	Precipitation type	Amount of precipitation
11.02.2014 12:30 pm	1 °C	0 %	none	0
11.02.2014 1:00 pm	-2 °C	50 %	rain	0
11.02.2014 1:30 pm	-2 °C	90 %	rain	3 mm/h
11.02.2014 2:00 pm	-2 °C	90 %	rain	7 mm/h
11.02.2014 2:30 pm	-5 °C	90 %	snow	1 cm/h
11.02.2014 3:00 pm	-5 °C	90 %	snow	6 cm/h

The system 1 generates a temporal course T1 from the weather data by considering the provided algorithm and the recent data of a weather data recording device 109, i. e. a temperature schedule of the set temperature of the railway point 3. Here, the weather data of the weather data provider W is completed by the local weather data and corrected to a temporal course T2. This temporal course T2 can be as follows in table 2:

Table 2 “Temperature schedule”

Time stamp	Set rail temperature
11.02.2014 12:30 pm	-99 °C
11.02.2014 1:00 pm	-99 °C
11.02.2014 1:30 pm	0 °C
11.02.2014 2:00 pm	1 °C
11.02.2014 2:30 pm	3 °C
11.02.2014 3:00 pm	6 °C

This temperature schedule of the rail temperature is subsequently transmitted to the control unit 103 via the DFÜ connection. The control unit 103 receives the temperature schedule and replaces a possibly already present older temperature schedule by the new temperature data. Since the control unit 103 has its own clock, it can process the temperature schedule respectively. Referring to the data

in the example table “Temperature schedule”, this means that on the 11th February in 2014 (as random example date) at 12:30 pm a set temperature of the point of -99 °C is sufficient and that the point has to be kept at that temperature level from this time on. -99 °C stands for the status that no heating is required. From the 11th February in 2014 at 1:30 pm on, another temperature is valid. The switching device 105 is now instructed to keep the rail temperature respectively on 0 °C.

The controlling of the point heating 107 according to the weather data of the weather data provider W represents a risk when the weather data is wrong due to wrong location configuration or wrong or missing weather data and the control unit 103 has no specification for controlling. In this case, the set rail temperature is wrong and the point can freeze or is heated with too much energy. Thus, it is always advantageously to maintain the local weather based controlling which is referred to when the weather forecast based temperature specifications are too disadvantageously for the point.

The inventive system 1 is generally protected against the failure of the weather forecast based controlling. If the process chain fails, the local controlling of the control unit 103 takes the control as usually. The control unit 103 also sends an error message to the processing unit 101 which points out that the weather forecast based control has failed. It may happen that weather data is transmitted belatedly due to shortages or errors at the weather data provider W or problems with the internet. The system 1 has the possibility of overlapping of the weather data for the next hours, i. e. a prognosis horizon. For this time period which can be extended to several days, the temperature schedule of the railway point 3 is provided and then processed by the control unit 103.

Due to the fact that the inventive system 1 receives weather data for the recent location of the point from a weather data provider W and that it can evaluate these data, the system sends the information to the control of the point heating 107 that proactive heating of the railway point 3 is required as soon as a condition for heating occurs. As a result, the railway point 3 is preheated needs-based and for example, will not be supercooled and therefore freeze in case of extreme weather situations.

Perspectively, further proactive behaviour patterns of this control can be added and thus be improved regularly.

Reference Signs

1	system
3	railway point
101	processing unit
103	control unit
105	switching device
107	point heating
109	weather data recording device
W	weather data provider
G	group level
F	field level
DFÜ	data transmission

PATENTKRAV

1. System (1) til vejrdatastøttet opvarmning af jernbanesporskifter (3), omfattende:

- en med en vejrdataudbyder (W) forbundet regneenhed (101), der er indrettet til med forudbestemte tidsintervaller at anmode vejrdataudbyderen (W) om vejrdata for mindst ét jernbanesporskifte (3),
- mindst én med regneenheden (101) forbundet styreenhed (103),
- mindst ét med den mindst ene styreenhed (103) forbundet skifteudstyr (105), og
- mindst én med skifteudstyret (105) forbundet sporskiftevarmer (107) til mindst ét jernbanesporskifte (3),

kendetegnet ved,

at regneenheden (101) er indrettet til løbende at hente vejrdataene for mindst ét jernbanesporskifte (3), løbende at analysere og løbende angive et tidsforløb (T1) for optimale måltemperaturer for det mindst ene jernbanesporskifte (3), hvorved der fortløbende og vejrafhængigt sker en opdatering af måltemperaturen af jernbanesporskiftet (3), og

at styreenheden (103) er udformet således, at den på grundlag af de fra regneenheden (101) angivne tidsforløb (T1) og ved hjælp af det mindst ene skifteudstyr (105) regulerer den mindst ene sporskiftevarmer (107) for det mindst ene jernbanesporskifte (3) med regelmæssige tidsintervaller, indtil den passende måltemperatur af jernbanesporskiftet (3) er nået.

2. System (1) ifølge krav 1, yderligere omfattende

- mindst én med regneenheden (101) forbundet vejrregistreringsindretning (109) til det mindst ene jernbanesporskifte (3), hvor regneenheden (101) yderligere er udformet således, at det sammenligner tidsforløbet (T1) med faktiske vejrdata ved det mindst ene jernbanesporskifte (3), som måtte blive overført gennem vejrregistreringsindretningen (109), og et opdateret tidsforløb (T2) med optimale måltemperaturer for det mindst ene jernbanesporskifte (3), og

hvor styreenheden (103) er udformet til, på grundlag af det fra regneenheden (101) angivne, opdaterede tidsforløb (T2) ved hjælp af det mindst ene skifteudstyr (105) at regulere den mindst ene sporskiftevarmer (107) til det mindst ene jernbanesporskifte (3).

3. System (1) ifølge krav 1 eller 2, hvor regneenheden (101) danner et gruppelederplan (G), og den mindst ene styreenhed (103), det mindst ene skifteudstyr (105) og den mindst ene sporskiftevarmer (107) for mindst ét jernbanesporskifte (3) danner i det mindste ét feltplan (F).

4. System (1) ifølge krav 3, hvor gruppelederplanet (G) og feltplanet (F) er anbragt lokalt i afstand fra hinanden eller ved siden af hinanden eller i en integreret enhed.

5. System (1) ifølge krav 3 eller 4, hvor gruppelederplanet (G) er forbundet med én, to eller flere feltplaner (F).

6. System (1) ifølge ét af kravene 3 til 5, hvor det mindst ene feltplan (F) ved hjælp af datafjernoverføring (DFÜ) er forbundet med gruppelederplanet (G).

7. Fremgangsmåde til vejrdatastøttet opvarmning af jernbanesporskifter (3), omfattende følgende trin:

a) anmodning om vejrdata for mindst ét jernbanesporskifte (3) fra en vejrdataudbyder (W) ved hjælp af en regneenhed (101), der er således indrettet, at den med forudbestemte tidsintervaller anmoder om vejrdata for mindst ét jernbanesporskifte (3) fra vejrdataudbyderen (W),

b) analyse af de indhentede vejrdata ved hjælp af en algoritmisk proces under fastholdelse af et tidsforløb (T1) af optimale måltemperaturer for det mindst ene jernbanesporskifte (3),

d) angivelse af tidsforløbet (T1) til en styreenhed (103), som er forbundet til det mindst ene jernbanesporskifte (3), og

e) regulering af en ved det mindst ene jernbanesporskifte (3) anbragt sporskiftevarmer (107) på basis af tidsforløbet (T1) ved hjælp af det mindst ene skifteudstyr (105),

kendetegnet ved,

at i trin a) bliver anmodningen om vejrdata løbende fornyet, og fremgangsmåden bliver gennemført på ny, hvorved i trin b) analysen af de bestilte vejrdata sker løbende i forudbestemte tidsintervaller, og hvorved i trin d) angivelsen af tidsforløb (T1) af vejrdata sker løbende med forudbestemte tidsintervaller, hvorved der fortløbende og vejrafhængigt sker en opdatering af jernbanesporskiftets (3)

måltemperatur, og at i trin e) sker reguleringen af en sporskiftsvarmer (107) med regelmæssige tidsafstande, indtil den passende måltemperatur af jernbanesporskiftet (3) er nået.

8. Fremgangsmåde ifølge krav 7, yderligere omfattende et trin

c) sammenligning af tidsforløbet (T1) med faktiske vejrdata ved det mindst ene jernbanesporskifte (3), som formidles gennem en vejrregistreringsindretning (109) under bevarelse af et opdateret tidsforløb (T2) for optimale måltemperaturer for det mindst ene jernbanesporskifte (3),

hvor i trin d) det opdaterede tidsforløb (T2) bliver afgivet til styreenheden (103), og hvor der i trin e) sker regulering af den ved det mindst ene jernbanesporskifte (3) anbragte sporskiftevarmer (107) på basis af det opdaterede tidsforløb (T2) ved hjælp af det mindst ene skifteudstyr 105).

9. Fremgangsmåde ifølge et af kravene 7 eller 8, hvor vejrdataene omfatter parametrene lufttemperatur, nedbørsmængde, nedbørssandsynlighed, dugpunkt og/eller solskinsvarighed.

10. Fremgangsmåde ifølge et af kravene 7 til 9, hvor der ud fra vejrdataene og tidsforløbet (T2) beregnes energibehovet til ét eller flere efterfølgende tidsrum, og dette overføres til sporskiftevarmeren (107).

Fig. 1