(19) DANMARK

(10) DK/EP 3774268 T3

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: ***B 29 C 45/76 (2006.01)***

(45) Oversættelsen bekendtgjort den: **2022-01-24**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2021-11-03**

(86) Europæisk ansøgning nr.: **20732847.7**

(86) Europæisk indleveringsdag: **2020-06-12**

(87) Den europæiske ansøgnings publiceringsdag: **2021-02-17**

(86) International ansøgning nr.: **EP2020066252**

(87) Internationalt publikationsnr.: **WO2020254196**

(30) Prioritet: **2019-06-19 DE 102019208937**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(73) Patenthaver: **Arburg GmbH + Co KG, Arthur-Hehl-Strasse, 72290 Lossburg, Tyskland**

(72) Opfinder: **DUFFNER, Eberhard, , 72181 Starzach, Tyskland**

(74) Fuldmægtig i Danmark: **Patrade A/S, Ceresbyen 75, 8000 Århus C, Danmark**

(54) Benævnelse: **FREMGANGSMÅDE TIL TILVEJEBRINGELSE AF ET DRIFTSSYSTEM TIL EN MASKINSTYRING**

(56) Fremdragne publikationer:
EP-A2- 1 297 941

Description

The invention relates to a method for providing an operating system of a machine control system for an injection moulding machine for processing plastics and other plasticisable masses, on a target system which is independent of the injection moulding machine, having the features of claim 1.

Where, in the context of this invention, mention is made of an “executable settings dataset”, this refers to a dataset of settings data with which an injection moulding machine can be operated for the production of injection moulded parts, typically without the need for a further intervention by a user.

The expression “converted operating system information” should be understood in the context of this application to be information concerning an operating system which is adapted to a particular target system. The operating system of an injection moulding machine, for example, is merely a code which, by means of the reading in of the specific machine configuration data, becomes the specific machine.

A “digital twin” should be understood in the context of this application to be a digital copy of a real machine, for example, an injection moulding machine. The digital twin has all the properties, specifications and settings possibilities of the real machine. The digital twin is preferably one-to-one from the operating system code, which by means of exactly the same configuration data is executable on another target operating system, for example, by means of an app.

From EP 1 297 941 A2, there is known a method according to the preamble of claim 1 for providing an operating system of a machine control system for an injection moulding machine for processing plastics and other plasticisable masses making use of a virtual model of the injection moulding machine .

From DE 10 2011 005 062 A1, a method is known for providing data of a field device by means of a cloud solution. The field device is arranged on an automation technology network and is connected to other field devices via a data bus. The field devices communicate at least with a server of a service provider so that a preconfigured dataset can be augmented with customer-specific and/or user-specific data. A dataset extended with the additional data is then made available to a remotely located client.

In the field of plastics injection moulding machines, a method for the interactive control of a machine is known from EP 0 573 912 B1, wherein in a data processing unit, a basic knowledge set and a dataset relating to the fundamental rules of the operation of an injection moulding machine are fed in. By means of a sequence editor, a machine operation can be generated, wherein the machine checks each input for plausibility and makes interactive proposals for the augmentation of the already existing sequence.

A device for processing plastics is disclosed in DE 10 2004 041 891 B3. The device has recording means which record the raw material supply or are provided on the forming unit and/or the plasticiser unit and serve for recording process and/or material parameters. Through evaluating means, data of the recording means can be determined with regard to the expected production duration and/or the expected production costs. A control apparatus for controlling the material feed apparatus can be configured as the end device (client) and can be connected to a data network, by means of which different data services are made available. It is also possible to modify parameters of a production process by means of the data services of the control apparatus.

In WO 2006/098451 A1, a method for controlling and operating a production cell for producing plastics injection moulded parts is disclosed. Therein, machine processes are formed on the basis of functionally complete components which together form a domain model, created, administered and executed with the aid of a domain language. A particular component can thus be programmed component-oriented and/or command-oriented. For example, the components of the moulding tool can thus be programmed through the commands Open and Close.

CH 705456 A1 discloses a computerised machine control system which comprises an application-independent, machine-specific part and an application-specific, machine-independent part. By this means, a better integration of machines from different manufacturers can be realised.

A device and a method for controlling and for operating a production cell are disclosed in US 2012/0185077 A1. Machine processes that are based upon machine control components are created, administered and executed with the aid of a domain language. For a free configurability of machine control components, it is proposed to

select a machine control component from a set of pre-determined component types and to assign to a machine control component a permissible technology from a set of technologies, wherein for each technology of a component type, a logic is stored which comprises and defines the interfaces required for the machine control component and the technology.

Proceeding from this prior art, it is an object of the present invention to make available to a processor a copy of a machine control system, so that settings data can be created or modified independently of the injection moulding machine, manufacturer data being referred to if necessary. .

This object is achieved with a method for providing an operating system of a machine control system having the features of claim 1. Advantageous developments are the subject matter of the dependent claims. The features individually set out in the claims are combinable with one another in a technically meaningful manner and can be supplemented with explanatory facts from the description and details from the Figures, wherein further embodiments of the invention are disclosed.

According to the method, information relating to an operating system of a machine control system of an injection moulding machine is provided, said operating system already being configurable or adaptable by means of configuration data to a first injection moulding machine. This operating system can then be used with all the configuration data as a digital twin on a target system, making use of a hardware-independent app for converting the information to the target system. Since the machine control software is, in and of itself, already configured on the machine control system of the injection moulding machine to the properties of the physically existing machine, with the preferably identical configuration file from the machine control system which is adapted bidirectionally converted to the target system, it is possible to work on the target system with the control screen of the real machine. In this way, datasets and, in particular, settings datasets can preferably be originally created offline or existing settings datasets can be modified there. An executable settings dataset created in this way is then transferred from the target system to the injection moulding machine, whereby again an adaptation for the operating system of the machine control system takes place by means of a hardware-independent app.

The further settings dataset thus created then usually enables an immediate operation of the injection moulding machine.

Preferably, the digital twin is operated on the target system offline from the first injection moulding machine and/or as a platform solution in the cloud, so that the injection moulding machine can be further operated independently. It is possible simultaneously to prepare the injection moulding machine for the production of new injection moulding parts and also to check whether the injection moulding machine is at all suitable for the production of the next job. In this way, the suitability of the injection moulding machine can be checked in advance of an current production, so that down times can be reduced.

Preferably, the target system also receives product information relating to a product to be produced on an injection moulding machine, for which a specific calculation of a settings dataset can take place. The calculation takes place on a processor without a postprocessor and without a virtual model of the injection moulding machine, since due to the machine configuration and the data available locally or preferably at the manufacturer, all the information is available which enables an executable settings dataset to be generated for the respective injection moulding machine.

It is advantageous if an expert knowledge set is made available at least to the target system, but preferably also to the injection moulding machine, from which it is apparent which components and which configuration a machine configuration must have so that a settings dataset is also executable on the respective injection moulding machine. By this means, both faulty input and also the production of faulty parts can be prevented. At the same time, the run-up or starting phase at the start of production of a new injection moulded part is significantly reduced.

Additionally, in an advantageous manner, on the basis of the expert knowledge set and/or on the basis of the existing machine configuration on the respective injection moulding machine, it can be checked whether the further settings dataset is executable on the first injection moulding machine. For this purpose, sufficient information is available to the processor to enable such calculation and checking . If the result is that this is possible, the corresponding steps are carried out on the existing injection moulding machine. If, however, the result leads thereto that the processor ascertains that it is not possible on the injection moulding machine

provided for the production, then a necessary machine configuration is determined. In this case, according to the method, it is checked whether further injection moulding machines are available to the user and whether one of these injection moulding machines has a machine configuration required for the production. If this is the case, the production of the injection moulded part is passed to the identified other injection moulding machine. If no other injection moulding machine is identifiable, the user is notified accordingly. By means of this procedure, it is firstly possible to carry out production effectively wherever production is indeed possible and, secondly, the user can discover at an early stage whether production is at all possible at his plant. This has cost advantages and contributes to an effective production.

Preferably, in the context of the notification, the user also receives information concerning with which components the existing machine configuration can be adapted and reconfigured so that the settings dataset is also executable on the injection moulding machine. In other words, he receives information regarding how he can equip his injection moulding machine if needed, in order to ensure production. Precisely here, the advantage of an early advance calculation is clear since then reconfiguration measures are still possible if needed.

Advantageously, the machine configuration is identified by means of a key, a password or an identifier, which is preferably the machine number, towards the processor. Through this identifier, the current machine configuration is stored in a database which is available either locally at the user or externally, e.g. at the manufacturer. In this database, there is available the essential information, for example, configuration data of the injection moulding machine, knowledge data of an expert knowledge set, software functionality data of the operating system of the machine control system or of the injection moulding machine, which the user can access with the processor on creating further settings datasets. Precisely when information is preferably also accessible in a database at the manufacturer, the user can be comprehensively informed from there about which additional possibilities are available to him.

This is particularly advantageous if, in the database which is preferably a database at the manufacturer, the current equipment and machine configuration of a

respectively identifiable injection moulding machine is available and, furthermore, the further extension possibilities are also present there. For a comprehensible decision-making guide, it is also advantageous if there are stored in the database the history of the injection moulding machine in respect of its delivered state and later alterations, the service history with regard to service operations performed and/or datasets already created on the injection moulding machine which were executable for the production of products on the injection moulding machine. This information can be present optionally and also only partially. The same applies for the case that a plurality of injection moulding machines is present at a user, for the association and linking of these injection moulding machines. Such a database is then contacted by the processor for obtaining further information and/or for reconciling information in order to generate corresponding settings datasets and/or user information therefrom.

A reliable and updated calculation and support can take place, in particular, if the processor is associated with at least the database at the manufacturer or has access to a cloud solution, so that the method can preferably be carried out on the processor at the manufacturer. In this case, it is thus ensured that this information is indeed up to date and does not have to be updated, where relevant, by means of a remote access.

Preferably, the method can be further developed in that update information for an injection moulding machine is also accessible on the database, this relating, in particular, to updates relating to the machine configuration and a functional scope of the injection moulding machine possibly modified thereby. In this way, a new settings dataset can be made available for the injection moulding machine on the basis of the update information, which also makes it easier for the user, where relevant, to make his machine capable of operation for the respective product or, for example, more energy-efficient.

In an advantageous manner, a similarity assistant can be provided which preferably identifies anonymised similarities between already produced products and products to be produced as well as between machine configurations with which products have already been produced and are to be produced, specifically using injection moulding machines that are present at different users. With this, knowhow generated by different users together which supports a reliable production of injection moulded

parts can be accessed. For this purpose, the similarities identified are used for creating the at least one new, or modifying the at least one existing, settings dataset and/or for calculating the further settings dataset.

Further advantages are disclosed by the subclaims and the description below of preferred exemplary embodiments. The features set out individually in the claims are combinable with one another in a technologically useful manner and can be supplemented with explanatory facts from the description and with details from the drawings, whereby further embodiments of the invention are disclosed.

The invention is described in greater detail below, making reference to exemplary embodiments illustrated in the drawings, in which:

Fig. 1 shows a schematic representation of an injection moulding machine cooperating with a processor which has access to a database, if needed,

Fig. 2 shows a schematic representation of the processor and the information accessible to it,

Fig. 3 shows a schematic representation of a plurality of injection moulding machines connected to a local database,

Fig. 4 shows a flow diagram for the creation of an executable settings dataset,

Fig. 5 shows a modified method sequence with integrated executability checking.

Description of preferred exemplary embodiments

The invention will now be described in greater detail, using examples, making reference to the attached drawings. The exemplary embodiments are merely examples, however, which should not be regarded as restricting the inventive concept to a particular arrangement. Before the invention is described in detail, it should be noted that it is not restricted to the respective components of the device and the respective method steps, since these components and methods can vary. The expressions used here are intended only to describe particular embodiments and are not used restrictively. Furthermore, where the singular or the indefinite

article are used in the description or the claims, this relates also to a plurality of these elements, provided it is not clearly indicated otherwise in the overall context.

The Figures show a method that is suitable for providing an operating system B of a machine control system MS for an injection moulding machine SGM, SGM_1 for processing plastics and other plasticisable masses. The operating system B of the machine control system MS is thereby provided on a target system Z which is independent of the injection moulding machine, having a processor P. This is described below making reference to Fig. 1 in conjunction with Fig. 4.

According to the invention, in principle, it is to be made possible to use a copy of an operating system of a machine control system on any desired computer. This preferably identical copy is installed on a target system Z so that only the specific requirements for the display device and the input and output unit predetermined by the target system are adapted during the installation. For this purpose, the drivers that are specific for the target system Z and different from the machine control system MS are installed. For this, a hardware-independent app is provided for the operating system B of the machine control system MS (steps 102, 103). Similarly, information items relating to the operating system B of the machine control system MS of a first injection moulding machine SGM, SGM_1 are provided, said operating system being configurable or adaptable (step 101) by means of configuration data of a first machine configuration MK_1 to the properties of the first injection moulding machine SGM, SGM_1. In this way, the machine control system MS and/or its operating system B is in and of itself adapted to the properties of the actually available injection moulding machine.

With the preferably identical configuration file of the machine control system MS, possibly bidirectionally converted to the respective input and output units of the systems used and, in particular, of the target system Z preferably used offline, the machine control system MS thus also becomes a control copy in the form of a digital twin of the real machine (step 104).

On the target system Z, at least a new, further settings dataset ED_w can now be created or at least an existing settings dataset ED_I can be modified which is executable for producing injection moulded parts on the injection moulding machine SGM, SGM1 (step 105). This is shown in Fig. 1, in which the injection moulding

machine SGM at bottom centre in Fig. 1 is connected to the processor P of the target system Z. From there, the executable settings dataset ED_I can be used in order to generate a further settings dataset ED_W and possibly to return it to the injection moulding machine. For this purpose, the further settings datasets ED_W created or modified on the target system Z are transferred to the first injection moulding machine SGM, SGM_1 (step 106). There, the injection moulding machine can be operated (step 107) with the dataset ED_W created or modified on the target system.

Preferably, the digital twin of the machine control system MS can be operated on the target system Z offline from the first injection moulding machine SGM, SGM1 and/or on the target system as a platform solution in the cloud. In particular, for this purpose, an identification is possibly required using an identifier Ident. While during local operation of the machine according to the method, the machine can be identified by the machine number, and the associated data are present on a local server, a customer identifies himself in a cloud solution by means of a key or a password assigned to the customer. In each case, the respective datasets are transportable and are tested as system files for the respective machine in the context of the processing.

According to the method, a first settings dataset ED_I that is executable on the first injection moulding machine is transferred to the target system Z, wherein at this time point, information items relating to the operating system B of the machine control system MS (steps 101, 112 in Fig. 5) are already present. Additionally, product information items PI according to Fig. 1 and Fig. 5 (step 113) are provided relating to a product to be produced as an injection moulded part on an injection moulding machine. Using the information relating to the first machine configuration MK_1 and the settings dataset ED_I that is executable on the injection moulding machine, a further settings dataset ED_W for producing the product to be produced is now calculated (step 114), wherein the calculation according to Fig. 1 takes place on a processor P. For this purpose, neither a postprocessor nor a virtual model of the injection moulding machine is needed.

Subsequently, the further settings dataset calculated on the digital twin is transferred to the first injection moulding machine SGM_1 or at least one other injection moulding machine SGM, SGM_2, …, SGM_x, as set out for the last case illustrated in Fig. 3. The

respective injection moulding machine can thus be operated with the further settings dataset ED_w for producing the product to be produced.

Figs. 1 and 2 show that, if relevant, an expert knowledge set K is provided. This expert knowledge set K contains information regarding which components and which configuration a machine configuration MK must have so that a further settings dataset ED_w is or will be executable on an injection moulding machine.

It is advantageous if at this time point, i.e. after the provision of the settings dataset and possibly also on the basis of the expert knowledge set K, it is checked whether the further settings dataset ED_w is at all executable (step 115) on the first injection moulding machine SGM_1. If this is the case, the respective injection moulding machine SGM_1 can obtain the settings dataset ED_w and can thus also be operated (steps 116, 122).

If, however, this is not the case, the processor is capable, on the basis of the information provided to it, to determine a machine configuration MK_n (step 117) for the production of an injection moulded part to be produced. In this case, in the next step, it is enquired firstly whether a plurality of injection moulding machines is available at a user in order to ascertain whether a required machine configuration MK_n is present at another injection moulding machine $SGM_2, \ldots, SGM_x$ at the user. If this is the case, the injection moulded part to be produced can be operated on the identified other injection moulding machine with the further settings dataset ED_w. If, therefore, another suitable machine can be identified in step 118, the settings dataset according to step 119 is transferred to the identified injection moulding machine and this can be operated accordingly as per step 122. If no other injection moulding machine is identified, the user is notified accordingly.

This notification has the advantage for the user that he is now informed that the product cannot be produced at the moment on his injection moulding machine. In this way, action can be taken in good time to initiate corresponding reconfiguration work or for alternatives to be considered. Preferably, the notification of the user includes information concerning with which components the machine configuration MK_1, MK can be adapted and reconfigured so that the further settings dataset ED_w is executable on the injection moulding machine (step 120). In principle, the user

receives information therewith regarding how he can reconfigure his machines so that a production of the injection moulded part to be produced becomes possible. If the injection moulding machine has been reconfigured accordingly, then the new settings database ED_n can be transferred to the correspondingly reconfigured injection moulding machine SGM_n (step 121) and the injection moulding machine can be operated accordingly (step 122).

According to Fig. 1, the machine configuration MK_1, MK of an injection moulding machine SGM, SGM_1 is preferably identified towards the processor P by means of an identifier Ident which is preferably the machine number or a password or key known to the user in such a way that an access to the current machine configuration in a database DB is provided. This database contains at least the following information:

- configuration data of a machine configuration MK, MK_1, MK_w, MK_2, …, MK_x
- knowledge data of an expert knowledge set K,
- software functionality data of the operating system B of the machine control system MS or the injection moulding machine.

As shown at the top in Fig. 1, this database also has further information since preferably in this database which is particularly preferably a database at the manufacturer, the following information is available to access:

- current equipment E and machine configuration MK of a respective injection moulding machine identifiable with the identifier Ident,
- information regarding further extension possibilities M of the equipment E as well as the machine configuration MK of the respective identifiable injection moulding machine.

Optionally, the following information can also be present at least partially in the database DB:

- a history H of the identifiable injection moulding machine with regard to the delivery status and later reconfigurations undertaken since delivery,
- a service history WH relating to service operations undertaken,
- information relating to datasets D already created on the injection moulding machine in the past which were executable on the injection moulding machine for the production of injection moulded parts,

- if a plurality of injection moulding machines is operated at the user, an association and linking of this plurality of injection moulding machines to one another.

Preferably, the processor P can contact the database DB to receive further information and/or for reconciliation information, in particular if what is required is to create a correspondingly adapted further settings dataset ED_w.

It is also advantageous if the database DB shown at top in Fig. 1 is present externally, that is, for example at the manufacturer and an association of the processor P with this database DB takes place. In this case, the method can also be carried out on a processor P at the manufacturer. The data can be provided to the user in any desired manner, whereby access via an app, via the Internet or a cloud-based solution are conceivable.

If a plurality of injection moulding machines is available at the user, then it is also possible to determine a preselection of machines that are suitable for the further settings dataset ED_w and also to condition these accordingly. This provides the possibility of creating operational planning for the user in order to be able to produce high value injection moulded parts as efficiently and effectively as possible in a time-optimised manner.

With all this information, the processor P is capable, in accordance with Fig. 2, given the existence of an execution-capable settings dataset ED_I with an expert knowledge set K relating to possible machine configurations and settings datasets, to propose a new machine configuration MK_n and to generate a further settings dataset ED_w. Similarly, however, the processor P is also capable, without knowledge of an existing settings dataset ED_I, of generating a new settings dataset ED_n.

In addition, update information for an injection moulding machine can be provided on the database DB, this update information comprising, in particular, updates for the machine configuration MK and a thereby modified functional scope of the injection moulding machine. It is thereby possible, for example, to provide a new settings dataset ED_n which can be, or at least could be, executed on the injection moulding machine on the basis of the update information. This gives the user the possibility of informing himself regarding with which update he can, where relevant, operate his machine still more efficiently.

With the database DB, in particular, if it is provided at the manufacturer, similarities can also be identified by means of the similarity assistant SA shown on the right side in Fig. 1. For this purpose, anonymised similarities between already produced products and products to be produced are preferably also made available, such as similarities between machine configurations MK with which products have already been produced, and machine configurations with which products are to be produced. This takes place using injection moulding machines SGM which are preferably present with different users, in order thereby to make an information pool usable. The similarities identified are then used to create the at least one new, or to modify the at least one existing, settings dataset ED_I and/or to calculate the further settings dataset ED_W.

Reference signs

B	Operating system
D	Datasets
DB	Database
DB lokal	Local database
E	Equipment
ED_l	Executable settings dataset
ED_w	Further settings dataset
ED_n	New settings dataset
H	History
Ident	Identifier
K	Expert knowledge set
M	Modification possibilities
MS	Machine control system
MK	Machine configuration
MK_1	First machine configuration
MK_n	Required machine configuration
P	Processor
PI	Product information
SA	Similarity assistant
SGM	Injection moulding machine
SGM_1	First injection moulding machine
SGM_2, …, SGM_x	Further injection moulding machines
WH	Service history
Z	Target system

Patentkrav

1. Fremgangsmåde til tilvejebringelse af et driftssystem (B) til en maskinstyring for en sprøjtestøbemaskine (SGM, SGM_1) til forarbejdning af kunststoffer og andre plastificerbare masser,

kendetegnet ved, at tilvejebringelsen af informationer om driftssystemet (B) finder sted på et af sprøjtestøbemaskinen uafhængigt målsystem (Z) med en processor (P) og har følgende trin:

a) tilvejebringelse af informationer om et driftssystem (B) til en maskinstyring (MS) for en første sprøjtestøbemaskine (SGM, SGM_1), hvilket driftssystem ved hjælp af konfigurationsdata for en første maskinkonfiguration (MK_1) kan konfigureres eller tilpasses til den første sprøjtestøbemaskines (SGM, SGM_1) egenskaber,

b) tilvejebringelse af en hardware-uafhængig app for maskinstyringens (MS) driftssystem (B),

c) installering af driftssystemet (B) til maskinstyringen (MS) med alle konfigurationsdata som digital tvilling på målsystemet (Z) under anvendelse af den hardware-uafhængige app til konvertering af informationerne om maskinstyringens (MS) driftssystem (B) til målsystemet (Z), hvorved en konfigurationsfil for maskinstyringen med henblik på offline-oprettelse eller -ændring af indstillingsdatasæt bidirektionalt konverteret er tilpasset til målsystemet,

d) oprettelse på målsystemet (Z) af i det mindste et nyt eller ændring af i det mindste et bestående indstillingsdatasæt (ED_I) til fremstillingen af sprøjtestøbte dele, hvilket indstillingsdatasæt er eksekverbart på den første sprøjtestøbemaskine (SGM, SGM_1),

e) overførsel af et på målsystemet (Z) oprettet eller ændret yderligere indstillingsdatasæt (ED_W) til den første sprøjtestøbemaskine (SGM, SGM_1),

f) drift af den første sprøjtestøbemaskine (SGM, SGM_1) med det yderligere indstillingsdatasæt (ED_W).

2. Fremgangsmåde ifølge krav 1, hvorved den digitale tvilling drives på målsystemet offline fra den første sprøjtestøbemaskine (SGM, SGM_1) og/eller på målsystemet (Z) som platformsløsning i skyen.

3. Fremgangsmåde ifølge krav 1 eller 2, hvorved den endvidere omfatter trinene:

g) overførsel af det i det mindste ene på den første sprøjtestøbemaskine eksekverbare indstillingsdatasæt (ED_I) til målsystemet (Z),

h) tilvejebringelse af produktinformationer (PI) om et produkt, der skal fremstilles på en sprøjtestøbemaskine som sprøjtestøbt del, til målsystemet (Z),

i) beregning af det yderligere indstillingsdatasæt (ED_W) til fremstilling af det produkt, der skal fremstilles, under anvendelse af informationen om den første maskinkonfiguration (MK_1) samt af det på sprøjtestøbemaskinen eksekverbare indstillingsdatasæt (ED_I) på målsystemet (Z), hvorved beregningen sker på en processor (P) uden en postprocessor og uden en virtuel model af sprøjtestøbemaskinen,

j) overførsel af det yderligere indstillingsdatasæt (ED_W) fra målsystemet (Z) til den første sprøjtestøbemaskine (SGM_1) eller i det mindste en anden sprøjtestøbemaskine (SGM, SGM_2,...SGM_X),

k) drift af den første sprøjtestøbemaskine (SGM1) eller en anden sprøjtestøbemaskine med det yderligere indstillingsdatasæt (ED_W) til fremstilling af det produkt, der skal fremstilles.

4. Fremgangsmåde ifølge et af de foregående krav, hvorved den omfatter følgende yderligere trin:

- tilvejebringelse af en ekspertviden (K) om, hvilke komponenter og hvilken konfiguration en maskinkonfiguration (MK) skal have, for at det yderligere indstillingsdatasæt (ED_W) er eksekverbart på en sprøjtestøbemaskine.

5. Fremgangsmåde ifølge et af kravene 3 eller 4, hvorved den omfatter følgende yderligere trin:

- kontrol ifølge trin (i) i krav 3 på grundlag af ekspertvidenen (K) og/eller på grundlag af den på den respektive sprøjtestøbemaskine bestående maskinkonfiguration (MK) af, om det yderligere indstillingsdatasæt (ED_W) er eksekverbart på den første sprøjtestøbemaskine (SGM_1),
- hvis ja, gennemførelse af trinene (j) og (k),
- hvis nej, bestemmelse af en nødvendig maskinkonfiguration (MK_n),
- hvis der hos en bruger findes flere sprøjtestøbemaskiner, konstatering af, om der findes en nødvendig maskinkonfiguration (MK_n) på en anden af de hos brugeren eksisterende sprøjtestøbemaskiner (SGM_2,...,SGM_X), og overførsel

af det yderligere indstillingsdatasæt (ED_w) til den konstaterede anden sprøjtestøbemaskine,

- hvis der ikke kan konstateres en anden sprøjtestøbemaskine, underrettes brugeren.

6. Fremgangsmåde ifølge krav 5, hvorved underretningen af brugeren indeholder informationer om, med hvilke komponenter maskinkonfigurationen (MK_1; MK) kan tilpasses og ombygges sådan, at det yderligere indstillingsdatasæt (ED_w) er eksekverbart på sprøjtestøbemaskinen.

7. Fremgangsmåde ifølge et af de foregående krav, **kendetegnet ved, at** en sprøjtestøbemaskines (SGM, SGM_1) maskinkonfiguration (MK_1; MK) i retning mod processoren (P) identificeres via en identifikation (Ident), fortrinsvis via det maskinnummer, under hvilket den aktuelle maskinkonfiguration er deponeret i en database (DB), i hvilken i det mindste en af de følgende informationer er indeholdt: konfigurationsdata, vidensdata fra en ekspertviden (K), softwarefunktionalitetsdata for driftssystemet (B) til maskinstyringen (MS) eller sprøjtestøbemaskinen (SGM, SGM_1).

8. Fremgangsmåde ifølge et af de foregående krav med trinene:

- tilvejebringelse af en database (DB), fortrinsvis en database hos producenten, i hvilken der er indeholdt følgende informationer:
- aktuelt udstyr (E) og maskinkonfiguration (MK) for en respektiv, identificerbar sprøjtestøbemaskine,
- yderligere udvidelsesmuligheder (M) for udstyret (E) og maskinkonfigurationen (MK) for den respektive, identificerbare sprøjtestøbemaskine,

og er indeholdt følgende informationer optionalt som helhed eller delvist:

- den identificerbare sprøjtestøbemaskines historie (H) med henblik på leveringstilstand og senere ombygning,
- vedligeholdelseshistorie (WH) med henblik på foretagne vedligeholdelsesarbejder,
- på sprøjtestøbemaskinen allerede oprettede datasæt (D), der var eksekverbare for fremstillingen af produkter på sprøjtestøbemaskinen,
- hvis der findes flere sprøjtestøbemaskiner hos en bruger, tilordning og sammenkædning af disse flere sprøjtestøbemaskiner,

- processorens (P) kontaktering af databasen (DB) for at få yderligere informationer og/eller til afstemning af informationer.

9. Fremgangsmåde ifølge et af de foregående krav med trinene:
tilordning af processoren (P) til databasen (DB) hos producenten og gennemførelse af fremgangsmåden på processoren (P) hos producenten.

10. Fremgangsmåde ifølge et af kravene 3 til 9 med trinet:
hvis der findes flere sprøjtestøbemaskiner hos en bruger, bestemmelse af en forudgående udvælgelse på sprøjtestøbemaskiner, der er egnede til det yderligere indstillingsdatasæt (ED_W), ifølge trin (i) i krav 3.

11. Fremgangsmåde ifølge et af de foregående krav med trinene:
- tilvejebringelse af opdateringsinformationer for en sprøjtestøbemaskine på databasen (DB), hvorved opdateringsinformationerne især omfatter opdateringer for maskinkonfigurationen (MK) samt et derved ændret funktionsomfang på sprøjtestøbemaskinen,
- tilvejebringelse af et nyt indstillingsdatasæt (ED_n) for sprøjtestøbemaskinen på grundlag af opdateringsinformationerne.

12. Fremgangsmåde ifølge et af de foregående krav med trinene:
- tilvejebringelse af en lighedsassistent (SA) til konstatering af fortrinsvis anonymiserede ligheder mellem allerede fremstillede produkter og produkter, der skal fremstilles, og mellem de maskinkonfigurationer (MK), med hvilke produkter allerede er blevet fremstillet og skal fremstilles, ved hjælp af sprøjtestøbemaskiner (SGM), der findes hos forskellige brugere,
- anvendelse af de konstaterede ligheder til oprettelse af det i det mindste ene nye eller ændring af det i det mindste ene bestående indstillingsdatasæt (ED_I) henholdsvis til beregning af det yderligere indstillingsdatasæt (ED_W).

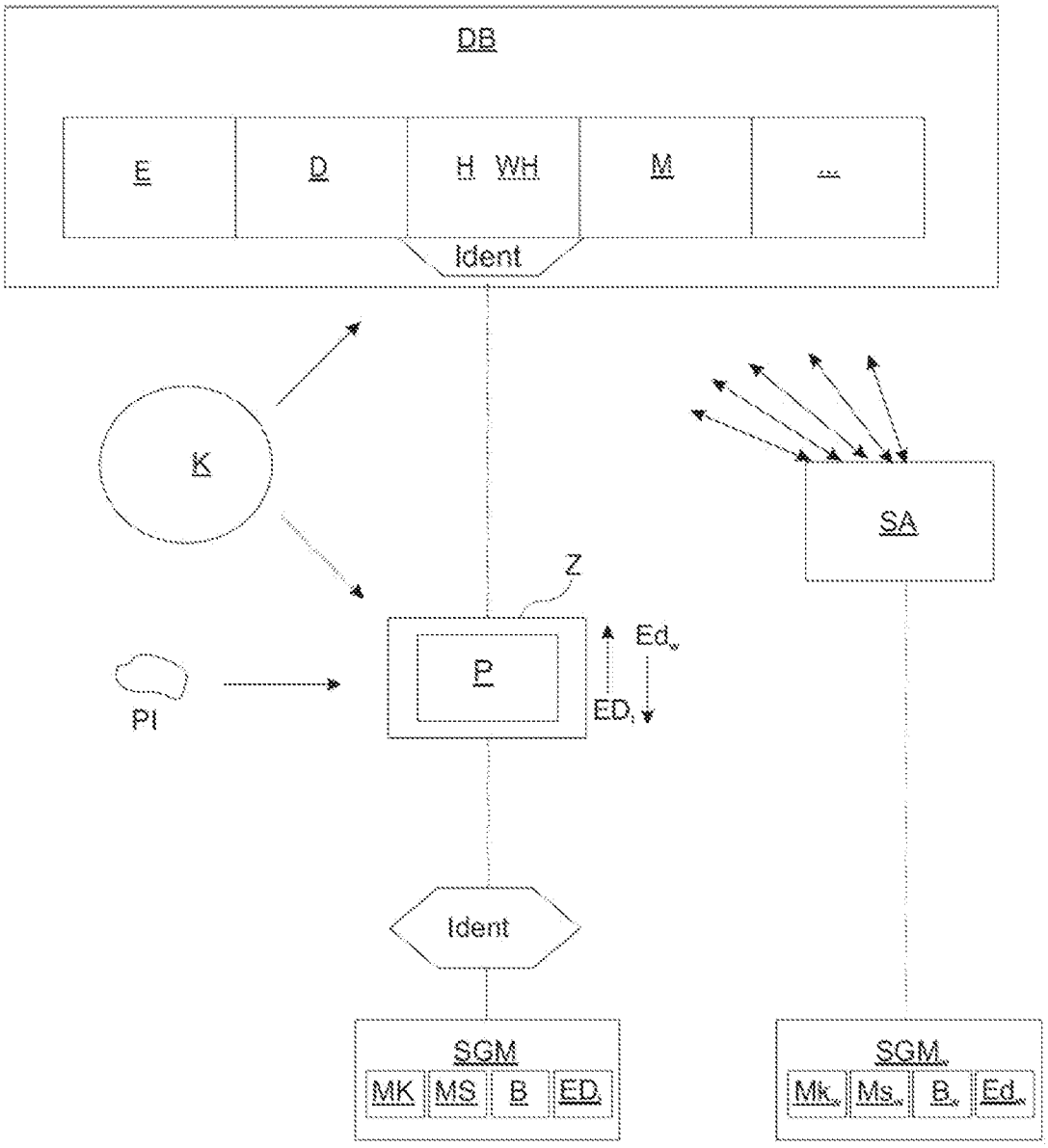

Fig. 1

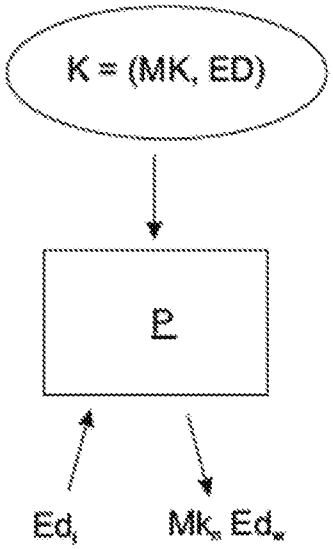
K = (MK, ED)
P
Ed1
Mk, Edn

Fig. 2

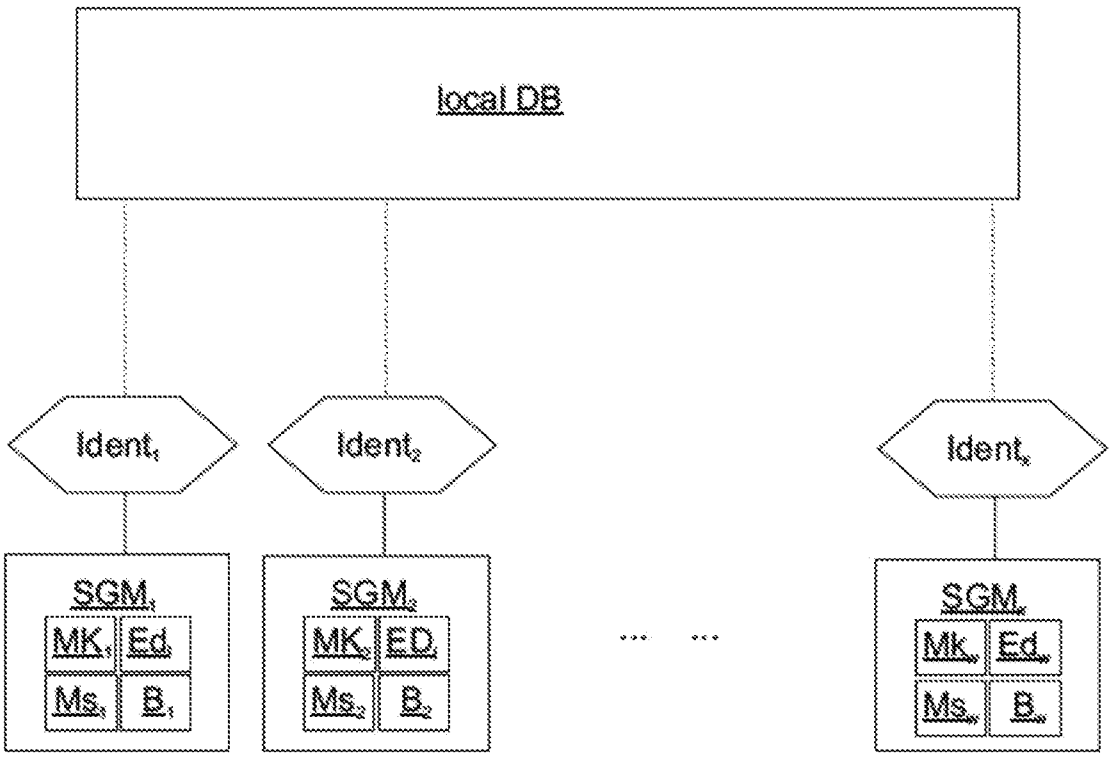
local DB
Ident1
Ident2
Identn
SGM1
MK1
Ed1
Ms1
B1
SGM2
MK2
ED2
Ms2
B2
... ...
SGMn
Mkn
Edn
Msn
Bn

Fig. 3

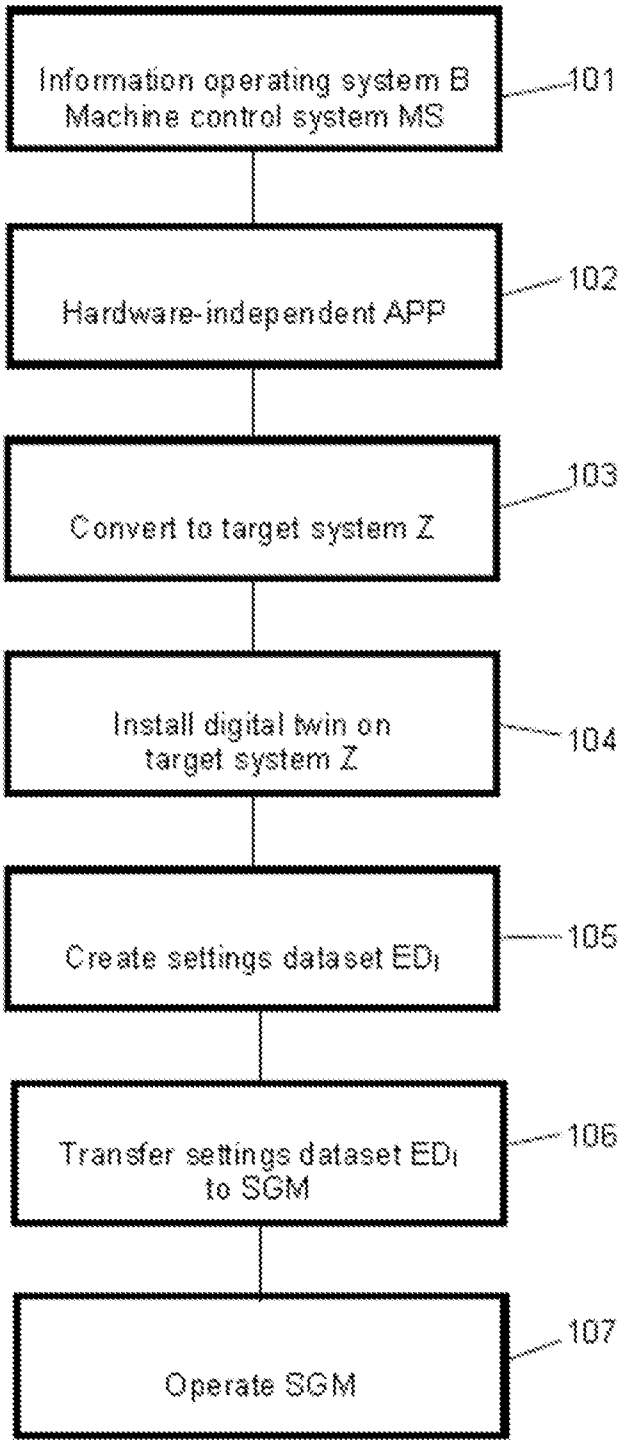
Information operating system B
Machine control system MS
101
Hardware-independent APP
102
Convert to target system Z
103
Install digital twin on
target system Z
104
Create settings dataset EDI
105
Transfer settings dataset EDI
to SGM
106
Operate SGM
107

Fig. 4

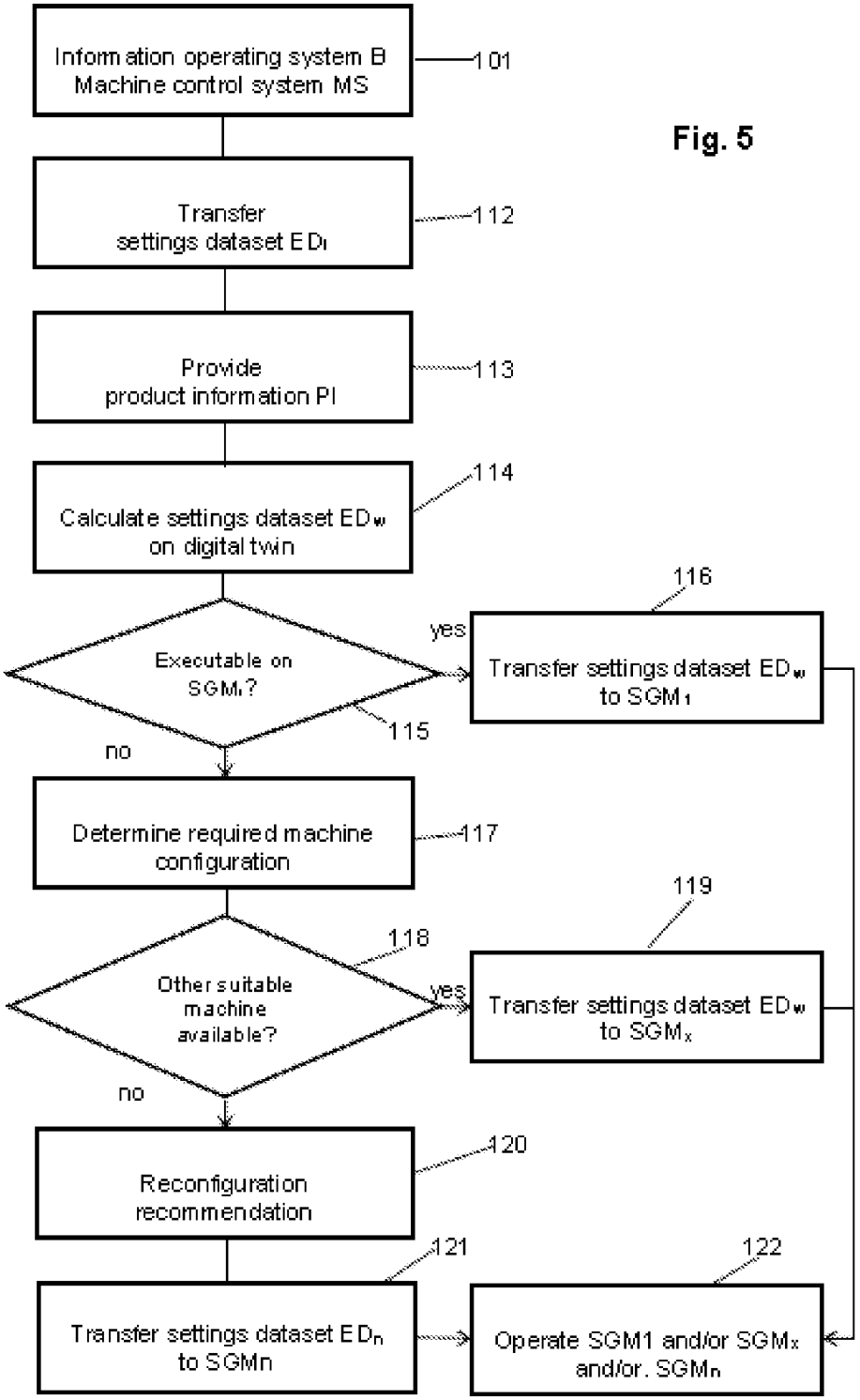
Information operating system B
Machine control system MS
101
Transfer
settings dataset EDI
112
Provide
product information PI
113
Calculate settings dataset EDw
on digital twin
114
Executable on
SGM1?
yes
115
116
Transfer settings dataset EDw
to SGM1
no
Determine required machine
configuration
117
Other suitable
machine
available?
118
yes
119
Transfer settings dataset EDw
to SGMx
no
Reconfiguration
recommendation
120
Transfer settings dataset EDn
to SGMn
121
Operate SGM1 and/or SGMx
and/or. SGMn
122

Fig. 5