



(51) International Patent Classification:

G07F 13/02 (2006.01)

G07F 13/10 (2006.01)

G07F 13/06 (2006.01)

(21) International Application Number:

PCT/US2024/031341

(22) International Filing Date:

29 May 2024 (29.05.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/507,303

09 June 2023 (09.06.2023)

US

(71) Applicant: PPG INDUSTRIES OHIO, INC. [US/US];

3800 West 143rd Street, Cleveland, Ohio 44111 (US).

(72) Inventors: DENG, Jun; c/o PPG Industries Ohio, Inc.,

3800 West 143rd Street, Cleveland, Ohio 44111 (US).

CONNOR, Daniel Martin; c/o PPG Industries Ohio, Inc.,

3800 West 143rd Street, Cleveland, Ohio 44111 (US).

(74) Agent: TREBILCOCK, Christine W. et al.; PPG Industries, Inc.,

One PPG Place, 35th Floor, Pittsburgh, Pennsylvania 15272 (US).

(81) Designated States (unless otherwise indicated, for every

kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,

CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM,

DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,

HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG,

KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY,

MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA,

NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO,

RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH,

(54) Title: APPARATUS AND METHOD FOR VENDING COATING REAGENTS

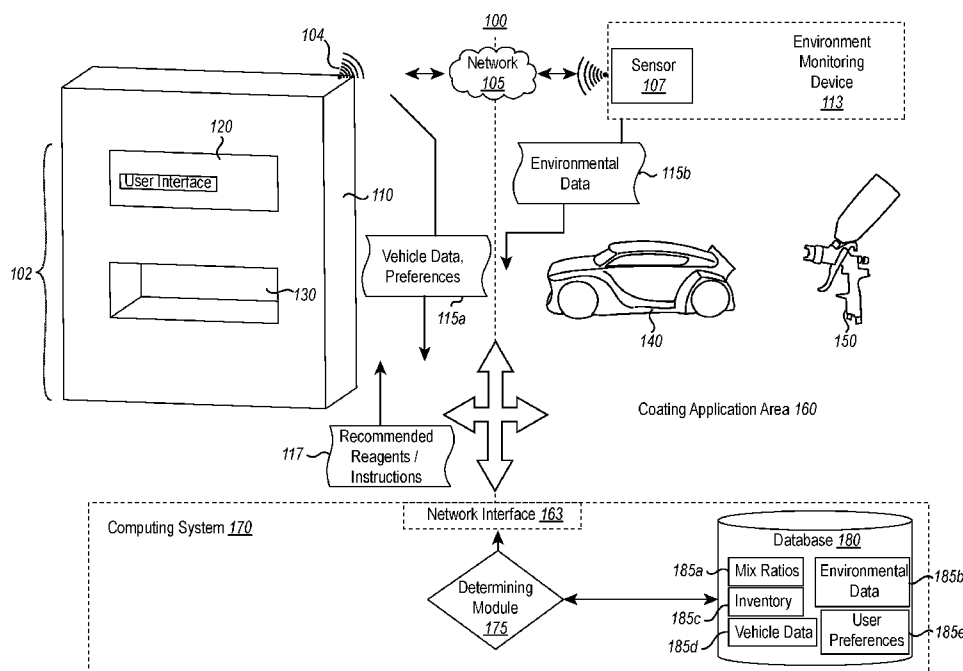


FIG. 1

(57) Abstract: A vending machine for providing ready to use packages of coating reagents can be configured to: receive a set of coating variables comprising: (i) data received from an environmental input corresponding to local environmental data located adjacent a painting preparation area, and (ii) one or more end-user supplied application variables for applying the coating to an object; identify, based upon the one or more coating variables, a first ratio of crosslinking reagent to mix with a second ratio of polymer reagent; determine a mix instruction for applying the identified ratios of crosslinking and polymer reagents in a volume of coating, consistent with the received one or more application variables; and upon receipt of a user selection, dispense a container of crosslinking reagent and a container of polymer reagents in accordance with the volume corresponding to the determined mix instruction.

TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS,
ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report (Art. 21(3))*

APPARATUS AND METHOD FOR VENDING COATING REAGENTS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present invention claims the benefit of priority to US Provisional
5 Application No. 63/507,303, filed on June 9, 2023, the entire content of which is incorporated
herein by reference.

BACKGROUND

1. Field

10 [0002] The present disclosure relates to devices, computer-implemented methods, and
systems for providing coating reagents for eventual application.

2. Background

[0003] Coating manufacturers generally provide coatings as mixed reagents in certain
15 preset volumes that are ready to apply. For example, a coating manufacturer may provide a
retail store with several sets of premixed coatings in sealed containers where the end user need
apply the coating, or manually add another reagents such as hardener and then apply the coating
to the given object. In some cases, the user can then save the remaining, unused volume for
later applications, whereas some mixtures may immediately begin to denature if not applied
20 quickly and hence need to be discarded after completion of a project. In industrial settings, the
coating manufacturer may similarly provide the coating mixed, or unmixed, and the industrial
user may use various equipment to properly mix the toners and bases before applying the
coating. In general, conventional coatings in the form of basecoats, or color layers can be
mixed in advance and later stored without much difficulty. On the other hand, the sheer number
25 and variety of possible colors, shades, and finishes, can create inventory problems for
maintaining an appropriate level of coating reagents, toners, or other additives.

[0004] Some types of coatings or coating reagents may be particularly vulnerable to
inventory issues since their respective selections or mix ratios may vary in response to various
factors such as environment or other factors about the object to be coated. In addition, there
30 are many coating reagent products available that can meet different needs in refinish body
shops. Each given coating reagent may, in turn, also have one or more specified ancillary
products to be used with the given coating, such as multiple choices for accompanying
hardeners and reducers that provide particular end-use effects. Users in a body shop generally
need to select the proper coating and ancillary products based on a given shop environment,

and/or a job requirement for the given repair. This selection process tends to be complex and particularly challenging for a less skilled worker. To accommodate the different preferences and mixing abilities, there may be a need to for a wider variety of coating reagents to maintain in inventory. While these inventory issues can be difficult for both large-scale and small-scale application environments, such inventory issues may be particularly acute for smaller body shops, which may have fewer resources for managing coating inventory, and in turn may be much more sensitive to the costs of waste.

[0005] Accordingly, there are a number of difficulties in the art that can be addressed.

SUMMARY

[0006] The present disclosure provides systems, methods, and computer program products that enable robust inventory management and delivery of coatings of all types, including clearcoats. For example, the present disclosure includes a vending machine-style apparatus that maintains various volumes of coating reagents in various states of mixture, as applicable for the given type of coating. Upon receipt of various parameters for a particular application, the vending machine can provide an appropriate set of containers, as well as mixing instructions to an end user. The end user can then unseal the physical containers, and mix the reagents in accordance with the provided instructions with a high degree of confidence and while minimizing waste.

[0007] For example, a vending machine (and corresponding computerized method) can be configured to receive a set of coating variables comprising: (i) data corresponding environmental input corresponding to local environmental data located adjacent a coating application area, and (ii) one or more end-user supplied application variables for applying the coating to an object. The vending machine can also be configured to identify, based upon the one or more coating variables, a first ratio of crosslinking reagent to mix with a second ratio and type of polymer reagent within a volume of a coating. In addition, the vending machine can be configured to determine a mix instruction for applying the identified ratios of crosslinking and polymer reagents within a volume, and consistent with the received one or more application variables. Furthermore, the vending machine can be configured to, upon receipt of a user selection, dispense a container of crosslinking reagent and a container of polymer reagent in accordance with the volume corresponding to the determined mix instruction.

[0008] Additional features and advantages will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice. The

features and advantages may be realized and obtained by means of the instruments and combinations particularly pointed out in the appended claims. These and other features will become more fully apparent from the following description and appended claims, or may be learned by the practice of the examples as set forth hereinafter.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0009] To describe the manner in which the above-recited and other advantages and features can be obtained, a more particular description of the subject matter briefly described above will be rendered by reference to specific examples which are illustrated in the appended drawings. Understanding that these drawings depict only typical examples and are not therefore to be considered to be limiting in scope, examples will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

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[0010] Figure 1 illustrates a schematic of a system for vending coating containers for use with coating application apparatus in accordance with the present disclosure;

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[0011] Figures 2A, 2B, and 2C illustrate a sequential schematic in which the vending machine in Figure 1 distributes physical coating containers for use in a coating application, in accordance with the present disclosure;

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[0012] Figure 3 illustrates another schematic of the vending machine of Figures 1 and 2A-2C in which the vending machine dispenses physical containers with one or multiple compartments for use in a coating application;

[0013] Figure 4 illustrates a flowchart of a decision tree for use in determining and delivering one or more applicable coating reagent containers; and

[0014] Figure 5 illustrates an additional or alternative computer-implemented method for use in determining and delivering one or more applicable coating reagent containers.

25

DETAILED DESCRIPTION

[0015] The present disclosure provides systems, methods, and computer program products that enable robust inventory management and delivery of coatings of all types, including clearcoats. For example, the present disclosure includes a vending machine-style apparatus that maintains various volumes of coating reagents in various states of mixture, as applicable for the given type of coating. Upon receipt of various parameters for a particular application, the vending machine can provide an appropriate set of containers, as well as mixing instructions to an end user. The end user can then unseal the physical containers, and

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mix the reagents in accordance with the provided instructions with a high degree of confidence and while minimizing waste.

[0016] In particular, as will be understood more fully herein from the following specification and claims, the present disclosure provides one or more solutions that enable satisfaction of different coating reagent preferences, appropriately adjusted for local application environment, for a given end-user without overwhelming inventory and other resource concerns. This can be accomplished at least in part through highly tailored coating reagents delivered in an essentially on-demand format, and with a wide range of available attributes in the finished product.

[0017] In one example, a coating system, such as a clearcoat or other coating system, may comprise a plurality of different types of resin reagents with favorable stability. Resin reagents, for example, can contain one or more unique resins, along with ultra-violet absorbers (UVA) / or Hindered Amine Light Stabilizers (HALs) additives and solvents. The several unique resins can include a wide range of resins with differing polymer properties, including differing by Mw, Tg, functionality and reactivity. A vending machine device (e.g., 110, Figure 1) can provide the resin reagents in various physical containers, which may be sealed containers in various different volumes. A vending machine device (e.g., 110), discussed more fully herein, can hold the physical containers of resin reagents.

[0018] In addition, the present disclosure can include providing, through the vending machine (110) a wide range of crosslinker reagents, such as in the case of coatings in the form of clearcoats. Crosslinker reagents may contain unique crosslinkers along with solvents. Several unique crosslinkers may be utilized to cover wide ranges of crosslinker properties, also including Mw, Tg, functionality and reactivity. A vending machine device (e.g., 110, Figure 1) can provide the crosslinker reagents in various physical containers, which may be sealed containers in various different volumes. A vending machine device (e.g., 110), discussed more fully herein, can hold the physical containers of crosslinker reagents, and provide the containers relevant to the determined reagents so that sufficient amounts are available to be mixed by the user.

[0019] Still further, the present disclosure can provide for the use of a number of catalyst reagents. Each catalyst reagent may comprise one or more catalysts, catalyst modulators, inhibitors and solvents. The concentration of catalyst in the reagents may range from 1% to 100%. Yet still further, the present disclosure can provide a number of reducer reagents. Each reducer reagent may comprise one or more solvents with a specific range of physical properties, such as relative evaporation rate, and Hansen solubility parameters.

[0020] As before, a vending machine device (e.g., 110, Figure 1) can provide the catalyst or reducer reagents in various physical containers, which may comprise sealed containers in various different volumes. A vending machine device (e.g., 110), discussed more fully herein, can hold the physical containers of catalyst reagents, and provide the containers relevant to the determined reagents so that sufficient amounts are available to be mixed by the user. The vending machine 110 and corresponding system 100 (including a computing system 170) can manage each of these different reagents to eliminate guesswork or other errors through systems and processes that enable correct providing of given reagents in correct amounts. This can ensure users are always using the right products and in the right amounts, thereby maximizing productivity while minimizing waste.

[0021] As an initial matter, for purposes of understanding aspects of the present disclosure, it will be understood herein that the articles “a” or “an” can include “one or more.” That is, although the disclosure may be presented in terms of ‘a’ feature, ‘an’ element, and the like, one or more of any of these components or other recited components can be used according to the present invention. In addition, as used herein, the terms “executable module,” “executable component,” “component,” “module,” or “engine” can refer to hardware processing units or to software objects, routines, or methods that may be executed within system 100. The different components, modules, engines, and services described herein may be implemented as objects or processors that execute on computer system 100 (e.g., as separate threads).

[0022] In general, “modules” and “components” will be understood as abstractions of generalized processing components that can be used in at least one implementation of the present invention, and there may be more or fewer than those illustrated and described, and as may be suited for a particular server and cloud operating environment. As used herein, a “module” means computer executable code that, when executed by one or more processors at a given computer system (e.g., computer system 170), cause the given computer system to perform a particular function.

[0023] By contrast, a “component” means a passive set of instructions or data structures or records that store, manage, and/or otherwise provide information handled through a given module. One of skill in the art, however, will appreciate that the distinction between a different modules or components is at least in part arbitrary, and that modules or components may be otherwise combined and divided and still remain within the scope of the present disclosure. As such, the description of a component as being a “module” or a “component” is provided only for the sake of clarity and explanation and should not be interpreted to indicate that any

particular structure of computer executable code and/or computer hardware is required, unless expressly stated otherwise. In this description, the terms “component,” “agent,” “manager,” “service,” “engine,” “virtual machine” or the like may also similarly be used.

[0024] Turning now to the Figures, Figure 1 illustrates a schematic of a system 100 for vending, or otherwise delivering in response to a user request, coating containers of reagents for use with coating application apparatus in accordance with the present disclosure. For example, Figure 1 shows that system 100 comprises a vending machine (or vending machine device) 110 having a body or frame 102, a user interface 120 (provided via computing system 170), and a delivery section 130. Figure 1 also shows that vending machine device 110 can communicate over a network 105 via a network component 104, such as the illustrated wireless connection interface.

[0025] One will appreciate, however, that the network component 104 can additionally or alternatively be configured for hardwired network communication with an environment monitoring device 113, which in turn can comprise one or more sensors 107. In one example, the one or more sensors 107 are located on or within the vending machine 110, which, in turn, may also be located in, or sufficiently proximate to, the coating application area 160. Furthermore, one will appreciate that the illustrated one or more sensors 107 can comprise a number of different sensors for monitoring the physical environment of coating application area 160, such as a humidity sensor, a temperature sensor, a barometric pressure sensor, or the like. Furthermore, the environment monitoring device 113 can be configured as a standalone unit for use in coating application area 160, or can be configured as an attachment of a spray applicator 150, or otherwise included with one or more other computing elements used in the coating application area 160. In still further aspects, the vending machine 110 may be located in a completely separate geographical location relative to the coating application area 160.

[0026] In the coating application area 160, a spray applicator 150 (e.g., whether robotically, or operated by a human user) can apply, or mix and apply, a given set of coating reagents to a given object, such as the illustrated vehicle 140. One will appreciate that the illustrated vehicle 140 is but one type of object that may be coated or painted in the coating application area 160. A coating applicator may, for example, spray other types of objects, or parts thereof, as needed, including body panels, original parts, replacement parts, and the like. Other objects may include boats, bicycles, industrial, commercial, or other residential equipment, doors, walls, and parts or portions thereof. Accordingly, both the terms object and vehicle will be understood to be broadly encompassing of any physical object to be coated.

[0027] Figure 1 also illustrates a schematic of a computing system 170 that can be used in connection with the system 100. The computing system 170 can be a stand-alone computing system operated by, for example, a remote user, or may be embodied within the vending machine 110 itself, or may comprise a set of various client and server systems that are in communication with one or more of the vending machine 110 and/or coating applicator 150. In addition, the illustrated computing system 170 can comprise any number of software components, and modules, as well as physical memory, physical storage, or even virtual or network based versions of the same, as needed to effectuate the steps and mechanisms outlined herein. For example, Figure 1 shows that computing system 170 comprises a network interface component 163 that receives and delivers communications over network 105.

[0028] Figure 1 also shows that computing system 170 can comprise a database 180, having stored thereon a set of various components that comprise various data and logic for managing component amounts and mix ratios as compared with environmental data, as well as various end-user preferences and object/vehicle data. For example, Figure 1 shows that database 180 comprises a mix ratio component 185a, an environmental data component 185b, an inventory component 185c, a vehicle data component 185d, and a user preferences component 185e. The components of Figure 1 are discussed more fully below with respect to Figures 2 and 3.

[0029] For example, Figures 2A, 2B, and 2C illustrate a sequential schematic of the vending machine 110 in operation. For example, in Figure 2A, an end user enters various data for use by the vending machine 110 through user interface 120. As previously mentioned, the user may enter this information directly in a user interface 120 presented by the vending machine 110, or supplied via one or more separate, stand-alone computing systems, such as a mobile device, or desktop computer system working in connection with vending machine 110. As shown in Figure 2A, the user can, through user interface 120, select and provide data about the object to be coated, such as Auto ID. For example, the user may interact with a user interface 120 on vending machine 110, or may interact with user interface 120 displayed through a mobile phone, or desktop computer, and select the Auto ID button (or other object identification information). The user can then enter in the year, make, and model information for the object/vehicle, which in turn may display various color or clearcoat options that the user can then select through interface 120.

[0030] In addition, Figure 2A shows that the user can enter data through user interface 120 about particular coating preferences, such as by entering various finishing or finishing speed preferences. The preferences can be entered and processed as one or more messages

115a by computing system 170., and stored in the user preference component 185e. By way of explanation, Figure 1 shows merely for purposes of illustration that the one or more messages 115a supplying user data are in transit from the vending machine 110 to computing system 170. One will appreciate, however, that this schematic is merely for convenience to show
5 interaction between the user and computing system 170, which in turn may or may not be included within vending machine 110 or may be supplied through another one or more devices.

[0031] In any event, the finishing preferences 115a can include desired physical characteristics in the finished product, such as texture or color, or other visible effects in the case of general coatings, or smoothness, shine, or gloss, and so forth in the case of clearcoat.

10 The user may be able to make other preferences sent with the messages 115a, such as preferences to have certain curing or hardening speeds, speeds of application, and/or to avoid certain compounds among other available reagent options. For example, an end user may desire certain preferences for gloss or smoothness, or application speed, but would like to avoid the use of certain types of volatile compounds, or other reagent compounds for which a local
15 environment may be more sensitive.

[0032] Figure 1 also shows that, in addition to the user supplied data in the one or more messages 115a, the computing system 170 can also process various messages 115b from the local environment sensors, which may provide various localized data for the coating application area 160. As mentioned, the one or more messages 115b relayed from the one or
20 more sensors 107 can comprise data corresponding to humidity, temperature, pressure, or other local environmental variables for the coating application area 160. Even though Figure 1 shows a separate sensor 107 communicating environmental data 115b, the user may also manually enter this information so that the dispensing apparatus 110 may receive the environmental data from either the end-user, the sensor 107, or some mixture thereof. For example, the user may
25 simply read the sensor or other instrumentation from device 113, and or the user may gather other known environmental information for the coating application area 160 from public data, and enter it through a user interface. In either case, the computing system 170 can compare the requests or other informational downloads from messages 115a, 115b directed to the desired result or finish, and then determine an appropriate set of coating reagents that are
30 optimized for or otherwise dictated by the user and sensor supplied data. For example, determining module 175 may determine that the entered automotive information and finish information provided by the user in the one or more messages 115a involves a particular set of polymer reagents at a particular volume, as well as crosslinking reagents, and/or catalyzing

reagents at a different volume and mix ratio. Each of these can take the form of one or more reagent reagents packaged in a commonly-sized preset volume.

[0033] For example, vending machine 110 can be configured for active management of inventory, and thus may comprise several physical compartments (not shown), which are barcode-(or other machine-readable indicium)-restricted, meaning that a barcode (or other relevant machine readable indicum) scan may be needed for a particular reagent compartment of a particular size in order for the compartment door to open. Along these lines, there may be two physical locations for polymer reagent in vending machine 110, such as one for 1 liter-size containers, and one for 0.5 liter-sized containers. Similarly, there may be physically-sized slots that limit what particular containers of certain sizes or diameters may be inserted in the slots. The vending machine 110 may, in turn, only unlock the relevant compartment or slot for the container and particular ingredient upon confirmation of the barcode or other machine indicia found on the given container (e.g., 133, 135). Thus, although not shown, vending machine 110 may comprise various machine-code readers, such as a barcode reader, a QR code reader, an infrared reader, or other form of wireless or Bluetooth protocol that computer system 170 can use to verify and/or process a given.

[0034] One will of course appreciate, however, that having such a restriction to inventory placement is not necessarily required. For example, the vending machine 110 may not have any sort of machine-reading requirement, but may instead have a user interface that a user merely needs to enter or unlock in order to unlock a given storage compartment. In still further cases, the vending machine 110 may be configured for more passive management, meaning that the end-user may have such a locking mechanism disabled, or the vending machine 110 may generally allow a user to freely add or remove containers at will, such that the user primarily manages the inventory directly through user interface 120. Hence, the inventory component 185c of database 180 may be alternatively configured for active management and/or passive management. That is, active management involves a machine verification system for accessing a storage compartment, while the passive management avoids such requirements, or otherwise places the inventory management in the hands of user input, or other forms of separate user management.

[0035] In either case, vending machine 110 can be configured to store different sizes and mixtures of polymer reagents, along with any additives within various preset volumes, such as 1 liter or 0.5 liters, etc. For example, a polymer reagent storage compartment may comprise in separate physical size or volume compartments certain containers having various unique resins, along with the aforementioned ultra-violet absorbers (UVA) / Hindered Amine

Light Stabilizers (HALs) additives and solvents mixed in sets of 0.5 liters, 1.0 liter, 1.5 liter sizes and so forth. The polymer compartment may include areas for storing a wide range of resins with differing polymer properties, including differing storage for polymers differing by Mw, Tg, functionality and reactivity, or to be mixed at other viscosities.

5 **[0036]** In addition, vending machine 110 can be configured to store different sizes and mixtures of crosslinker reagents at certain preset volumes, such as in the case of coatings in the form of clearcoats. For example, vending machine 110 may contain various physical compartments (not shown) for storing crosslinker reagents with differing crosslinkers and solvents within various preset volumes, such as 0.5 liters, 1.0 liter, 1.5 liters, and so forth. The
10 crosslinker storage compartments can contain physic containers having several different, unique crosslinkers that cover wide ranges of crosslinker properties, also including Mw, Tg, functionality and reactivity. Vending machine device (e.g., 110, Figure 1) can then retrieve an appropriate crosslinker physical container of an appropriate volume upon selection, or upon designation by computer system 170 if appropriate for the user-selected coating and end result
15 properties.

[0037] Still further, vending machine 110 may comprise different physical compartments (not shown) for storing different sizes and mixtures of catalyst reagents. In particular, vending machine 110 may contain various physical compartments (not shown) for storing catalyst reagents with differing modulators, inhibitors and solvents, and in given
20 physical containers at various preset volumes, such as 0.5 liters, 1.0 liter, 1.5 liters, and so forth. The concentration of catalyst in the reagents may range from 1% to 100%, and may be stored in different physical locations in order to enable precise retrieval and delivery by the vending machine 110 of the given mixtures. Along similar lines, the vending machine 110 can also store a number of reducer reagents in various preset volumes, and in specifically designated
25 physical compartments as similarly noted above. As previously mentioned, each reducer reagent may comprise one or more solvents with a specific range of physical properties, such as relative evaporation rate, and Hansen solubility parameters. The computing system 170 can optimize the particular delivery of different physical containers to best match the user preferences and environmental information.

30 **[0038]** Along these lines, Figures 2A, 2B, and 2C illustrate a sequential schematic in which the vending machine in Figure 1 distributes physical reagent containers for use in a coating application, in accordance with the present disclosure. In particular Figure 2A shows that an end user enters various indicium via a user interface 120. As previously noted, the user interface 120 may comprise rendered instructions on a display provided by vending machine

110, or alternatively may comprise a rendered interface on another, separate computer system. Through the user interface 120, the end-user enters the information pertaining to the object to be coated, such as an object or automotive ID. This may be in the form of a vehicle identification number (VIN), a make/model/year of a given vehicle, or other form of information that enables the computing system 170 to identify an amount and/or type of coating material to be used. The user may also enter in other information that indicates an amount of the object to be coated, if less than all of the vehicle. Though the user interface 120, the user may also enter various preferences for the coating, such as gloss, smoothness, shine, texture, application or curing speed, or types of component reagents to use or to be avoided as applicable.

[0039] As previously mentioned for Figure 1, the computer system 170 can take the information entered by the user via one or more messages 115a, and compare the requests with the given environmental data 115b to thereby ensure that the recommended reagents are optimized for the environment. In other cases, the computing system 170 may additionally or alternatively include public weather information that may indicate future data for temperature, pressure, and humidity, and consider such information along with current local data in the coating application area 160. Hence, the computing system 170 can consider immediate time frames, as well as eventual time frames. This may enable the computing system 170 to be used to prepare containers at a remote location that can be delivered for use within a given time frame in the coating application area 160. Such an arrangement may be particularly helpful for smaller shops that may have difficulties storing excess inventory.

[0040] Figure 2B shows that, upon review and calculation of the various inputs by the computing system 170, the vending machine 110 provides a corresponding set of reagents in one or more physical containers, such as the illustrated physical containers 133, 135. By way of explanation, even though Figure 2B shows two containers being vended in vending location 130, one will appreciate in view of the specification and claims herein that the vending machine 110 may be configured to dispense one or multiple containers at a time. In addition, one will appreciate that the physical containers 133, 135 will contain preset volumes of reagent, such as a polymer and a crosslinker, or a polymer mixture, crosslinker mixture, and/or a catalyst mixture, or other relevant combinations (not shown) that are customized to the user entered data (e.g., from Figure 2A). Figure 2B further shows that containers 133 and 135 are differently sized objects, representing that the computing system 170 can further select containers with particular volumes that avoid waste to the extent possible.

[0041] The computing system 170 can likewise retrieve multiple volumes of reagent in various mixtures of container sizes for larger jobs. Hence, the two illustrate physical containers 133, 135 in Figure 2B are only by way of example, and there may be many more physical containers with different sizes provided as applicable. Still further, the vending machine can provide mixing instructions through the user interface 120, or through a printed object provided in the vending location 130. For example, the computing system 170 can determine and provide specific recipe, mix, and cleanup instructions for each container, and/or for the combination of containers added together.

[0042] Figure 2C further shows that the end user can then take the containers and apply the reagents directly to the coating applicator 150. For example, the coating applicator 150 can comprise an e-coat apparatus, a coating atomizer, a spray gun, or other form of coating application device. The example physical containers 133, 135, etc., in turn, can be configured for direct application to the coating applicator 150. For example, the physical containers 133, 135 may comprise a particular physical connection interface (e.g., lid, or other interface within an upper removable lid), that interfaces physically and directly with a corresponding physical interface of the coating applicator 150. The precise physical interconnection may be employed in a number of different ways between the coating applicator 150 and the physical containers 133, 135. In one example, the physical containers 133, 135 have a particularly-shaped lid that direction connects to a receptacle in coating applicator 150, which causes a release of reagent. This may be by perforation of a membrane, or, for example, where insertion of the container 133, 135 causes a physical retraction of a sealing element, thereby allowing reagent to flow therein. In still other cases, the user may manually release a lid of the physical container 133, 135, and simply pour the particular reagent contents directly into the coating applicator 150. Similarly, the user may open and manually mix the containers in accordance with the provided mix instructions, and then provide the already mixed materials into the coating applicator 150.

[0043] Figure 3 illustrates another, alternate schematic of the vending machine 110 in which the vending machine 110 vends out containers containing multiple reagents but within different containers. For example, vending machine 110 may be configured to provide a single container with a single compartment, or can vend out the containers as segmented containers, of which the illustrated containers 137a, 137b, 137c, and 137d are but alternate examples. In particular, system 100 can employ multiple different formats for storing certain reagents for common, repeat mixtures while preserving the reagents from interacting until needed. In view of the foregoing, vending machine 110 can deliver reagents in either ready-to-use mixtures or ready-to-mix containers even in a single container. In other cases, vending machine 110 can

deliver reagents into multiple containers (e.g., Figures 2A-2B). In still other cases, vending machine 110 can deliver reagents into multiple containers or compartments all within the same container. The illustrated alternate container formats 137a-137b can include by way merely of example circular or cylindrical formats 137a-b with internal compartment divisions, while
5 containers 137c-137d show square or rectangular containers with internal compartment divisions. One will appreciate that other types of shapes and divisions within the container are possible with the spirit of the present disclosure.

[0044] In general, the compartment divisions in containers 137a-137d (or containers within containers) can be used to separate reactive components or other types of reagents that
10 may more quickly denature upon mixing. In other cases, the containers may contain a sealable bladder for one of the compartments, while the others remain open to air or regular atmosphere. In still other cases, the containers may include lids that are specifically shaped to preserve and seal containers or compartments within the containers 137a-137d. One will appreciate that other shapes and compartment configurations may be used in accordance with the present
15 disclosure.

[0045] Figure 4 illustrates an example flowchart of a decision tree for use in dispensing one or more applicable coating containers for use in accordance with the present disclosure. For example, Figure 4 shows that a decision tree can begin with an act 205, in which a user enters object details. For example, as shown in Figures 1 and 2A, the end-user can enter in
20 various object details, such as vehicle identification number, make, model, year, color, and so forth. Moreover, the object is not limited to automobiles, but can represent other types of objects, including but not limited to aerospace, recreational vehicles (e.g., boats), or other consumer objects (e.g., bicycles) for which a coating is needed.

[0046] Figure 4 further illustrates in a next act 210 that the user can enter desired coating properties. For example, as shown in Figure 1 and 2A, the user can enter data through
25 a user interface 120 that indicates preferred finishes or other physical properties of the final look and feel of the coating. For example, in a clearcoat environment, the end user may specify gloss, smoothness, texture, or other types of variables for achieving a particular look and feel. This can have implications to the type of crosslinker or other catalysts, solvents, reducers, and
30 so forth that may be needed in the mixture to attain final end appearance.

[0047] Along these lines, Figure 4 shows that a next step in the decision tree 200 can include an act 215 of determining the size of object or repair.. For example, computing system 170 (Figure 1) can take the user inputs 115a, which may include an option to either use user specifications, or to use the computer-generated reagents. If the user elects to select its own

reagents without optimization, the decision tree flow to acts 225 and 230, in which the vending machine 110 identifies and delivers the requested reagents. If the user selects an optimization, such as “smart clear,” the computing system 170 may then optimize the user inputs in connection with user recommendations and environmental variables.

5 [0048] For example, Figure 4 shows that, in view of “smart” optimization, the computing system 170 can also take into account local environmental variables. As previously noted, this may be accomplished by computing system 170 receiving and processing one or more messages 115b from one or more sensors 170. The one or more can be included or attached to the coating applicator 150, and/or may be located in one or more separate standalone
10 devices, such as may the illustrate environment monitoring device 113. The computing system 170 can then coordinate with various rules/components in database 180 to determine an optimum volume and type of reagents.

[0049] Accordingly, Figure 4 shows that the decision tree can include an act 235 of determining a particular set of containers. For example, for a job that needs 2.0 liters of
15 polymer reagent, and 0.25 liters of crosslinker and/or catalyst, the computing system 170 may designate two 1.0 liter containers of polymer reagent, and one 0.5 liter container of crosslinker/catalyst reagent. The computing system 170 may adjust these requirements up or downward based on current environmental variables, and/or anticipated environmental variables based on other public data about regional temperature, pressure, and humidity. In
20 general, environmental factors may not change the overall volume of the mixture of reagents, but it may affect the dosing ratio or even type of reagent used in a given coating, which could, in some cases change the number of containers to vend out. One will appreciate however, that numbers of containers of particular reagents will tend to depend more on characteristics (e.g., size, coating type) of the object, whereas the environmental factors will tend to affect more a
25 given type of reagent to use. Along these lines, the computing system 170 may also base the number of containers to vend out based on the number of containers held in a given storage compartment. Alternatively, the computing system 170 may prepare a list of physical containers of given sizes based on expected future inventory based on expected shipments of physical containers of particular reagents.

30 [0050] Figure 4 further shows that the decision tree can then move to steps 240 and 245, in which the vending machine 110 provides the containers determined by the computing system 170. The vending machine 110 (and/or computer system 170) can then send one or more messages to an inventory component 185c of database 180, indicating which physical containers 133, 135, etc. have been retrieved and need to be restocked. Thus, the inventor is

automatically added and deleted by the vending machine 110 / computing system 170 with each receipt and storage of physical containers 133, 135, as well as with each delivery. In particular, as inventory is close to depletion, the decision tree in Figure 4 further moves to acts 250 and 255. In act 250, the computing system 170 coordinates with the aforementioned inventory component 185c to determine what remains in storage in the vending machine 110, what components are in excess or close to depletion, and hence what needs to be reordered. In act 255, a stock order can be sent out automatically by the vending machine 110 (e.g., from computer system 170) or can be submitted as an alert to a user for eventual ordering. Figure 4 shows that the decision tree completes at this point, i.e., step 260.

10 **[0051]** Figure 5 illustrates that an additional or alternative method 300 for use in determining and delivering one or more applicable coating reagent containers can comprise an act 310 of receiving a set of coating variables. Act 310 includes receiving a set of coating variables comprising: (i) data corresponding environmental input corresponding to local environmental data located adjacent a coating application area, and (ii) one or more end-user supplied application variables for applying the coating to an object. For example, an end-user provides various details about an object to be coated, as well as variables relevant to final look and appearance, through a user interface 120. The user interface 120 may be presented directly at the vending machine 110, or may be presented through a mobile or other standalone computing device serving as computing system 170, upon which the relevant data are sent to
20 the vending machine 110.

[0052] Figure 5 also illustrates that method 300 can comprise an act 320 of identifying a ratio of reagents to use. Act 320 includes identifying, based upon the one or more coating variables, a first ratio of crosslinking reagent to mix with a second ratio and type of polymer reagent. For example, computing system 170, in connection with vending machine 110, can use the user supplied variables 115a and potentially also one or more environmental variables in message 115b to determine an amount of different types of reagents to complete the order. The determination includes an appropriate ratio for the end mixture to be applied for each reagent.

[0053] In addition, Figure 5 shows that method 300 can comprise an act 330 of determining a mix instruction. Act 330 includes determining a mix instruction for applying the identified ratios of crosslinking and polymer reagents consistent with the received one or more application variables. For example, in addition to determining the ratios from act 320, computing system 170 can also determine a sequence of steps for adding the reagents, when to add them and in what amounts into a coating applicator 150. The computing system 170 can

also determine and provide instructions relevant to the shelf life of the given reagents upon mixture with another reagent, and/or upon exposure to a reactive environment that begins to degrade the reagent. For example, the computing system 170 may provide instructions that a mixture of polymer reagent and crosslinking reagent has approximately two hours to be applied before the mixture needs to be discarded due to degradation, or otherwise due to other curing or setting the prohibits wet application.

[0054] Furthermore, Figure 5 shows that method 300 can comprise an act 340 of dispensing containers of identified reagents. Act 340 includes, upon receipt of a user selection, dispensing a container of crosslinking reagent and a container of polymer reagents in accordance with a volume corresponding to the determined mix instruction. For example, Figure 2B shows that vending machine delivers the physical containers 133, 135 that were previously determined by computing system 170, and can further provide relevant mixing or other end-use instructions. Such instructions can further include various MSDS (material safety data sheet) information needed to properly work with the given reagents. Such instructions can still further include computer-oriented instructions to execution by a separate computing device, such as a mobile device, tablet, watch, or personal computer that provides various timing alerts regarding expiration of given reagents or mixtures from the point of delivery, or from other variables measured from an application start/stop top received from the coating applicator 150.

[0055] Accordingly, the present disclosure provides a number of systems, components, and methods that enable a number of advantages over the present art. For example, when customers need to repair and paint cars, the proper ready-to-use product is provided to them on-demand. This can allow coating applicators to focus on spraying paint or other coating formulations without an accompanying need to make precise selections and mix them in a precise ratio. This simplifies the work process for end-users and addresses several conventional difficulties. Because a coating manufacturer providing the solutions outlined herein are providing not only paint, but also services that are beneficial to end-users, coating manufacturers can expand the way they connect with end-users. The connection can be facilitated by delivering ready-to-apply, or ready-to-mix-and-apply products that best fit the end-user's needs on-demand. That is, both large and small shops can order reagents on demand, and apply them precisely as needed in a timely fashion without error and while minimizing waste.

[0056] The following discussion is intended to provide a brief, general description of a suitable computing environment in which the present disclosure may be implemented.

Although not required, the present disclosure will be described in the general context of computer-executable instructions, such as program modules, being executed by computers in network environments. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Computer-executable instructions, associated data structures, and program modules represent examples of the program code means for executing steps of the methods disclosed herein. The particular sequence of such executable instructions or associated data structures represents examples of corresponding acts for implementing the functions described in such steps.

[0057] Those skilled in the art will appreciate that the present disclosure may be practiced in network computing environments with many types of computer system configurations, including personal computers, hand-held devices, multi-processor systems, microprocessor-based or programmable consumer electronics, network PCs, minicomputers, mainframe computers, and the like. The present disclosure may also be practiced in distributed computing environments where local and remote processing devices perform tasks and are linked (either by hardwired links, wireless links, or by a combination of hardwired or wireless links) through a communications network. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

[0058] The present disclosure may comprise or utilize a special-purpose or general-purpose computer system that includes computer hardware, such as, for example, a processor and system memory, as discussed in greater detail below. The scope of the present disclosure also includes physical and other computer-readable media for carrying or storing computer-executable instructions and/or data structures. Such computer-readable media can be any available media that can be accessed by a general-purpose or special-purpose computer system. Computer-readable media that store computer-executable instructions and/or data structures are computer storage media. Computer-readable media that carry computer-executable instructions and/or data structures are transmission media. Thus, by way of example, and not limitation, the present disclosure can comprise two distinctly different kinds of computer-readable media: computer storage media and transmission media.

[0059] Computer storage media are physical storage media that store computer-executable instructions and/or data structures. Physical storage media include computer hardware, such as RAM, ROM, EEPROM, solid state drives (“SSDs”), flash memory, phase-change memory (“PCM”), optical disk storage, magnetic disk storage or other magnetic storage devices, or any other hardware storage device(s) which can be used to store program code in the form of

computer-executable instructions or data structures, which can be accessed and executed by a general-purpose or special-purpose computer system to implement the disclosed functionality of the present disclosure.

[0060] Transmission media can include a network and/or data links which can be used to carry program code in the form of computer-executable instructions or data structures, and which can be accessed by a general-purpose or special-purpose computer system. A “network” is defined as data links that enable the transport of electronic data between computer systems and/or modules and/or other electronic devices. When information is transferred or provided over a network or another communications connection (either hardwired, wireless, or a combination of hardwired or wireless) to a computer system, the computer system may view the connection as transmission media. Combinations of the above should also be included within the scope of computer-readable media.

[0061] Further, upon reaching various computer system components, program code in the form of computer-executable instructions or data structures can be transferred automatically from transmission media to computer storage media (or vice versa). For example, computer-executable instructions or data structures received over a network or data link can be buffered in RAM within a network interface module, and then eventually transferred to computer system RAM and/or to less volatile computer storage media at a computer system. Thus, it should be understood that computer storage media can be included in computer system components that also (or even primarily) utilize transmission media.

[0062] Computer-executable instructions comprise, for example, instructions and data which, when executed at a processor, cause a general-purpose computer system, special-purpose computer system, or special-purpose processing device to perform a certain function or group of functions. Computer-executable instructions may be, for example, binaries, intermediate format instructions such as assembly language, or even source code.

[0063] Those skilled in the art will appreciate that the present disclosure may be practiced in network computing environments with many types of computer system configurations, including, personal computers, desktop computers, laptop computers, message processors, hand-held devices, multi-processor systems, microprocessor-based or programmable consumer electronics, network PCs, minicomputers, mainframe computers, mobile telephones, PDAs, tablets, pagers, routers, switches, and the like. The present disclosure may also be practiced in distributed system environments where local and remote computer systems, which are linked (either by hardwired data links, wireless data links, or by a combination of hardwired and wireless data links) through a network, both perform tasks. As such, in a distributed system

environment, a computer system may include a plurality of constituent computer systems. In a distributed system environment, program modules may be located in both local and remote memory storage devices.

[0064] Those skilled in the art will also appreciate that the present disclosure may be practiced in a cloud-computing environment. Cloud computing environments may be distributed, although this is not required. When distributed, cloud computing environments may be distributed internationally within an organization and/or have components possessed across multiple organizations. In this description and the following claims, “cloud computing” is defined as a model for enabling on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services). The definition of “cloud computing” is not limited to any of the other numerous advantages that can be obtained from such a model when properly deployed.

[0065] A cloud-computing model can be composed of various characteristics, such as on-demand self-service, broad network access, resource pooling, rapid elasticity, measured service, and so forth. A cloud-computing model may also come in the form of various service models such as, for example, Software as a Service (“SaaS”), Platform as a Service (“PaaS”), and Infrastructure as a Service (“IaaS”). The cloud-computing model may also be deployed using different deployment models such as private cloud, community cloud, public cloud, hybrid cloud, and so forth.

[0066] A cloud-computing environment, or cloud-computing platform, may comprise a system that includes a host that is capable of running virtual machines. During operation, virtual machines emulate an operational computing system, supporting an operating system and perhaps other applications as well. Each host may include a hypervisor that emulates virtual resources for the virtual machines using physical resources that are abstracted from view of the virtual machines. The hypervisor also provides proper isolation between the virtual machines. Thus, from the perspective of any given virtual machine, the hypervisor provides the illusion that the virtual machine is interfacing with a physical resource, even though the virtual machine interfaces with the appearance (e.g., a virtual resource) of a physical resource. Examples of physical resources including processing capacity, memory, disk space, network bandwidth, media drives, and so forth.

[0067] The present disclosure can be described in terms of various different aspects and configurations and alternates thereof for practicing the present disclosure. For example, a first aspect includes a vending machine configured to provide ready to use packages of coating reagents for preparation and application of a coating, which includes a processor; a plurality of

first containers having a preset volume of at least one crosslinking reagent, and a plurality of second containers having a preset volume at least one polymer reagent, wherein each crosslinking reagent is physically sealed from interaction with each polymer reagent; and a computer-readable storage medium comprising computer-executable instructions stored that, when executed, cause the processor of the vending machine to perform the following: receive a set of coating variables comprising: (i) data corresponding environmental input corresponding to local environmental data located adjacent a coating application area, and (ii) one or more end-user supplied application variables for applying the coating to an object; identify, based upon the one or more coating variables, a first ratio of crosslinking reagent to mix with a second ratio and type of polymer reagent within a volume of a coating; determine a mix instruction for applying the identified ratios of crosslinking and polymer reagents within a volume, and consistent with the received one or more application variables; and upon receipt of a user selection, dispense a container of crosslinking reagent and a container of polymer reagent in accordance with the volume corresponding to the determined mix instruction.

[0068] In a second aspect, the vending machine as recited in the first aspect can be further configured to: determine a type of the crosslinking reagent to be used; and determine a type of the polymer reagent to be used. In a third aspect, the vending machine as recited in any of the preceding first through second aspects, the vending machine is further configured to receive the local environmental data at least in part from an environmental sensor; and the environmental sensor is: physically remote of the vending machine; and communicates with the vending machine over a network. In a fourth aspect, the vending machine as recited in any of the preceding first through third aspects, wherein the environmental input comprises local temperature and humidity of the coating application area. In a fifth aspect, the vending machine as recited in any of the preceding first through fourth aspects, the vending machine is further configured to: in response to the received set of coating variables, dispense multiple physical containers of polymer reagent in addition to the container of dispensed crosslinking reagent container. In a sixth aspect, the vending machine as recited in any of the first through fifth aspects, the coating application area comprises a spray booth. In a seventh aspect, the vending machine as recited in any of first through sixth aspects, one or more of the coating application variables in the set correspond to appearance of the applied coating on the object.

[0069] In an eighth aspect, in the vending machine as recited in the seventh aspect, the appearance of the applied coating comprises gloss, or smoothness of the applied coating on the object. In a ninth aspect, in the vending machine as recited in any of the seventh or eighth aspects, the appearance comprises texture of the applied coating on the object. In a tenth aspect,

in the vending machine as recited in any of the seventh through ninth aspects, the appearance comprises distinctiveness of image (DOI). In an eleventh aspect, in the vending machine as recited in any one of the preceding first through tenth aspects, the one or more application variables comprise any or both of: (i) speed of application of the coating or speed of cure of the coating on the object; and (ii) whether the coating will be air dried or baked. In a twelfth aspect, in the vending machine as recited in any one of the preceding first through eleventh aspects, the vending machine is further configured to: send one or more signals for use by another computer system; wherein the one or more sent signals provide a timer on that alerts the end user regarding expiration of any of the dispensed reagents.

10 [0070] In a thirteenth aspect, in the vending machine as recited in the twelfth aspect, the vending machine is further configured to: send one or more sent signals to a mobile device of the end-user to provide a timer on the mobile device that alerts the end user regarding expiration of any of the dispensed reagents. In a fourteenth aspect, in the vending machine as recited in any of the preceding first through thirteenth aspects, one of the first plurality of
15 containers and one of the second plurality of containers are dispensed within a single container that maintains both the reagent of the first container and the reagent of the second container in an unreactive state. In a fifteenth aspect, in the vending machine as recited in any of the preceding first through fourteenth aspects, the vending machine is further configured to: identify a reducer reagent; identify one or more solvents for use with the reducer reagent; and
20 identify one or more solvent parameters for the identified one or more solvents, the one or more solvent parameters including a relative evaporation rate and a Hansen solubility value.

[0071] In a sixteenth aspect, in the vending machine as recited in any of the preceding first through fifteenth aspects, the user provides the application variables to the vending machine through a user interface of a remote application program connected on a network. In
25 a seventeenth aspect, in the vending machine as recited in the fifteenth aspect: the vending machine provides one or more messages to the remote application program for container that is dispensed; and the remote application program indicates a change in inventory through the user interface in response to the one or more messages. In an eighteenth aspect, in the vending machine as recited in any of the preceding first through seventeenth aspect, the vending
30 machine is connected to a single device having the environmental sensor and one or more additional sensors contained in the single device. In a nineteenth aspect, in the vending machine as recited in any of the preceding first through eighteenth aspects, the plurality of first containers includes different sizes of containers containing different volumes of crosslinking reagent. In a twentieth aspect, in the vending machine as recited in any of the preceding claims,

the plurality of second containers includes different sizes of containers containing different volumes of polymer reagent.

[0072] In a twenty-first aspect, in the vending machine as recited in any of the preceding first through twentieth aspects, each container of the first and second plurality of containers comprises a barcode or QR code. In a twenty-second aspect, in the vending machine as recited in any of the preceding first through twenty-first aspects, the vending machine may further include a code reader for scanning a barcode or QR code of a given container of the first or second plurality of containers. In a twenty-third aspect, the vending machine as recited in any one of the twenty first or twenty second aspects can further include: a plurality of different physical compartments for holding the plurality of first containers and the plurality of second containers; and an inventory management system, wherein the inventory management system provides an indication of a given physical compartment in response to a scan of a barcode or QR code of the given container of the first or second plurality of containers. In a twenty-fourth aspect, in the vending machine as recited in any of the preceding first through twenty-third aspects, the coating comprises a clearcoat. In a twenty-fifth aspect, in the vending machine as recited in any of the preceding first through twenty-fourth aspects, the coating comprises a primer, an undercoat, a topcoat, a monocoat, or a sealer.

[0073] In addition or as an alternative to the foregoing, a twenty-sixth aspect of the present disclosure includes a computer-implemented method for storing and delivering reagents through a vending machine device, which includes receiving, by a computing system, a set of coating variables comprising: (i) data corresponding environmental input corresponding to local environmental data located adjacent a coating application area, and (ii) one or more end-user supplied application variables for applying the coating to an object; identifying, by the computing system, based upon the one or more coating variables, a first ratio of crosslinking reagent to mix with a second ratio and type of polymer reagent; determining, by the computing system, a mix instruction for applying the identified ratios of crosslinking and polymer reagents consistent with the received one or more application variables; and upon receipt of a user selection, dispensing, by the vending machine device, a container of crosslinking reagent and a container of polymer reagents in accordance with a volume corresponding to the determined mix instruction.

[0074] In a twenty-seventh aspect, the method as recited in the twenty-sixth aspect can further include receiving the local environmental data over a network connection from one or more environmental sensors connected to the network. In a twenty-eighth aspect, in the method as recited in the twenty-sixth aspect, the one or more environmental sensors provide

temperature and/or humidity data relevant to the coating application area. In a twenty-ninth aspect, in the method as recited in the twenty-sixth aspect, the one or more application variables from the end-user comprise physical appearance of the applied coating on the object. In a thirtieth aspect, in the method as recited in the twenty-eighth aspect, the physical appearance
5 comprise one or more of gloss, or smoothness of the applied coating on the object. In a thirty-first aspect, in the method as recited in any one of the twenty-sixth through thirtieth aspects, the one or more application variables comprise any or both of: (i) speed of application of the coating or speed of cure of the coating on the object; and (ii) whether the coating will be air dried or baked.

10 **[0075]** The present disclosure may be embodied in other specific forms without departing from its spirit or essential characteristics. The described examples are to be considered in all respects only as illustrative and not restrictive. The scope of the present disclosure is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the
15 claims are to be embraced within their scope.

CLAIMS

We claim:

1. A vending machine configured to provide ready to use packages of coating reagents for preparation and application of a coating, comprising:

5 a processor;
a plurality of first containers having a preset volume of at least one crosslinking reagent, and a plurality of second containers having a preset volume at least one polymer reagent, wherein each crosslinking reagent is physically sealed from interaction with each polymer reagent; and

10 a computer-readable storage medium comprising computer-executable instructions stored that, when executed, cause the processor of the vending machine to perform the following:

receive a set of coating variables comprising: (i) data corresponding environmental input corresponding to local environmental data located adjacent a coating application area, and (ii) one or more end-user supplied application variables for applying the coating to an object;

15 identify, based upon the one or more coating variables, a first ratio of crosslinking reagent to mix with a second ratio and type of polymer reagent within a volume of a coating;

20 determine a mix instruction for applying the identified ratios of crosslinking and polymer reagents within a volume, and consistent with the received one or more application variables; and

upon receipt of a user selection, dispense a container of crosslinking reagent and a container of polymer reagent in accordance with the volume corresponding to the determined mix instruction.

25

2. The vending machine as recited in claim 1, further wherein the vending machine is further configured to:

determine a type of the crosslinking reagent to be used; and

30 determine a type of the polymer reagent to be used.

3. The vending machine as recited in any of the preceding claims, wherein:

the vending machine is further configured to receive the local environmental data at least in part from an environmental sensor; and

the environmental sensor is:

physically remote of the vending machine; and
communicates with the vending machine over a network.

5 4. The vending machine as recited in any of the preceding claims, wherein the environmental input comprises local temperature and humidity of the coating application area.

5. The vending machine as recited in any of the preceding claims, wherein the vending machine is further configured to:

10 in response to the received set of coating variables, dispense multiple physical containers of polymer reagent in addition to the container of dispensed crosslinking reagent container.

15 6. The vending machine as recited in any of the preceding claims, wherein one or more of the coating application variables in the set correspond to appearance of the applied coating on the object.

7. The vending machine as recited in claim 6, wherein the appearance of the applied coating comprises gloss, or smoothness of the applied coating on the object.

20

8. The vending machine as recited in any of claims 6 or 7, wherein the appearance comprises texture of the applied coating on the object.

25 9. The vending machine as recited in any one of the preceding claims, wherein the one or more application variables comprise any or both of:

(i) speed of application of the coating or speed of cure of the coating on the object; and

(ii) whether the coating will be air dried or baked.

30 10. The vending machine as recited in any one of the preceding claims, wherein the vending machine is further configured to:

send one or more signals for use by another computer system;

wherein the one or more sent signals provide a timer on that alerts the end user regarding expiration of any of the dispensed reagents.

11. The vending machine as recited in any of the preceding claims, wherein:
one of the first plurality of containers and one of the second plurality of
containers are dispensed within a single container that maintains both the reagent of the
5 first container and the reagent of the second container in an unreactive state.
12. The vending machine as recited in any of the preceding claims, wherein the vending
machine is further configured to:
identify a reducer reagent;
10 identify one or more solvents for use with the reducer reagent; and
identify one or more solvent parameters for the identified one or more solvents,
the one or more solvent parameters including a relative evaporation rate and a Hansen
solubility value.
13. The vending machine as recited in any of the preceding claims, wherein:
the user provides the application variables to the vending machine through a
user interface of a remote application program connected on a network;
the vending machine provides one or more messages to a remote application
program for container that is dispensed; and
20 the remote application program indicates a change in inventory through the user
interface in response to the one or more messages.
14. The vending machine as recited in any of the preceding claims, wherein the plurality of
25 first containers includes different sizes of containers containing different volumes of
crosslinking reagent.
15. The vending machine as recited in any of the preceding claims, wherein the plurality of
second containers includes different sizes of containers containing different volumes of
30 polymer reagent.
16. The vending machine as recited in any of the preceding claims, further comprising:
a plurality of different physical compartments for holding the plurality of first
containers and the plurality of second containers; and

an inventory management system, wherein the inventory management system provides an indication of a given physical compartment in response to a scan of a barcode or QR code of the given container of the first or second plurality of containers.

5 17. The vending machine as recited in any of the preceding claims, wherein the coating comprises a clearcoat, a primer, an undercoat, a topcoat, a monocoat, or a sealer.

18. A computer-implemented method for storing and delivering reagents through a vending
10 machine device, comprising:

receiving, by a computing system, a set of coating variables comprising: (i) data corresponding environmental input corresponding to local environmental data located adjacent a coating application area, and (ii) one or more end-user supplied application variables for applying the coating to an object;

15 identifying, by the computing system, based upon the one or more coating variables, a first ratio of crosslinking reagent to mix with a second ratio and type of polymer reagent;

determining, by the computing system, a mix instruction for applying the identified ratios of crosslinking and polymer reagents consistent with the received one
20 or more application variables; and

upon receipt of a user selection, dispensing, by the vending machine device, a container of crosslinking reagent and a container of polymer reagents in accordance with a volume corresponding to the determined mix instruction.

25 19. The method as recited in claim 18, further comprising:

receiving the local environmental data over a network connection from one or more environmental sensors connected to the network;

wherein the one or more environmental sensors provide temperature and/or humidity data relevant to the coating application area.

30

20. The method as recited in claim 18 or 19, wherein:

the one or more application variables from the end-user comprise physical appearance of the applied coating on the object; and

the physical appearance comprises one or more of gloss, or smoothness of the applied coating on the object.

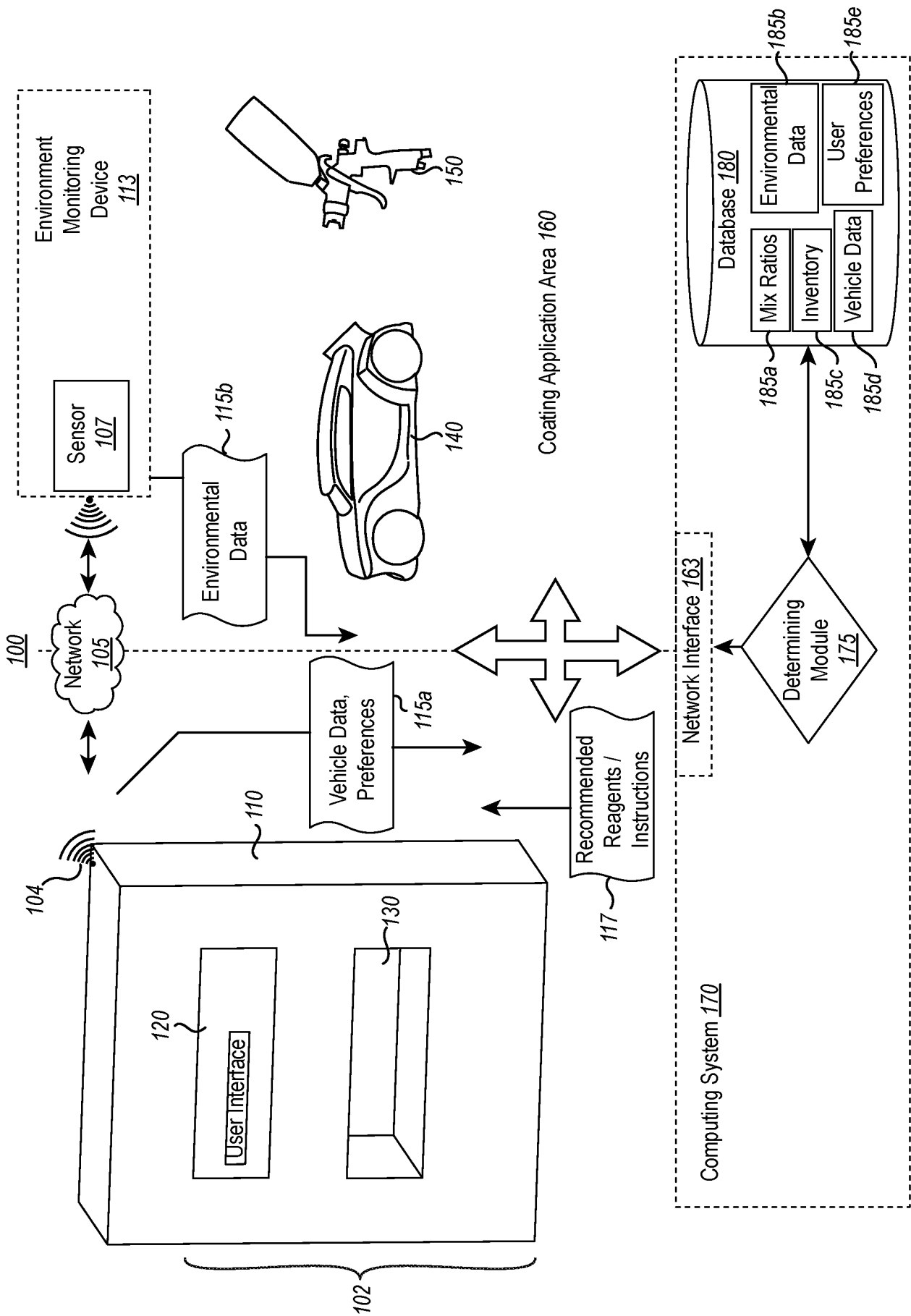


FIG. 1

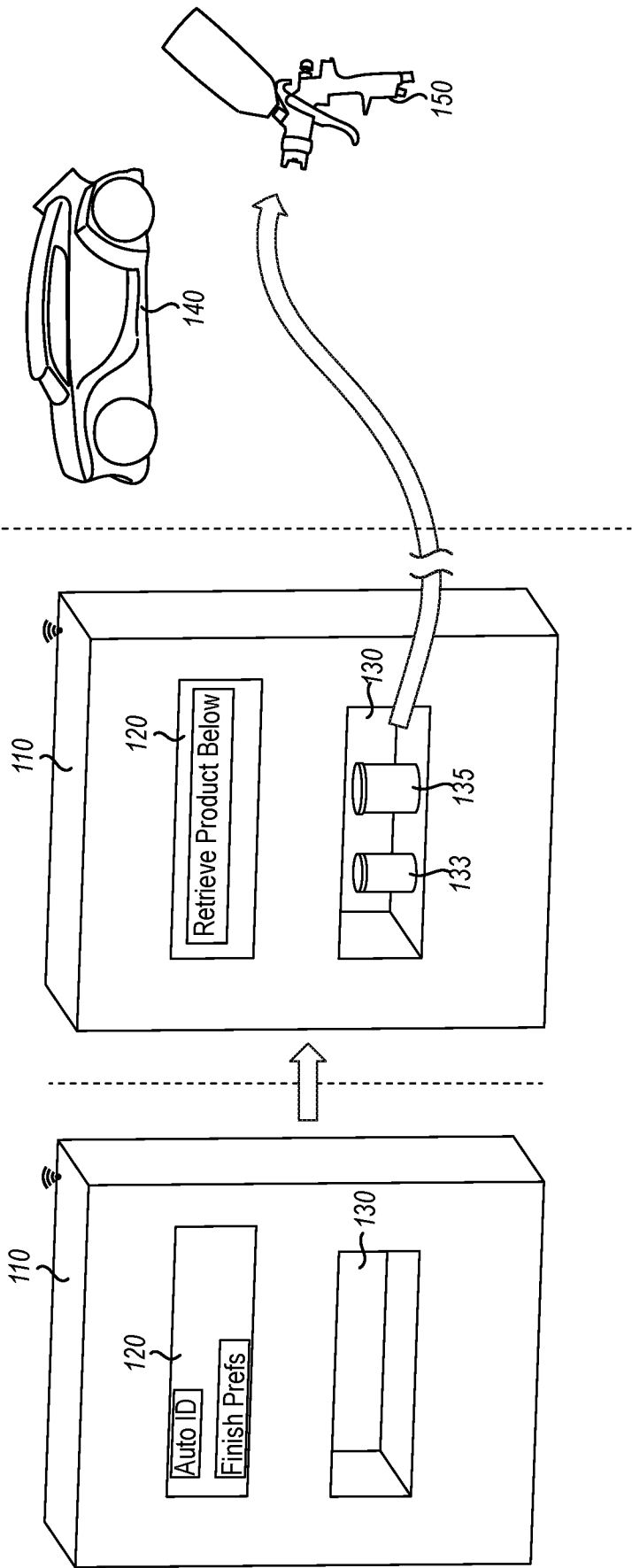


FIG. 2B

FIG. 2A

FIG. 2C

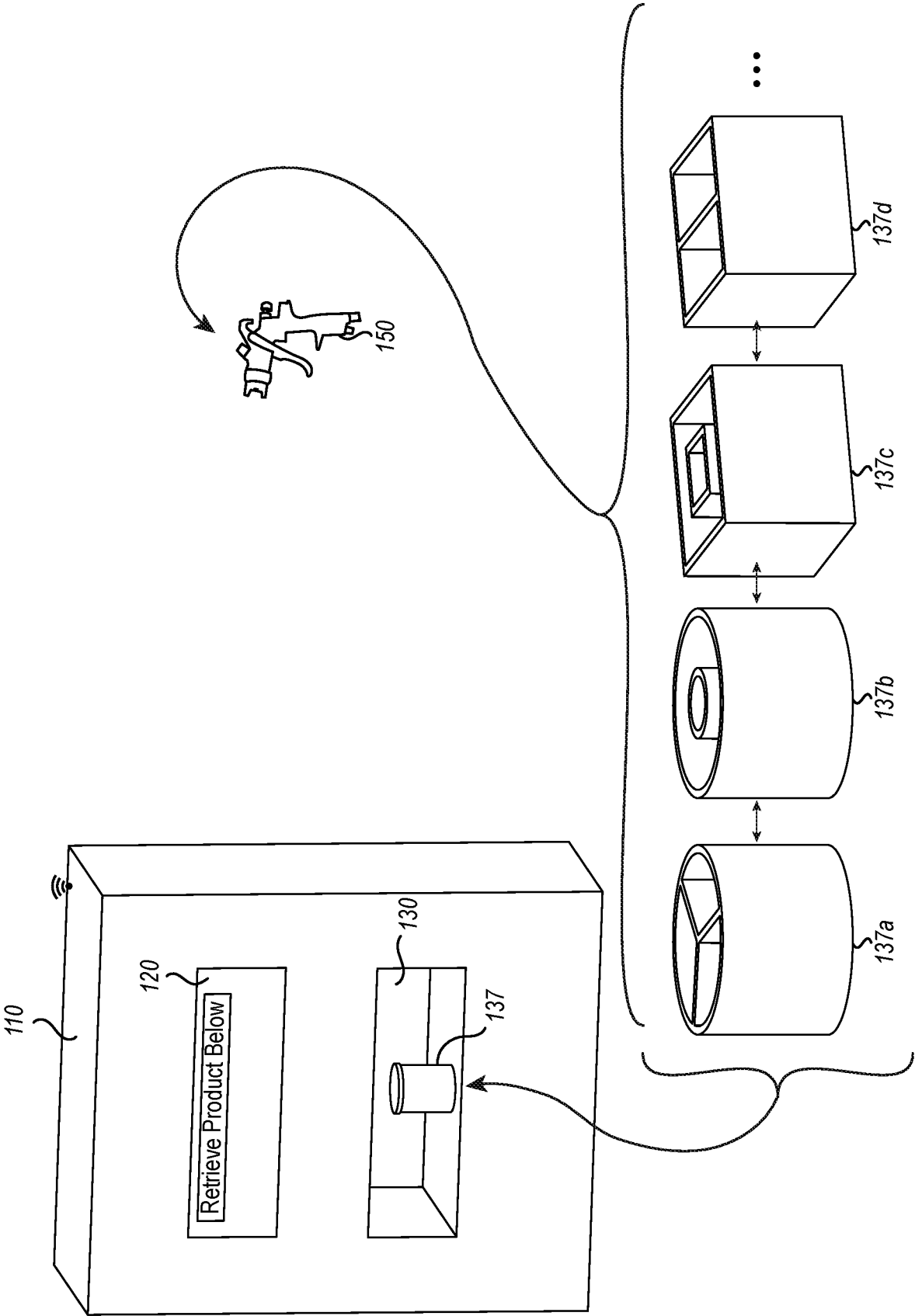


FIG. 3

4 / 5

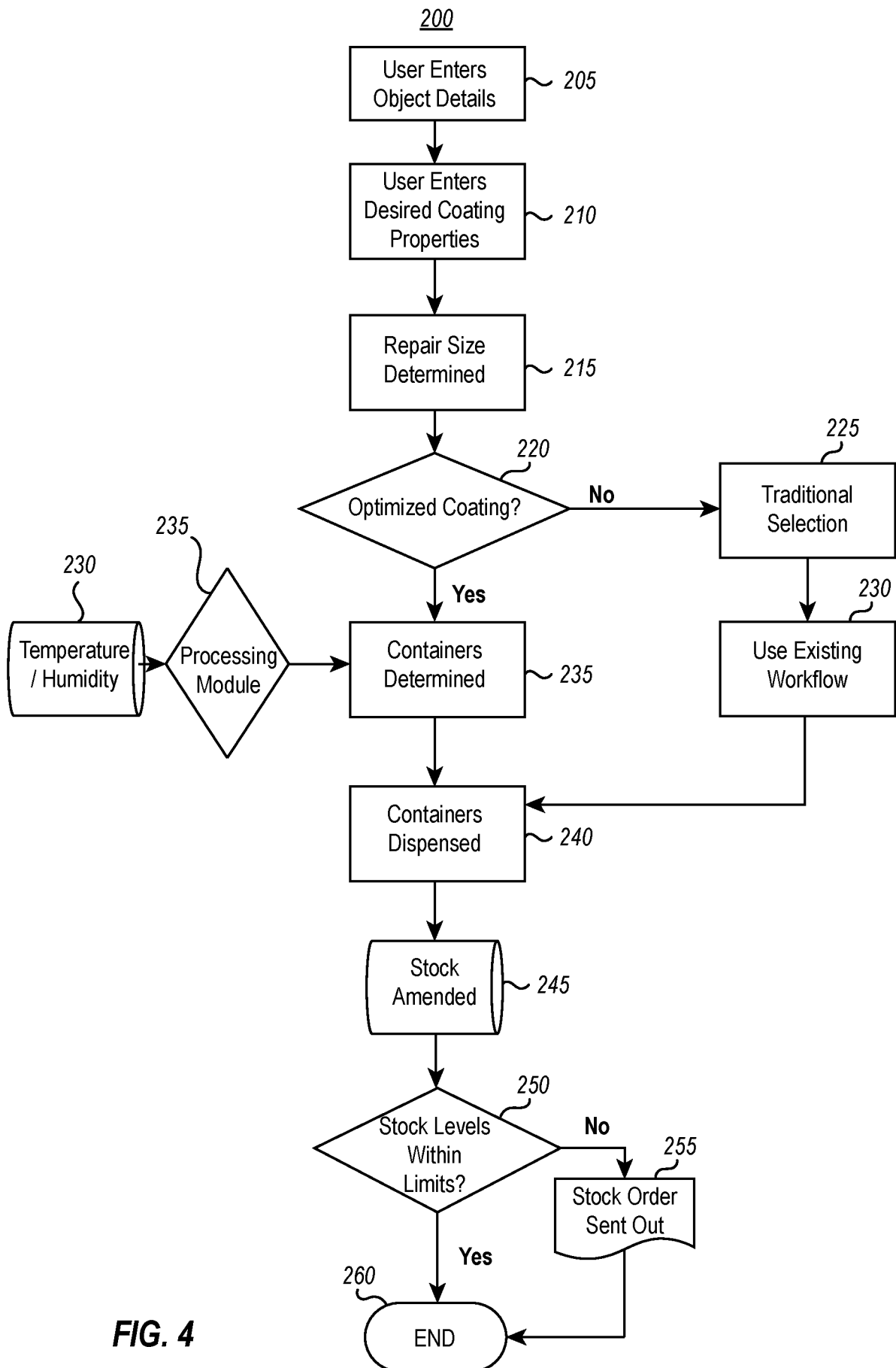
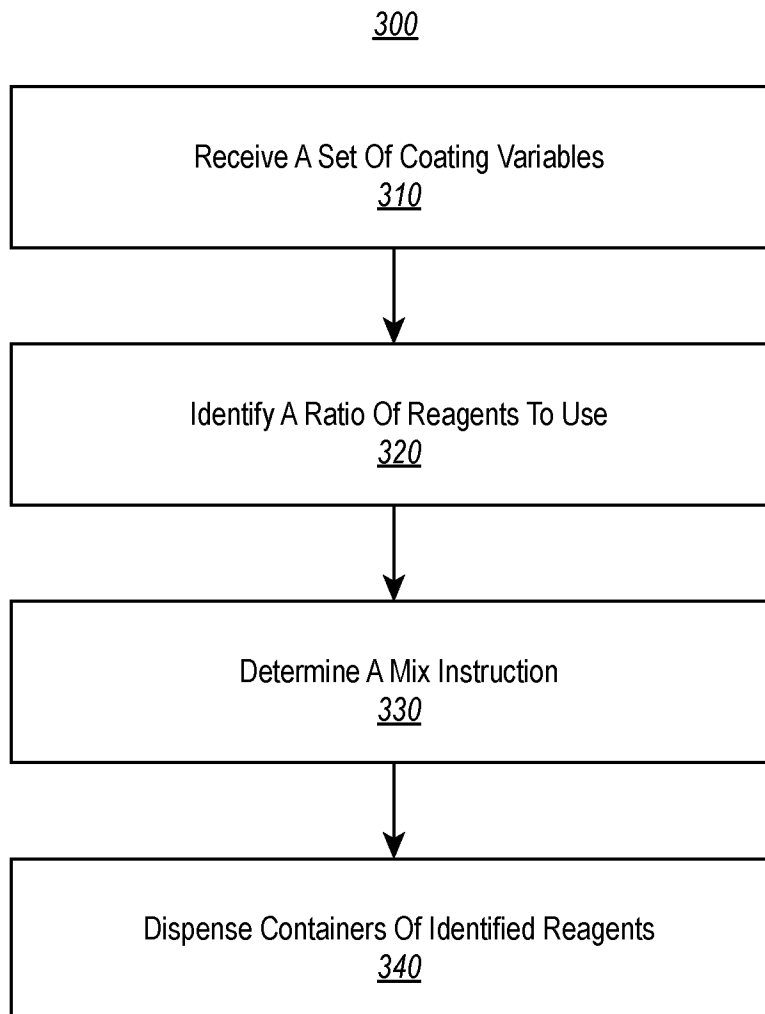


FIG. 4

5 / 5

**FIG. 5**

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2024/031341

A. CLASSIFICATION OF SUBJECT MATTER INV. G07F13/02 G07F13/06 G07F13/10 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) G07F Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO - Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2019/200733 A1 (THIEBAUT GERALDINE [FR] ET AL) 4 July 2019 (2019-07-04) paragraphs [0010], [0020], [0024], [0058], [0069]; figures 1,4 -----	1 - 20
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 2 July 2024		Date of mailing of the international search report 10/07/2024
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Verhoef, Peter

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2024/031341

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