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Boers

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[54] **SEMI-AUTOMATED SYSTEM FOR DISPENSING AUTOMOTIVE PAINT**

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[51] **Int. Cl.**[7] **B65B 1/30**

[52] **U.S. Cl.** **141/83**; 141/18; 141/100; 141/104; 141/192; 141/247; 141/284; 222/160; 222/164; 222/166; 222/504; 177/60

[58] **Field of Search** 141/18, 83, 100, 141/104, 192, 196, 247, 284, 391; 222/77, 160, 164, 166, 504; 177/60, 61, 64; 251/62, 63.4

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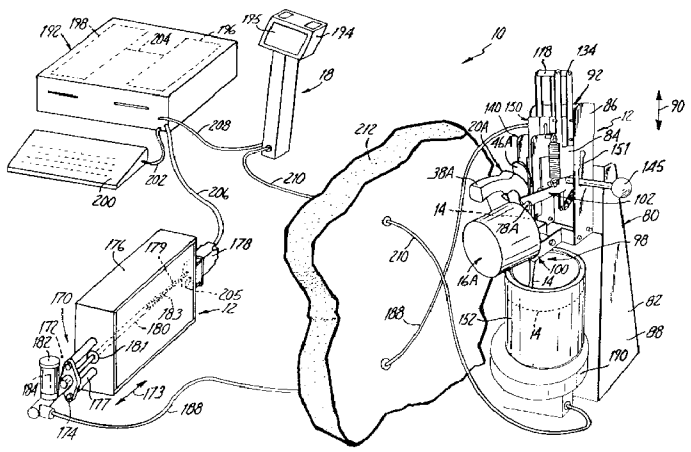
[57] **ABSTRACT**

A system for dispensing liquid paint components from their original containers into a paint receptacle according to a paint formula to form a liquid paint mixture. The dispensing system comprises a dispensing apparatus for dispensing the liquid paint component from its original container, and an apparatus for controlling the dispensing apparatus. The dispensing apparatus includes a mechanism for releasably receiving the original container of the liquid paint component, and a mechanism for dispensing the liquid paint component from its original container into the paint receptacle. The control apparatus includes a weigh cell and a control module coupled to the weigh cell and the dispensing mechanism. The weigh cell supports the paint receptacle to determine the weight of the liquid paint component dispensed into the paint receptacle. The control module controls the amount of the liquid paint component dispensed from its original container into the receptacle based upon information obtained from the weigh cell. The dispensing system virtually eliminates liquid paint component dispensing errors, thereby enhancing the efficiency of the dispensing system operator.

56 Claims, 8 Drawing Sheets



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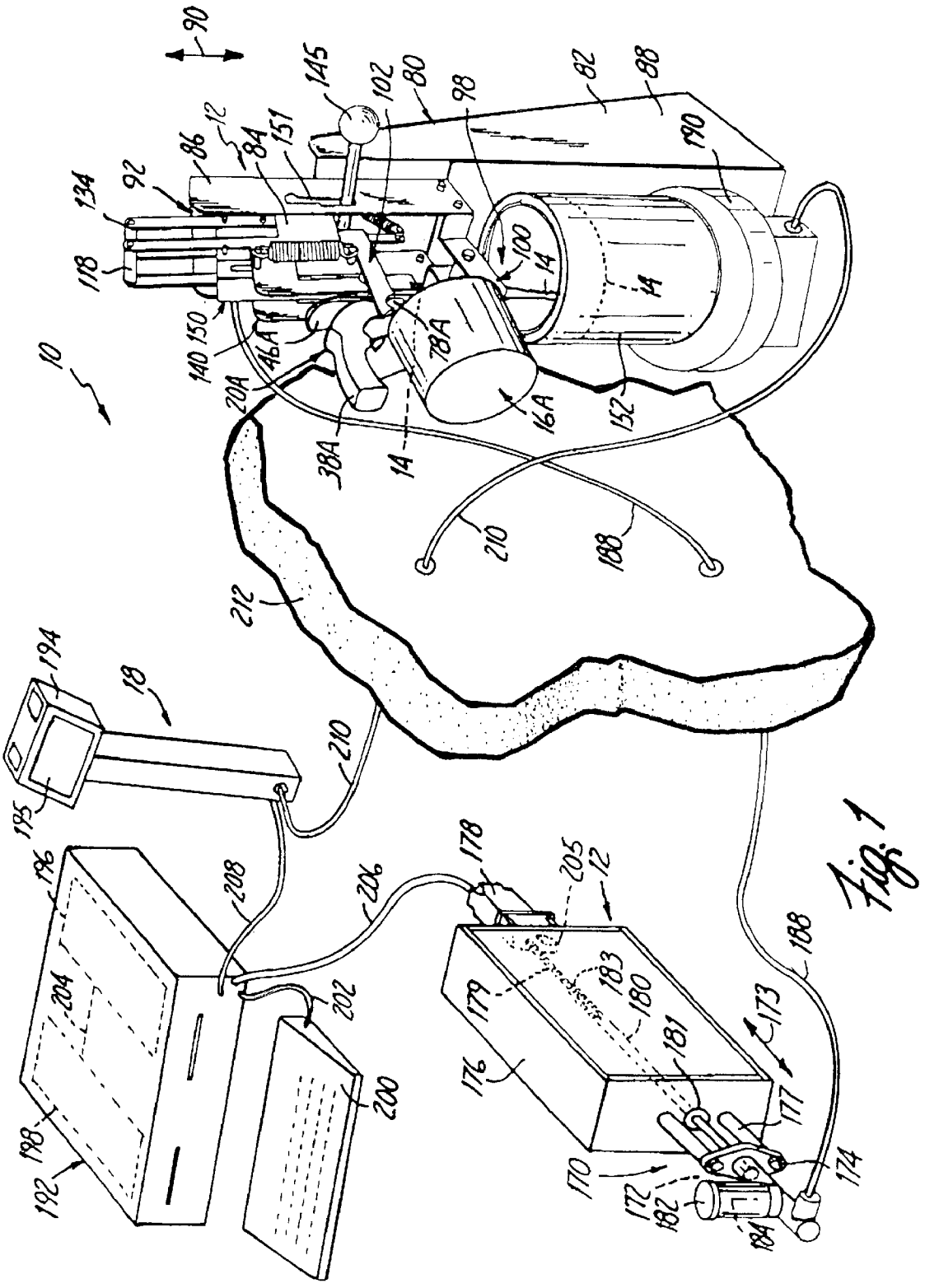
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Fig. 1

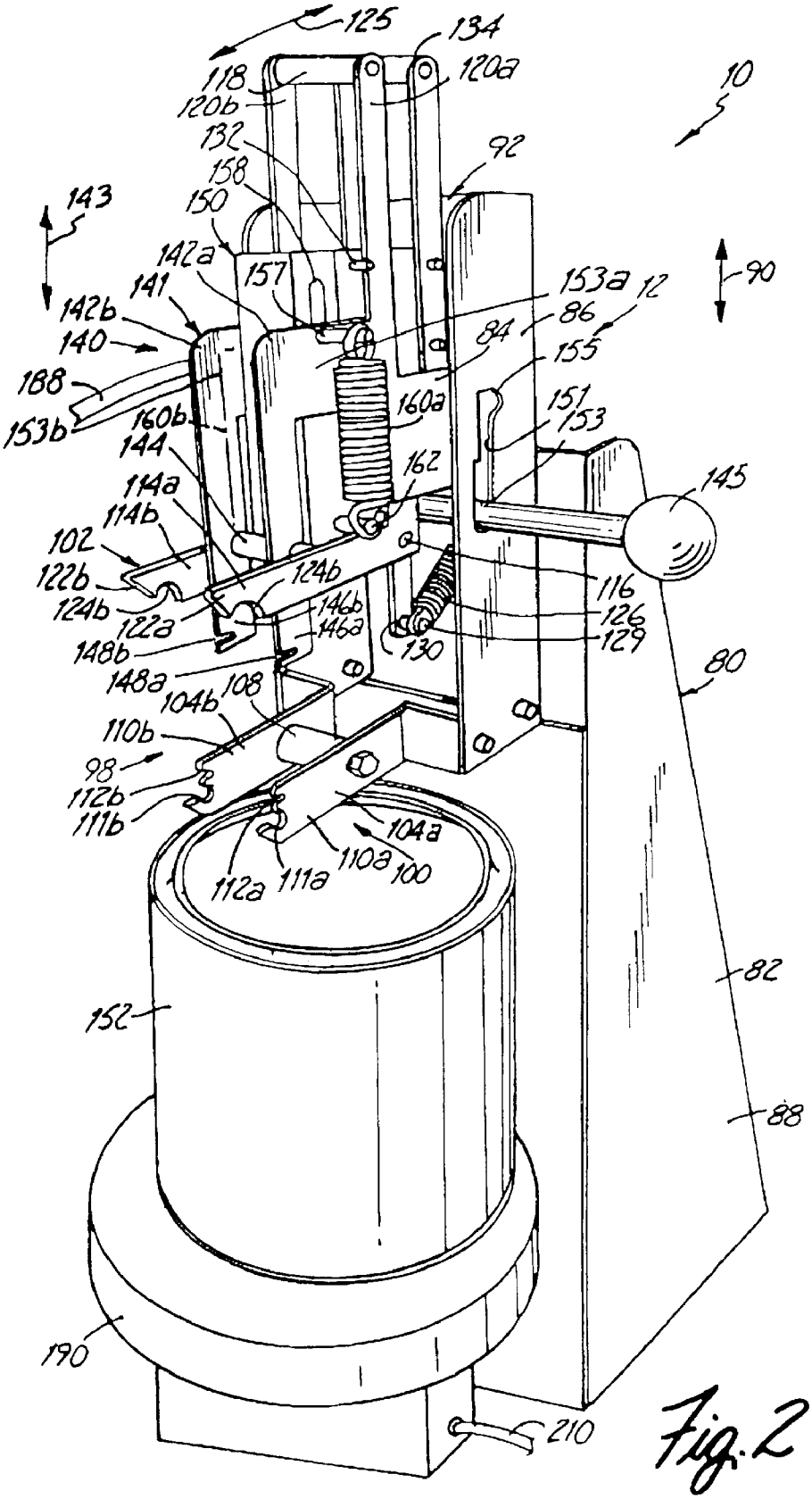
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Fig. 2

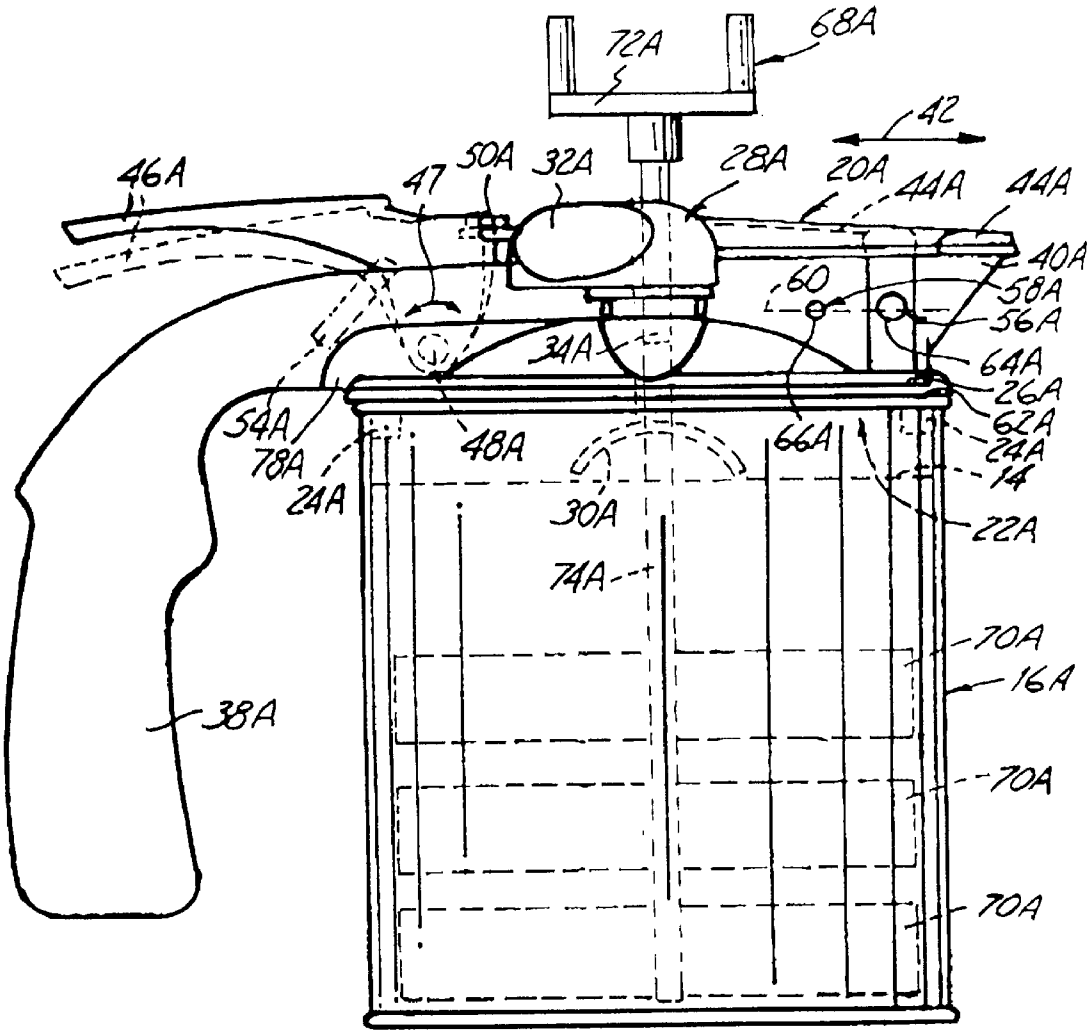
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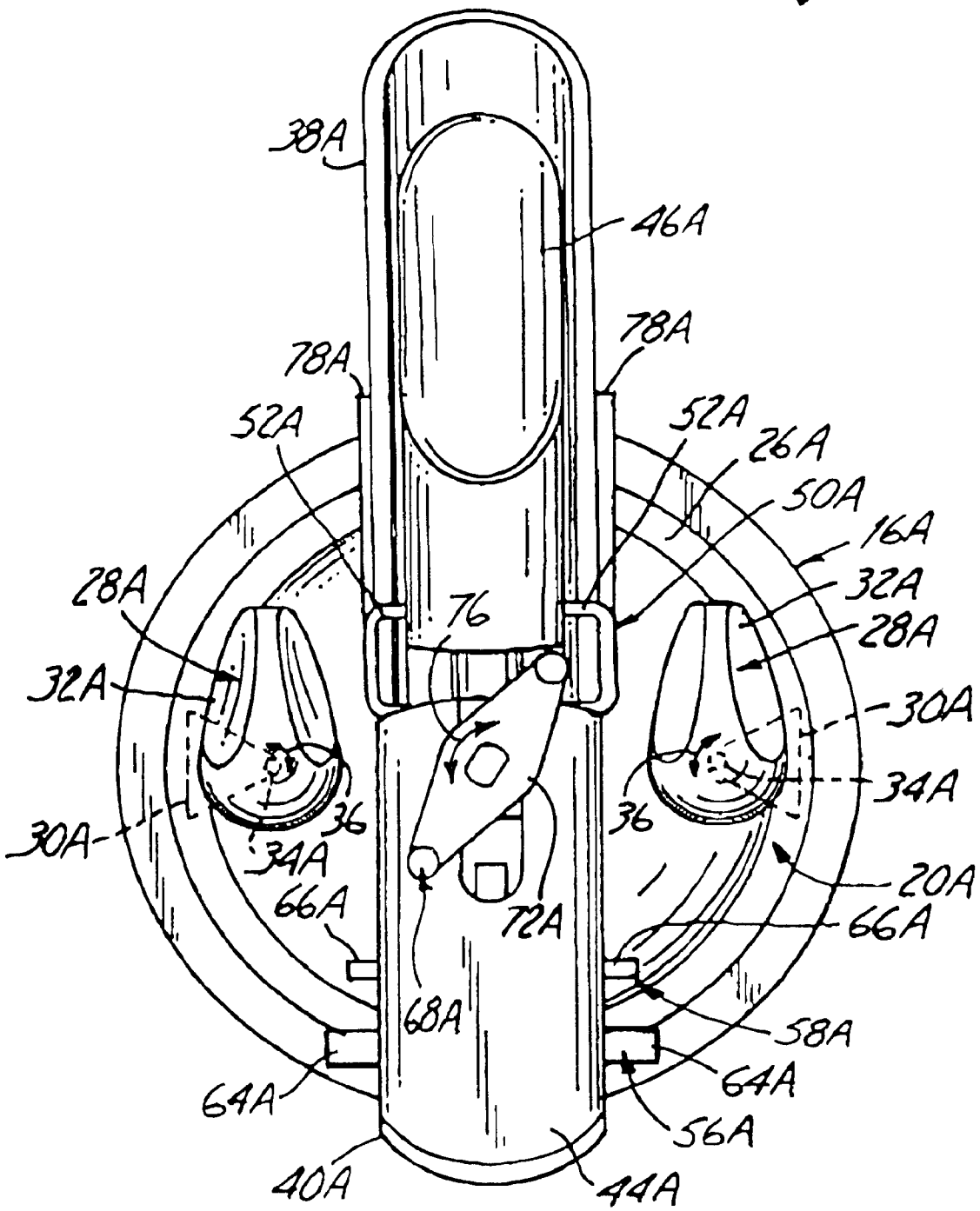
Fig. 3

Fig. 4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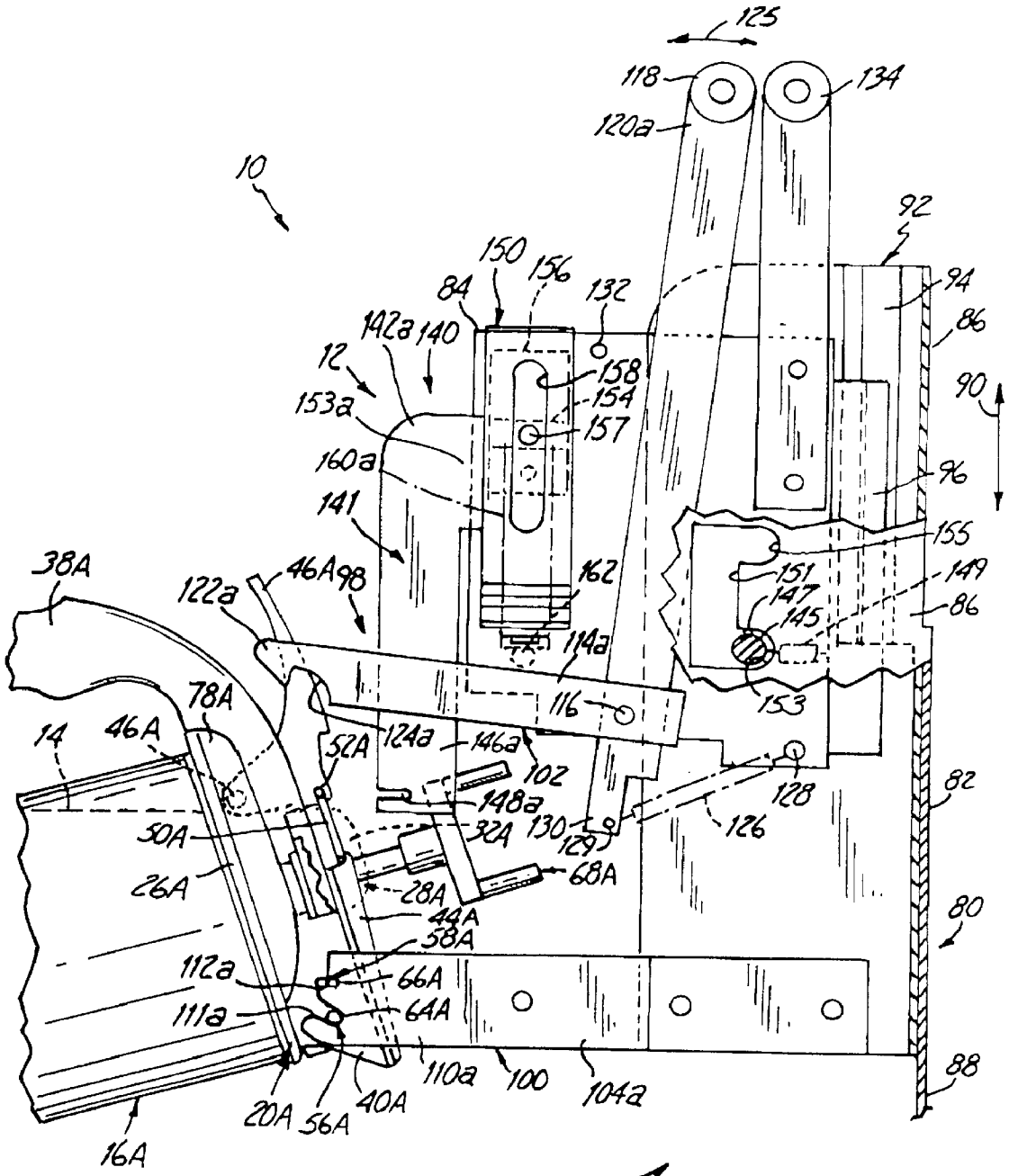
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Fig. 5

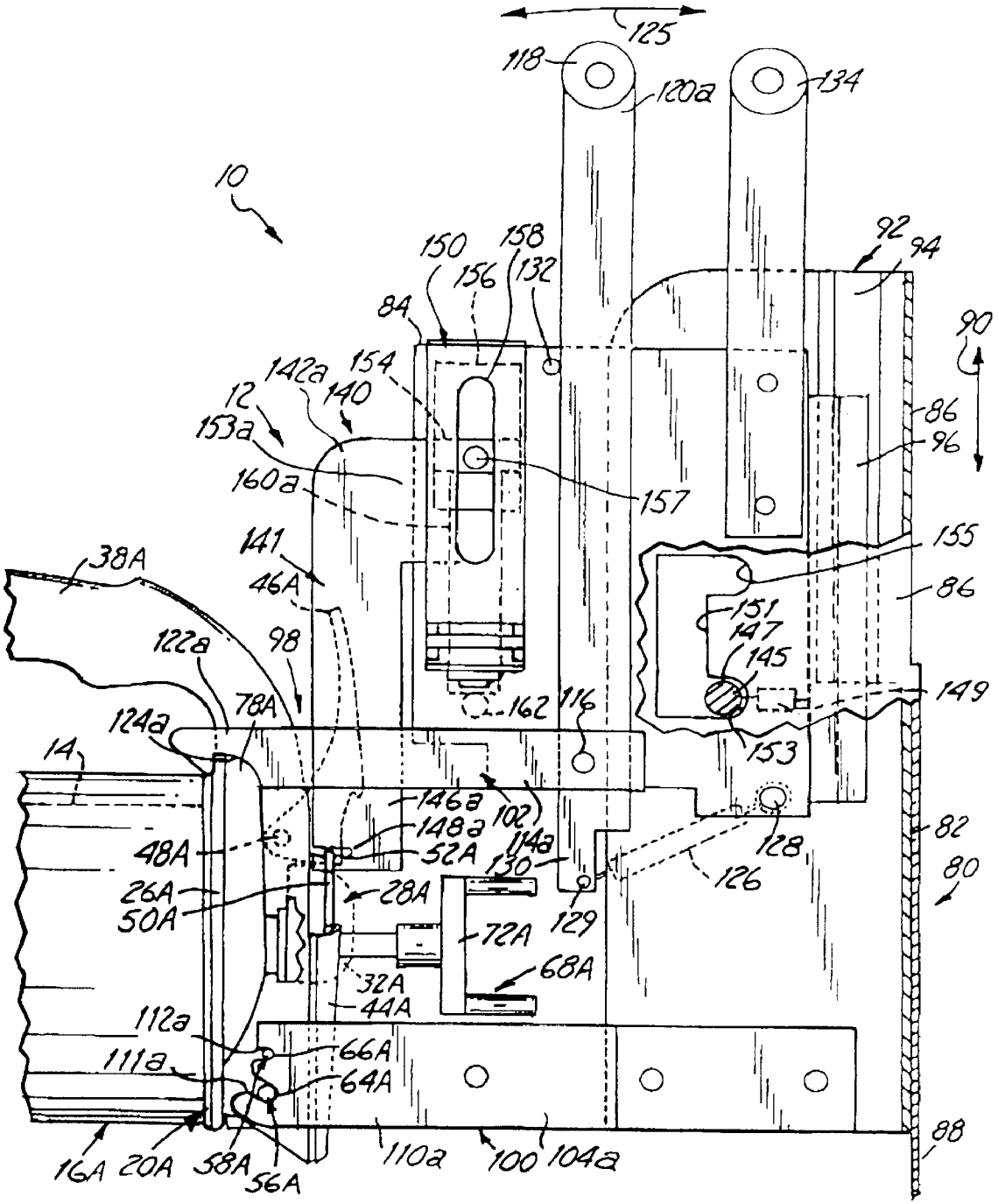
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Fig. 6

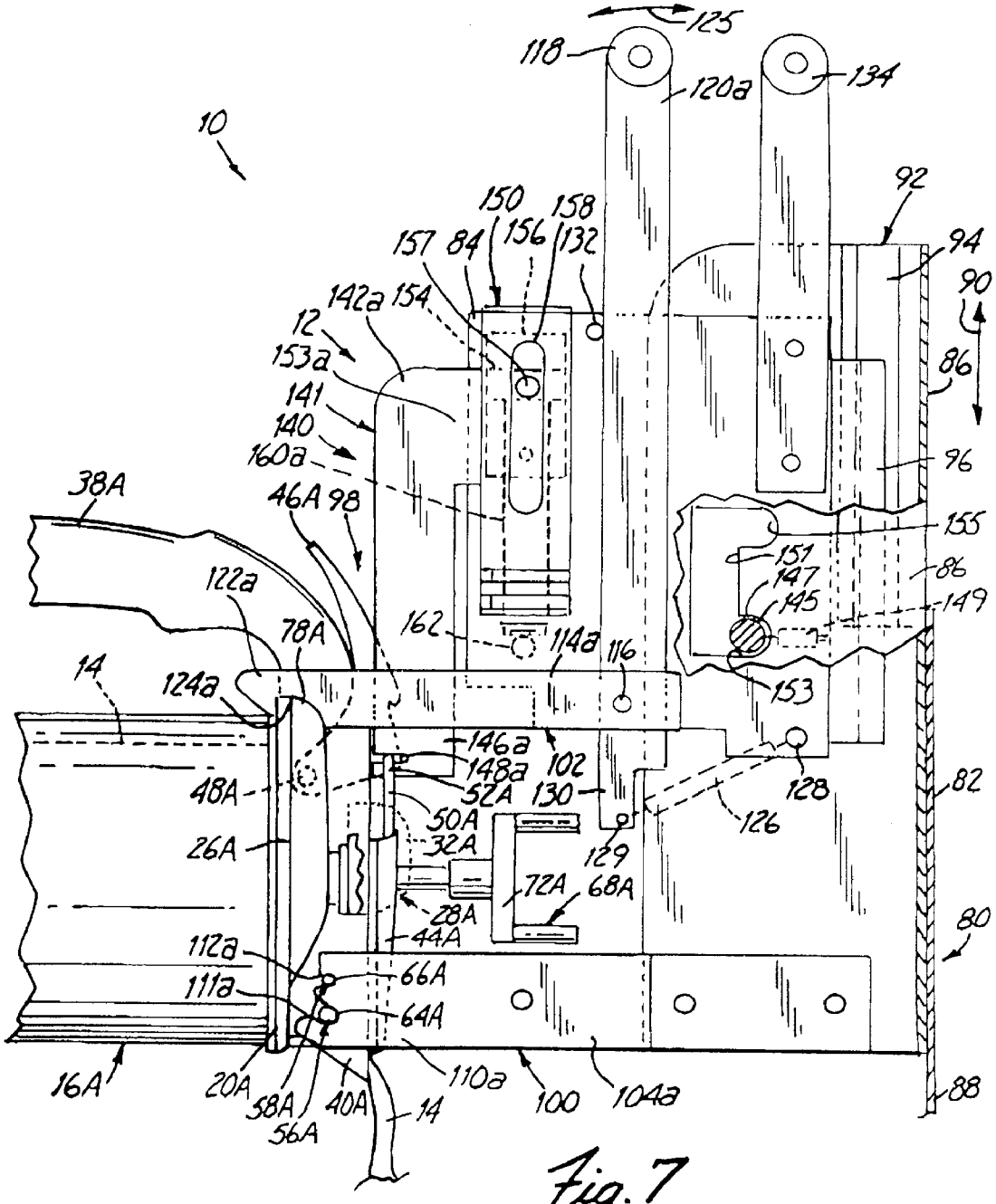
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Fig. 7

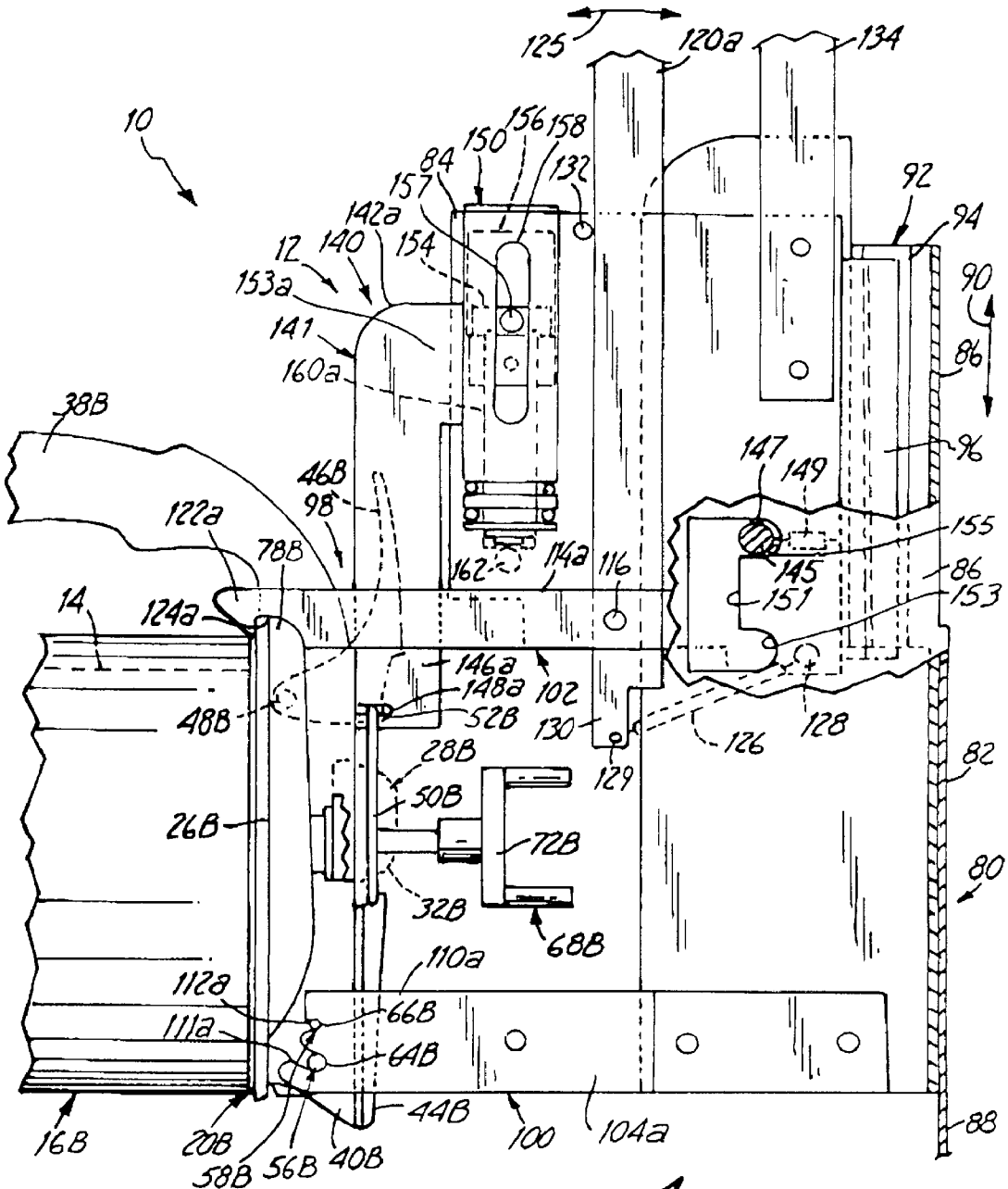
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Fig. 8

SEMI-AUTOMATED SYSTEM FOR DISPENSING AUTOMOTIVE PAINT

TECHNICAL FIELD

This invention relates to mixing paint components, such as colorants, tints and pearls, according to automotive paint formulas. In particular, the present invention is semi-automated system for dispensing paint components, according to a desired paint formula, that does not require a system operator to manually dispense measured quantities of the paint components.

CROSS REFERENCE TO RELATED APPLICATIONS

This patent application is related to U.S. patent application Ser. No. 09/189,338, entitled "Paint Container Lid for a Semi-Automated Automotive Paint Dispensing System" filed on even date herewith, assigned to the same assignee, and incorporated herein by reference thereto.

BACKGROUND OF THE INVENTION

In the automotive body repair industry, paint vendors provide auto body repair businesses, such as body shops and jobbers, with their paint formulas. Generally, these paint formulas are a composition (i.e., mixture) of paint components, such as colorants, tints, pearls, metallics, binders and/or balancers, that, once mixed, produce the desired color of paint to be applied to a repaired vehicle. The paint formulas of the paint vendors are formulated to match the colors that have been applied to vehicles by new car manufacturers over the years. In addition, these paint formulas contain variants, to match the color fading of paint that can occur to a vehicle over years of service. Moreover, the palettes of paint formulas of the paint vendors also contain custom colors (i.e., unconventional colors not typically used by vehicle manufacturers) that may be used to produce special finishes for custom or show cars. Hence, paint vendors provide body shops and jobbers with literally thousands of paint formulas for producing the vast spectrum of colors needed in the automotive body repair industry.

In the past, paint vendors would provide the body shops and jobbers with microfiche containing their paint formulas. Today the paint formulas are stored in computer memory. To determine the particular paint formula for a particular vehicle repair/paint job, a system operator, such as an employee of the body shop or jobber, first obtains the color code from the vehicle. This color code is typically part of the vehicle's identification number. In the case of an unconventional color, to be used to produce a custom paint finish, the code for a particular color is obtained from a catalog. This color code is then entered into the microprocessor of the computer, which accesses the computer memory, and displays, via a monitor, the paint vendor's paint formula which matches the identified vehicle color code.

The paint formulas are displayed according to the weight of the different paint components for mixing specific quantities of the paint formula, and the order in which the displayed paint components are to be mixed. Typically, paint formula mixing quantities are listed in quart, half gallon and gallon sizes, while the weight of the particular paint components needed to mix the desired quantity of paint, are listed in grams to a precision of a tenth of a gram. Generally, the paint components comprising tints, colorants, pearls and/or metallics are mixed first, while the paint components comprising binders and/or balancers are added last. Depending on the desired color, the paint formula can require just a few paint components, or over a dozen paint components, that must be mixed with a great degree of precision, to achieve a perfect color match.

Once the system operator determines that the correct desired paint formula is displayed on the computer monitor, the operator places a paint receptacle on a weigh cell that is linked to the microprocessor of the computer. Generally, a receptacle larger than the quantity of the paint formula to be mixed is used to accommodate any excess paint inadvertently mixed by the operator. With the receptacle on the weigh cell, the weigh cell is zeroed by the operator, to make ready for the process of adding paint components to the receptacle to mix the desired color paint formula. Typically, the various paint components (of which there are dozens) are stored in containers kept within a rack. The rack has a mechanism that periodically stirs the paint components within the containers, so that the various paint components are ready to be dispensed as part of the paint formula mixing process. The system operator then locates the first listed paint component, of the paint formula to be mixed, and pours, by hand, the paint component into the weigh cell supported paint receptacle, until the weight of the paint component dispensed (i.e., poured) to the receptacle matches what is displayed on the computer monitor. The operator continues along on this course (i.e., hand pouring the paint components from their containers), until the correct weight of all paint components, needed to mix the desired color paint formula, have been added to the paint receptacle atop the weigh cell.

Although the above described system for mixing paint components, according to a paint formula, allows a skilled system operator to adequately recreate paint colors needed for repair/paint jobs, there are some disadvantages to this system. For example, to mix a desired paint formula requires that the paint components be added to the paint receptacle, atop the weigh cell, with a great degree of accuracy. This accuracy, as stated earlier, is typically to a precision of 0.1 grams. For even a highly skilled operator this great degree of precision is difficult to obtain when hand pouring the paint components needed to mix the desired paint formula. It is especially difficult when many paint components must be poured into the paint receptacle in order to duplicate the paint formula.

The most common error on the part of the system operator of the body shop or jobber is over pouring, which is due primarily to the manual labor intensive nature of the paint component dispensing process. Over pouring occurs when the weight of the paint component added to the receptacle atop the weigh cell, exceeds the weight of the component shown on the computer display for the desired paint formula. When this happens, the microprocessor of the computer recalculates the weights of the other paint components that need to be added to the receptacle to compensate for the over poured component. This recalculation is done automatically by the microprocessor since the weigh cell is linked to the computer. Based upon this recalculation, the system operator then needs to re-pour the other paint components to offset the over poured component of the paint formula.

While this re-pouring task may not be difficult when the paint formula only has a few paint components, the re-pouring task is particularly time consuming when there is a great number of components in the paint formula. Specifically, if an over pouring error is made in the last paint component of a series of ten components of a paint formula, then all of the previous nine components may have to be re-poured to compensate. This re-pouring task may be

further complicated if another error is made during the re-pouring of the paint components as it may require some components to be re-poured two or three times until the paint formula is finally accurately reproduced. Hence, over pouring errors can be costly to a body shop or jobber because of the additional man hours needed to accurately mix the paint formula.

Not only are over pouring errors expensive because of the additional man hours needed to reproduce the paint formula, over pouring errors arc also costly in the amount of additional paint formula that is mixed because of the errors. Automotive paint can cost in excess of $100.00 per quart. An over pouring error of just one pint may translate into an additional cost of $50.00 that a body shop or jobber may have to absorb, unless this additional paint cost can be justified to an automobile collision insurance carrier. Moreover, this additional paint, if not used in the repair/paint job, becomes a hazardous waste that must be disposed of properly, thereby adding still more costs that are attributable to paint component over pouring errors.

There is a need for an improved system for dispensing paint components according to a paint formula. In particular, there is a need for a system for dispensing paint components of a paint formula that substantially eliminates system operator errors, specifically over pouring errors, that can be costly to a body shop or jobber. The paint component dispensing system should be easy to use, so as not to require a highly skilled operator, and should make better use of an operator's time to allow an operator to mix a greater number of paint formulas during a work day. In addition, the paint component dispensing system should comply with all regulations and laws governing the handling and mixing of paint components for the duplication of automotive paint formulas.

SUMMARY OF THE INVENTION

The present invention is a system for dispensing pourable components, such as liquid paint components, from their original containers into a receptacle according to a formula to form a mixture of pourable components, such as a liquid paint mixture. The dispensing system comprises a dispensing apparatus for dispensing the liquid paint component from its original container, and an apparatus for controlling the dispensing apparatus. The dispensing apparatus includes a support frame, a mechanism coupled to the support frame for releasably receiving the original container, and a mechanism coupled to the support frame for dispensing the liquid paint component from its original container into a receptacle, such as a paint receptacle. The control apparatus includes a weigh cell and a control module coupled to the weigh cell and the dispensing mechanism. The weigh cell supports the paint receptacle to determine the weight of the liquid paint component dispensed into the paint receptacle. The control module controls the amount of the liquid paint component dispensed from its original container into the receptacle based upon information obtained from the weigh cell.

The dispensing mechanism of the dispensing apparatus includes an operating device for releasably engaging a movable cover element of the original container of the liquid paint component. The operating device is movable between a first position and a second position. In the first position, the cover element is in a closed state and the liquid paint component is prevented from being dispensed from the original container. In the second position, the cover element is in an opened state and the liquid paint component is dispensed from the original container and into the paint receptacle. The support frame of the dispensing apparatus includes a main support structure and an ancillary support structure that is movable relative to the main support structure. The mechanism for releasably receiving the original container includes first and second mechanisms for engaging first and second portions of the original container of the paint component. The first and second engaging mechanisms are mounted to the main and ancillary support structures, respectively. The ancillary support structure is movable between a primary position and a secondary position. In the primary position, the first and second engaging mechanisms receive a quart size of the original container of the liquid paint component. In the secondary position, the first and second engaging mechanisms receive a gallon size of the original container of the liquid paint component.

This semi-automated dispensing system, for dispensing liquid paint components from their original containers according to a paint formula to form a liquid paint mixture, virtually eliminates system operator errors, in particular over pouring errors, that can be costly to a body shop or jobber. The semi-automated dispensing system is easy to use, and does not require a highly skilled operator, since operator interface with the dispensing system is substantially limited to identifying the desired paint formula, and loading and unloading the proper containers of the liquid paint components to and from the dispensing apparatus. In the semi-automated dispensing system of the present invention, the operator need no longer manually pour the paint components from their containers. The control module controlled dispensing mechanism of the semi-automated dispensing system automatically dispenses (i.e., pours) the liquid paint components from their containers, thereby ensuring a highly accurate, precision liquid paint component pour. In addition, the paint dispensing system makes efficient use of the operator's time, since the operator is free to perform other duties instead of holding the containers and performing the task of manually pouring the proper amounts of the liquid paint components. This efficiency gain allows the operator to mix a greater number of paint formulas during a work day. Lastly, the semi-automated dispensing system of the present invention complies with all regulations and laws, such as being explosion protected, governing the handling and mixing of liquid paint components for the duplication of automotive paint formulas.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are included to provide a further understanding of the present invention and are incorporated in and constitute a part of this specification. The drawings illustrate the embodiments of the present invention and together with the description serve to explain the principals of the invention. Other embodiments of the present invention and many of the intended advantages of the present invention will be readily appreciated as the same become better understood by reference to the following detailed description when considered in connection with the accompanying drawings, in which like reference numerals designate like parts throughout the figures thereof, and wherein:

FIG. **1** is a perspective view illustrating a dispensing and control apparatus of a semi-automated system for dispensing liquid paint components from their original containers in ac dance with the present invention.

FIG. **2** is a enlarged perspective view better illustrating the dispensing apparatus of the dispensing system of FIG. **1**.

FIG. **3** is a side elevational view of a quart size original paint container and lid member for holding a liquid paint component.

FIG. **4** is top elevational view of the paint container and lid member shown in FIG. **3**.

FIG. **5** is partial side elevational view with some parts omitted for clarity of the dispensing apparatus of FIGS. **1** and **2**, illustrating a quart size original container of a paint component being loaded into/unloaded from the dispensing apparatus.

FIG. **6** is partial side elevational view with some parts omitted for clarity similar to FIG. **5**, illustrating the quart size original container ready for dispensing of the liquid paint component.

FIG. **7** is partial side elevational view with some parts omitted for clarity similar to FIG. **6**, illustrating the liquid paint component being dispensed from its quart size original container.

FIG. **8** is partial side elevational view with some parts omitted for clarity similar to FIG. **6**, illustrating a gallon size original container ready for dispensing of a liquid paint component.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A semi-automated dispensing system **10** for dispensing liquid paint components according to a paint formula to form a liquid paint mixture in accordance with the present invention is illustrated generally in FIGS. **1** and **2**. The dispensing system **10** generally comprises a dispensing apparatus **12** for dispensing a liquid paint component **14** from its original container **16**A and **16**B, and a control apparatus **18** for controlling the dispensing apparatus **12**. FIGS. **1**, **3**–**7** show the quart size original container **16**A having a lid member **20**A, while FIG. **8** illustrates the gallon size original container **16**B having a lid member **20**B. The containers **16**A and **16**B (without the lid members **20**A and **20**B) are typical metal vessels within which liquid paint components **14**, such as tints, colorants, pearls, metallics, binders and balancers (used to mix automotive paint according to a paint formula) are shipped from a liquid paint component manufacturer to customers, such as body shops and jobbers. Beyond their size differences, the quart size and gallon size containers **16**A and **16**B and lid members **20**A and **20**B are substantially identical, therefore only the quart size original container **16**A and lid member **20**A will be described with particularity.

As seen best in FIGS. **3** and **4**, the original container **16**A is cylindrical shaped having an open top **22**A defined by a circumferential lip **24**A. The lid member **20**A includes a base portion **26**A adapted to engage and seal the open top **22**A of the container **16**A to protect the liquid paint component **14** within the container **16**A. The base portion **26**A of the lid member **20**A includes a pair of spaced, pivotable cam lock mechanisms **28**A that are used to releasably secure the lid member **20**A to the original container **16**A. Each of the cam lock mechanisms **28**A is defined by a cam element **30**A connected to a cam actuator **32**A by way of a post member **34**A. Pivotally moving the cam actuators **32**A by hand, as represented by double headed arrow **36**, moves the cam elements **30**A into and out of engagement with the lip **24**A to secure and release the lid member **20**A from the original container **16**A.

The lid member **20**A further includes a handle **38**A, for easy handling of the original container **16**A when the lid member **20**A is secured thereto, and a liquid paint component pour spout **40**A. The pour spout **40**A is covered by a linearly movable, as represented by double headed directional arrow **42**, cover element **44**A. The cover element **44**A is linearly movable between a closed state (shown in solid lines in FIG. **3**) and an opened state (shown in dashed lines in FIG. **3**). In the closed state of the cover element **44**A, the liquid paint component **14** is prevented from being poured (i.e., dispensed) from the original container **16**A through the pour spout **40**A. In the opened state of the cover element **44**A, the liquid paint component **14** can be poured from the original container **16**A through the pour spout **40**A by tilting the container **16**A using the handle **38**A.

As seen in FIG. **3**, the cover element **44**A is movable between its closed and opened states via a thumb actuator **46**A that is pivotally secured to the base portion **26**A by way of a pivot pin **48**A. The thumb actuator **46**A is pivotally movable as shown by double headed directional arrow **47**. As seen best in FIG. **4**, the thumb actuator **46**A is connected to the cover element **44**A via a wire loop **50**A. The wire loop **50**A includes end edges **52**A (FIG. **4**), the purpose of which will become clear below. When the thumb actuator **46**A is positioned as shown in solid lines in FIG. **3**, the cover element **44**A is in its closed state. The thumb actuator **46**A is biased to this normal position by a spring element **54**A (FIG. **3**) that acts between the base portion **26**A and the thumb actuator **46**A. When the thumb actuator **46**A positioned as shown in dashed lines in FIG. **3**, the cover element **44**A is in its opened state. The cover element **44**A is moved, from its closed state to its opened state, through the connecting wire loop **50**A by pivoting the thumb actuator **46**A about the pivot pin **48**A against the bias of the spring element **54**A. The cover element **44**A is allowed to return to its closed state from the opened state by simply releasing the thumb actuator **46**A.

As seen best in FIG. **4**, the lid member **20**A further includes a first and second spaced alignment rods **56**A and **58**A, respectively, positioned at a first portion of the lid member **20**A at the pour spout **40**A adjacent to the cover element **44**A. As seen in FIG. **3**, the first and second alignment rods **56**A and **58**A are positioned so as to define a plane **60** that is parallel to an upper surface **62**A of the circumferential lip **24**A of the original container **16**A. The first alignment rod **56**A is longer than and has a diameter greater than the second alignment rod **58**A. Free ends of the first and second alignment rods **56**A and **58**A define first and second pairs of registration lugs **64**A and **66**A, respectively, the purpose of which will become clear below. The first and second alignment rods **56**A and **58**A are mounted to the lid member **20**A by first drilling holes for the alignment rods **56**A and **58**A at the pour spout **40**A. The first and second alignment rods **56**A and **58**A are then press fit into the drilled holes.

As seen best in FIG. **3**, the lid member **20**A further includes a stirring device **68**A for stirring the liquid paint component **14** within the original container **16**A. The stirring device **68**A includes a plurality of paddles **70**A connected to a paddle actuator **72**A by way of a shaft member **74**A. Rotating the paddle actuator **72**A, as represented by double headed directional arrow **76** (FIG. **4**), causes rotation of the paddles **70**A and stirring of the liquid paint component **14**. The paddle actuator **72**A is driven (i.e., rotated) by a stirring mechanism (not shown) that is part of a storage rack (not shown) for holding various original containers **16**A of liquid paint components **14**.

Lastly, as seen best in FIG. **4**, the base portion **26**A of the lid member **20**A includes a pair of spaced latch lugs **78**A positioned at a second portion of the lid member **20**A to

either side of the thumb actuator **46**A. The purpose of these latch lugs **78**A will become clear below.

As seen best in FIGS. **1** and **2**, the dispensing apparatus **12** of the dispensing system **10** includes a support frame **80** defined by a main support structure **82** and an ancillary support structure **84**. The main support structure **82** has an upper portion **86** that is rigidly fixed to a lower portion **88**. The ancillary support structure **84** is linearly movable, as represented by double headed directional arrow **90**, relative to the upper portion **86** of the main support structure **82** via a slide mechanism **92**. As seen best in FIG. **5**, in one preferred embodiment, the slide mechanism **92** includes a channel member **94** on the upper portion **86** of the main support structure **82** that slidably receives a T-shaped slide member **96** on the ancillary support structure **24**. However, the slide mechanism **92** can comprise other shaped slide components as long as the components permit linear movement of the ancillary support structure **84** relative to the main support structure **82** along directional arrow **90**.

As seen best in FIGS. **2** and **5**, the dispensing apparatus **12** further includes a receiving mechanism **98** for releasably engaging the original container **16**A, **16**B of the liquid paint component **14**. The receiving mechanism **98** is defined by first and second engaging mechanisms **100** and **102**, respectively.

As seen best in FIG. **2**, the first engaging mechanism **100** includes first and second spaced arms **104***a* and **104***b* rigidly mounted to the upper portion **86** of the main support structure **82**. A bight member **108** rigidly connects together the first and second arms **104***a* and **104***b* near their free ends **110***a* and **110***b*. The free ends **110***a* and **110***b* of the first and second spaced arms **104***a* and **104***b* include first registration notches **111***a* and **111***b*, and second registration notches **112***a* and **112***b*. The first registration notches **111***a* and **111***b* are adapted to releasably receive (i.e., engage) the registration lugs **64**A of the first alignment rod **56**A for the lid member **20**A. The second registration notches **112***a* and **112***b* are adapted to releasably receive (i.e., engage) the registration lugs **66**A of the second alignment rod **58**A for the lid member **20**A. The first registration notches **111***a* and **111***b* are of a different size than the second registration notches **112***a* and **112***b*. This ensures that first registration notches **111***a* and **111***b* and the second registration notches **112***a* and **112***b* receive the correct sized alignment rod **56**A and **58**A, respectively. As seen in FIG. **5**, interengagement of the registration lugs **64**A and **66**A of the alignment rods **56**A and **58**A with the registration notches **111***a*,**111***b*, **112***a*, **112***b*, mounts (i.e., secures) and aligns a first portion of the container **16**A and lid member **20**A combination to the receiving mechanism **98** of the dispensing apparatus **12**.

The second engaging mechanism **102** includes first and second spaced L-shaped arms **114***a* and **114***b* pivotally mounted to the ancillary support structure **84** via a pivot pin **116**. A handle member **118** rigidly connects together the first and second L-shaped arms **114***a* and **114***b* at their first ends **120***a* and **120***b*. Second ends **122***a* and **122***b* of the first and second L-shaped arms **114***a* and **114***b* include latching notches **124***a* and **124***b*. The latching notches **124***a* and **124***b* are adapted to releasably receive (i.e., engage) the latch lugs **78**A of the lid member **20**A for the original container **16**A. The L-shaped arms **114***a* and **114***b* of the second engaging mechanism **102** are pivotally movable as a unit, as represented by double headed arrow **125**, between an unlatched state, wherein the original container **16**A of the liquid paint component **14** can be engaged with and disengaged from the first and second engaging mechanisms **100** and **102** (shown in FIG. **5**); and a latched state, wherein the original container **16**A is securely held between the first and second engaging mechanisms **100** and **102** (shown in FIG. **6**). A tension spring element **126** is coupled between a mounting peg **128** of the ancillary support structure **84** and a mounting peg **129** of an extension arm **130** on the L-shaped arm **114***a*. The tension spring element **126** biases the L-shaped arms **114***a* and **114***b* defining the second engaging mechanism **102** to the latched state against the stop member **132**.

As seen best in FIGS. **2** and **5**, the dispensing apparatus **12** of the dispensing system **10** further includes dispensing mechanism **140** mounted to the ancillary support structure **84** for moving the cover element **44**A of the lid member **20**A between its closed and open states. The dispensing mechanism **140** includes downwardly extending, first and second arms **142***a* and **142***b* that define an operating device **141** linearly movable, as a unit, as represented by double headed directional arrow **143** (FIG. **2**), relative to the ancillary support structure **84**. A bight member **144** rigidly connects together the first and second arms **142***a* and **142***b* near their free ends **146***a* and **146***b*. The free ends **146***a* and **146***b*, of the first and second arms **142***a* and **142***b*, include wire loop notches **148***a* and **148***b* adapted to releasably engage the end edges **52**A of the wire loop **50**A on the lid member **20**A (see FIG. **6**).

As seen in FIG. **7**, with the loop notches **148***a* and **148***b* of the operating device **141** engaged with the end edges **52**A of the wire loop **50**A (which is connected to the cover element **44**A), a transit mechanism **150** of the dispensing mechanism **140** can move the operating device **141** between a first position and a second position. In the first position of the operating device **141** (FIG. **6**), the cover element **44**A of the lid member **20**A is in its closed state which prevents the liquid paint component **14** from being dispensed from the original container **16**A. In the second position of the operating device **141** (FIG. **7**), the cover element **44**A is in its opened state which allows the liquid paint component **14** to be dispensed (i.e., poured) from the original container **16**A into a paint receptacle **152** (FIG. **1**).

As set forth previously, the ancillary support structure **84** is linearly movable, as represented by the double headed directional arrow **90**, relative to the upper portion **86** of the main support structure **82** via a slide mechanism **92**. This allows the receiving mechanism **98** (defined by the first and second engaging mechanisms **100** and **102**) and the dispensing mechanism **140** to accommodate quart size original containers **16**A (FIGS. **5**–**7**) and gallon size original containers **16**B (FIG. **8**). As seen in FIGS. **2** and **5**–**8**, the ancillary support structure **84** includes latch lever member **145** that is pivotally movable about a pivot pin **147** between a latched position and an unlatched position. The latch lever member **145** is biased to the latched position via a tension spring **149** extending between the lever member **145** and the ancillary support structure **84**. The latch lever arm **145** rides in a latch slot **151** in the upper portion **86** of the main support structure **82**. The latch slot **151** includes a quart size or primary latch notch **153** and a gallon size or secondary latch notch **155**. In operation, to move the ancillary support structure **84** from its primary (i.e., quart) position to its secondary (i.e., gallon) position, all a system operator need do is pivot the lever member **145** about the pivot pin **147** against the bias of the spring **149** from the quart size latch notch **153** to the latch slot **151**. The operator then moves the ancillary support structure **84** upward using the lever member **145**. This causes the second engaging mechanism **102** and the dispensing mechanism **140** to move away from the first engaging mechanism **100**, allowing more space so as to accommodate the gallon size original container **16**B. Once

the latch lever member **145** reaches the top of the latch slot **151** the operator then moves the lever member **145** into the gallon size latch notch **155** and the dispensing apparatus is ready to accommodate a gallon size container **16**B. To re-accommodate quart size containers **16**A this procedure is simply reversed.

As seen best in FIGS. **5–7**, the transit mechanism **150** of the dispensing mechanism **140** includes a piston member **154** linearly movable, along directional arrow **143** (FIG. **2**), relative to a cylinder member **156**. Opposite ends **153***a* and **153***b* of the first and second arms **142***a* and **142***b* (defining the operating device **141**) are rigidly coupled to the piston member **154** via a shaft member **157** that extends through a longitudinal slot **158** of the cylinder member **156**. Therefore movement of the piston member **154** within the cylinder member **156** causes the operating device **141** to move between its first and second positions. Tension spring elements **160***a* and **160***b* are coupled between the shaft member **157** and a mounting member **162** on the ancillary support structure **84**. The tension springs **160***a*, **160***b* bias the operating device **141** to its first position (also known as the primary position of the piston member **154**).

As seen in FIG. **1**, a drive mechanism **170** of the transit mechanism **150** moves the piston member **154** relative to the cylinder member **156**. The drive mechanism **170** includes a piston member **172** linearly movable, along double headed directional arrow **173**, relative to a cylinder member **174** mounted to a frame **176** via bracket structure **177**. A drive motor, such as a stepper motor **178**, is also mounted to the frame **176**. The drive motor **178** includes a drive screw **179** that is telescopically received within a drive tube **180** that is secured at one end to the piston member **172**. The drive tube **180** is slidably received within a bearing **181** of the frame **176** to allow movement of the drive tube **180**, and the piston member **172** therewith, relative to the frame **176**, drive motor **178** and cylinder member **174**. An opposite end of the drive tube **180** includes a drive nut **183** that threadably receives the drive screw **179** of the stepper motor **178**. Operation of the stepper motor **178** turns the drive screw **179** within the drive nut **183**. This in turn moves the drive tube **180** and therewith the piston member **172** within the cylinder member **174** along directional arrow **173**. A fluid reservoir **182** containing a hydraulic fluid **184** is in fluid communication with the cylinder member **174**. A fluid line **188** couples the fluid reservoir **182** to the cylinder member **156**. In operation, movement of the piston member **172**, via the stepper motor **178**, forces hydraulic fluid **184** to move to and from the cylinder member **174** and the fluid reservoir **182** through the line **188** then into and out of the cylinder member **156** to move the piston member **154**. Movement of the piston member **154**, via the above described hydraulic fluid pressure, in turn moves the operating device **141** which in turn moves the cover element **44**A of the lid member **20**A between its opened and closed states.

As seen in FIG. **1**, the control apparatus **18** of the dispensing system **10** includes a weigh cell **190** for supporting the paint receptacle **152** and a control module **192**. The weigh cell **190** determines the weight of the liquid paint component dispensed (i.e., poured) from the original container **16**A into the paint receptacle **152**. The control module **192** includes a display monitor device **194** having a display **195**, a microprocessor device **196**, a data storage device **198** and a user interface device, such as a keyboard **200**. The keyboard **200** is coupled to the microprocessor device **196** via a communication line **202**. The microprocessor device **196** and the data storage device **198** are linked through a communication line **204**. The microprocessor device **196** is linked to the stepper motor **178** and to a sensor **205** for monitoring the position of the drive screw **179** through the communication line **206**. The microprocessor device **196** is linked to the display monitor device **194** through communication line **208** and is further linked to the weigh cell **190** via communication line **210**. Since the control module **192** (i.e., microprocessor device **196**) is linked to the stepper motor **178** and the sensor **205**, the control module **192** can control operation of the stepper motor **178**, and thereby movement of the piston members **172** and **154**, and hence movement ofthe cover element **44**A to dispense the liquid paint component **14** from the original container **16**A. In addition, since the control module **192** is further linked to the weigh cell **190**, the control module **192** can control the amount (i.e., the weight) of the liquid paint component **14** dispensed from its original container **16**A to the paint receptacle **152** (atop the weigh cell **190**) based upon data (i.e., information) obtained from the weigh cell **190**. Moreover, since the control module **192** (i.e., the data storage device **198**) stores the paint formulas, the control module **192** can determine which liquid paint components **14** and the weights of these components needed to duplicate a particular paint formula and can control the dispensing mechanism **140** in accordance therewith.

As seen in FIG. **1**, the control module **192** and the drive mechanism **170** are positioned in another room such that the communication line **210** and the fluid line **188** pass through a wall **212** so as to provide explosion protection for the dispensing system **10**.

In operation, to mix a particular paint formula, the operator of the semi-automated dispensing system **10** first accesses the control module **192** through the keyboard **100** to call up the desired paint formula using the microprocessor device **196** the data storage device **198**. The paint formula (i.e., the liquid paint components **14**) is then displayed on the display **195** of the display monitor device **194**. The operator then loads the first container **16**A, **16**B of the needed liquid paint components into the dispensing apparatus **12**.

As seen in FIG. **5**, to mount (i.e., load) an original container **16**A of a liquid paint component **14** to the receiving mechanism **98** of the dispensing apparatus **12**, the operator of the dispensing system **10** first needs to pivot the second engaging mechanism **102** (defined by the L-shaped arms **114***a*, **114***b*) clockwise (as viewed in FIG. **5**) from its normal latched state to its unlatched state, against the handle/stop member **134** mounted to the ancillary support structure **84**. The operator, while gripping both the handle member **118** and the handle/stop member **134** to hold the second engaging mechanism **102** in its unlatched state (against the bias of the spring element **126**), then engages the registration lugs **64**A of the first alignment rod **56**A for the lid member **20**A with the first registration notches **111***a*, **111***b* of the first engaging mechanism **100** (FIG. **5**). Next, while still holding the second engaging mechanism **102** in its unlatched state, the operator pivots the container **16**A and lid member **20**A combination clockwise (as viewed in FIG. **5**) until the registration lugs **66**A of the second alignment rod **58**A are fully seated in the second registration notches **112***a*, **112***b* of the first engaging mechanism **100**; and the end edges **52**A of the wire loop **50**A are fully seated in the wire loop notches **148***a*, **148***b* of the operating device **141**. With the registration lugs **64**A and **66**A now fully seated in the registration notches **111***a*, **111***b*, **112***a*, **112***b*, and the end edges **52**A fully seated in the loop notches **148***a*, **148***b*, the operator pivots the second engaging mechanism **102** counter-clockwise to its latched state, so that the latching notches **124***a* and **124***b* engage the latch lugs **78**A of the lid

member **20**A securing the original container **16**A lid member **20**A combination to the receiving mechanism **98** the dispensing apparatus **12**. To remove the container **16**A for the dispensing apparatus **12**, this above described process is simply reversed.

The operator then starts the dispensing process using the keyboard **200** of the control module **192**. Since the control module **192** (i.e., microprocessor device **196**) is linked to the stepper motor **178** and the sensor **205**, the control module **192** controls operation of the stepper motor **178**, and thereby movement of the piston members **154** and **172**, and hence movement of the cover element **44**A to dispense (i.e., pour) the liquid paint component **14** from the original container **16**A into the paint receptacle **152**. The shape of the second registration notches **112***a*, **112***b* together with the second alignment pin **58**A prevents movement of the cover element **44**A from inadvertently disengaging the first alignment pin **56**A from the first registration notches **111***a*, **111***b*. The weight of the liquid paint component **14** dispensed into the paint receptacle **152** is monitored by the control module **192** through the weigh cell **190**, thereby ensuring an accurate liquid paint component pour. Once the first liquid paint component **14** is poured, its container **16**A, **16**B is removed and is replaced with the next paint component container **16**A, **16**B and so on, until all paint components **14** of the paint formula have been added to the paint receptacle **152**, thereby completing the paint formula mixing process.

This semi-automated dispensing system **10**, for dispensing liquid paint components **14** from their original containers **16**A, **16**B according to a paint formula to form a liquid paint mixture, virtually eliminates system operator errors, in particular over pouring errors, that can be costly to a body shop or jobber. The semi-automated dispensing system **10** is easy to use, and does not require a highly skilled operator, since operator interface with the dispensing system **10** is substantially limited to identifying the desired paint formula, and loading and unloading the proper containers **16**A, **16**B of the liquid paint components **14** to and from the dispensing apparatus **12**. In the semi-automated dispensing system **10** of the present invention, the operator need no longer manually pour the paint components **14** from their containers **16**A, **16**B. The control module **192** controlled dispensing mechanism **140** of the semi-automated dispensing system **10** automatically dispenses (i.e., pours) the liquid paint components **14** from their containers **16**A, **16**B, thereby ensuring a highly accurate, precision liquid paint component pour. In addition, the paint dispensing system **10** makes efficient use of the operator's time, since the operator is free to perform other duties instead of holding the containers **16**A, **16**B and performing the task of manually pouring the proper amounts of the liquid paint components **14**. This efficiency gain allows the operator to mix a greater number of paint formulas during a work day. Lastly, the semi-automated dispensing system **10** of the present invention complies with all regulations and laws, such as being explosion protected, governing the handling and mixing of liquid paint components **14** for the duplication of automotive paint formulas.

Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention. For example, although the semi-automated dispensing system **10** has been described as useable to dispense liquid automotive paint components **14** from their original containers **16**A and **16**B, the dispensing system can be used to dispense other pourable components, such as primers, thinners and liquid or powdered chemicals. In particular the dispensing system **10** could be used in laboratory or pharmaceutical organizations to accurately dispense liquid and powdered chemicals according to a desired formula.

What is claimed is:

1. A system for dispensing pourable components from their original containers into a receptacle according to a formula to form a mixture of pourable components, each of the original containers including a lid member, the dispensing system comprising:

a dispensing apparatus for dispensing a pourable component from its original container, the original container having a lid member, the dispensing apparatus including:

a support frame;

means, coupled to the support frame, for releasably receiving the original container, the receiving means including:

first means for engaging a first portion of the lid member, and

second means for engaging a second portion of the lid member, the second portion being spaced from the first portion; and

means, coupled to the support frame, for dispensing the pourable component from its original container into a receptacle; and

an apparatus for controlling the dispensing apparatus, including:

a weigh cell for supporting the receptacle and for determining the weight of the pourable component dispensed into the receptacle; and

a control module coupled to the weigh cell and the dispensing means for controlling the amount of the pourable component dispensed from its original container, based upon information obtained from the weigh cell.

2. The dispensing system of claim **1** wherein the lid member of the original container has a cover element that can be moved between a closed state and an opened state, and wherein the dispensing means includes:

an operating device for releasably engaging the cover element, the operating device being movable between a first position, wherein the cover element is in the closed state and the pourable component is prevented from being dispensed from the original container, and a second position, wherein the cover element is in the opened state and the pourable component is dispensed from the original container and into the receptacle.

3. The dispensing system of claim **2** wherein the dispensing means further includes:

a mechanism for moving the operating device between the first and second positions.

4. The dispensing system of claim **3** wherein the mechanism for moving the operating device includes:

a cylinder member;

a piston member coupled to the operating device, the piston member being movable within the cylinder member, such that movement of the piston member causes the operating device to move between the first and second positions; and

a drive mechanism coupled to the piston member for moving the piston member relative to the cylinder member.

5. The dispensing system of claim **4** wherein the drive mechanism is fluid pressure.

6. The dispensing system of claim **5** wherein the fluid pressure is hydraulic fluid pressure.

7. The dispensing system of claim 4 wherein the piston member has a primary position that corresponds to the first position of the operating device, and wherein the mechanism for moving the operating device further includes:

a mechanism for biasing the piston member to the primary position.

8. The dispensing system of claim 7 wherein the biasing mechanism includes at least one spring connected between the support frame and the operating device.

9. The dispensing system of claim 4 wherein the drive mechanism includes:

a cylinder member;

means connecting the cylinder member of the drive mechanism to the cylinder member of the mechanism for moving the operating device;

a piston member movable relative to the cylinder member of the drive mechanism, such that movement of the piston member of the drive mechanism causes movement of the piston member of the mechanism for moving the operating device; and

a drive motor coupled to the piston member of the drive mechanism for moving the piston member of the drive mechanism relative to the cylinder member of the drive mechanism.

10. The dispensing system of claim 9 wherein the connecting means of the drive mechanism includes:

a fluid reservoir in fluid communication with the cylinder member of the drive mechanism and the cylinder member of the mechanism for moving the operating device; and

a fluid within the fluid reservoir.

11. The dispensing system of claim 10 wherein the connecting means further includes:

a fluid line coupled between the drive mechanism cylinder member and fluid reservoir, and the cylinder member of the mechanism for moving the operating device.

12. The dispensing system of claim 10 wherein the fluid is hydraulic fluid.

13. The dispensing system of claim 9 wherein the control module is coupled to the drive motor for controlling operation of the drive motor and thereby movement of the piston member of the drive mechanism based upon information obtained from the weigh cell.

14. The dispensing system of claim 1 wherein the second engaging means is movable between a latched state, wherein the original container of the pourable component is held between the first and second engaging means, and an unlatched state, wherein the original container can be engaged with and disengaged from the first and second engaging means.

15. The dispensing system of claim 14 wherein an operator of the dispensing system moves the second engaging means between the latched and unlatched states.

16. The dispensing system of claim 14 wherein the means for releasably receiving the original container of the pourable component further includes:

means for biasing the second engaging means to the latched state.

17. The dispensing system of claim 16 wherein the biasing means includes a spring connected between the support frame and the second engaging means.

18. The dispensing system of claim 1 wherein the support frame includes:

a main support structure;

an ancillary support structure; and

means for allowing the ancillary support structure to move relative to the main support structure.

19. The dispensing system of claim 18 wherein the first engaging means is mounted to the main support structure and wherein the second engaging means is mounted to the ancillary support structure.

20. The dispensing system of claim 19 wherein the ancillary support structure is movable relative to the main support structure between a primary position, wherein the first and second engaging means receive a first size of the original container of the pourable component, and a secondary position, wherein the first and second engaging means receive a second size of the original container of the pourable component that is different than the first size.

21. The dispensing system of claim 20 wherein the first size is a quart and the second size is a gallon.

22. The dispensing system of claim 20 wherein an operator of the dispensing system moves the ancillary support structure between the primary and secondary positions.

23. The dispensing system of claim 19 wherein the dispensing means is mounted to the ancillary support structure.

24. The dispensing system of claim 1 wherein the control module includes:

a microprocessor device coupled to the weigh cell and the dispensing means;

data storage device coupled to the microprocessor device;

display monitor device coupled to the microprocessor device; and

a user interface device for allowing a user to communicate with the microprocessor.

25. The dispensing system of claim 24 wherein the user interface is a keyboard.

26. The dispensing system of claim 1 wherein the pourable component is a liquid paint component, the receptacle is a paint receptacle, the formula is a paint formula, and the mixture of pourable components is a liquid paint mixture.

27. A system for dispensing pourable components from their original containers into a receptacle according to a formula to form a mixture of pourable components, the dispensing system comprising:

a dispensing apparatus for dispensing a pourable component from its

original container, the dispensing apparatus including:

a main support structure;

an ancillary support structure;

means, coupled to one of the main and ancillary support structures, for dispensing the pourable component from its original container into a receptacle;

first means, mounted to the main support structure, for releasably engaging a first portion of the original container of the pourable component;

second means, mounted to the ancillary support structure, for releasably engaging a second portion of the original container; and

means for allowing the ancillary support structure to move relative to the main support structure between a primary position, wherein the first and second engaging means receive a first size of the original container of the pourable component, and a secondary position, wherein the first and second engaging means receive a second size of the original container of the pourable component.

28. The dispensing system of claim 27 wherein the first size is a quart and the second size is a gallon.

29. The dispensing system of claim 27 wherein the dispensing means is mounted to the ancillary support structure.

30. The dispensing system of claim 27 wherein the original container of the pourable component includes a lid member, and wherein the first and second portions of the original container are first and second portions of the lid member.

31. The dispensing system of claim 27 wherein the second engaging means is movable between a latched state, wherein a desired size of the first and second sizes of the original container of the pourable component is held between the first and second engaging means, and an unlatched state, wherein the desired size of the first and second sizes of the original container can be engaged with and disengaged from the first and second engaging means.

32. The dispensing system of claim 31 wherein an operator of the dispensing system moves the second engaging means between the latched and unlatched states.

33. The dispensing system of claim 27 wherein the dispensing apparatus further includes:

means for biasing the second engaging means to the latched state.

34. The dispensing system of claim 33 wherein the biasing means includes a spring connected between the ancillary support structure and the second engaging means.

35. The dispensing system of claim 27 wherein an operator of the dispensing system moves the ancillary support structure between the primary and secondary positions.

36. The dispensing system of claim 27, and further including:

an apparatus for controlling the dispensing apparatus, including:

a weigh cell for supporting the receptacle and for determining the weight of the pourable component dispensed into the receptacle; and

a control module coupled to the weigh cell and the dispensing means for controlling the amount of the pourable component dispensed from its original container, based upon information obtained from the weigh cell.

37. The dispensing system of claim 27 wherein the pourable component is a liquid paint component, the receptacle is a paint receptacle, the formula is a paint formula, and the mixture of pourable components is a liquid paint mixture.

38. A system for dispensing pourable components from their original containers into a receptacle according to a formula to form a mixture of pourable components, the dispensing system comprising:

a dispensing apparatus for dispensing a pourable component from its original container, the dispensing apparatus including:

a support frame;

means, coupled to the support frame, for releasably receiving the original container; and

an operating device, coupled to the support frame, for releasably engaging a movable cover element of the original container of the pourable component, the operating device being movable between a first position, wherein the cover element is in a closed state and the pourable component is prevented from being dispensed from the original container, and a second position, wherein the cover element is in an opened state and the pourable component is dispensed from the original container and into a receptacle, the operating device including:

a cylinder member;

a piston member coupled to the operating device, the piston member being movable within the cylinder member, such that movement of the piston member causes the operating device to move between the first and second positions; and

a drive mechanism coupled to the piston member for moving the piston member relative to the cylinder member, the drive mechanism including:

a cylinder member;

means connecting the cylinder member of the drive mechanism to the cylinder member of the operating device;

a piston member movable relative to the cylinder member of the drive mechanism, such that movement of the piston member of the drive mechanism causes movement of the piston member of the operating device; and

a drive motor coupled to the piston member of the drive mechanism for moving the piston member of the drive mechanism relative to the cylinder member of the drive mechanism.

39. The dispensing system of claim 38 wherein the connecting means of the drive mechanism includes:

a fluid reservoir in fluid communication with the cylinder member of the drive mechanism and the cylinder member of the operating device; and

a fluid within the fluid reservoir.

40. The dispensing system of claim 38, and further including:

an apparatus for controlling the dispensing apparatus, including:

a weigh cell for supporting the receptacle and for determining the weight of the pourable component dispensed into the receptacle from the original container; and

a control module coupled to the weigh cell and the drive motor for controlling operation of the drive motor based upon information obtained from the weigh cell, and thereby the amount of the pourable component dispensed from its original container into the receptacle.

41. The dispensing system of claim 38 wherein the pourable component is a liquid paint component, the receptacle is a paint receptacle, the formula is a paint formula, and the mixture of pourable components is a liquid paint mixture.

42. A system for dispensing pourable components from their original containers into a receptacle according to a formula to form a mixture of pourable components, the dispensing system comprising:

a dispensing apparatus for dispensing a pourable component from its original container, the original container having a cover element that can be moved between a closed state and an opened state, the dispensing apparatus including:

a support frame;

means, coupled to the support frame, for releasably receiving the original container; and

means, coupled to the support frame, for dispensing the pourable component from its original container into a receptacle, the dispensing means including:

an operating device for releasably engaging the cover element, the operating device being movable between a first position, wherein the cover element is in the closed state and the pourable component is prevented from being dispensed from the original container, and a second position, wherein the cover element is in the opened state and the pourable component is dispensed from the original container and into the receptacle, and

a mechanism for moving the operating device between the first and second positions, the moving mechanism including:

a cylinder member;

a piston member coupled to the operating device, the piston member being movable within the cylinder member, such that movement of the piston member causes the operating device to move between the first and second positions; and

hydraulic fluid pressure for moving the piston member relative to the cylinder member; and

an apparatus for controlling the dispensing apparatus, including:

a weigh cell for supporting the receptacle and for determining the weight of the pourable component dispensed into the receptacle; and

a control module coupled to the weigh cell and the dispensing means for controlling the amount of the pourable component dispensed from its original container, based upon information obtained from the weigh cell.

43. A system for dispensing pourable components from their original containers into a receptacle according to a formula to form a mixture of pourable components, the dispensing system comprising:

a dispensing apparatus for dispensing a pourable component from its original container, the dispensing apparatus including:

a support structure;

means, coupled to the support structure for dispensing the pourable component from its original container into a receptacle;

means, mounted to the support structure, for releasably engaging the original container of the pourable component, the engaging means having a first state for receiving a first size of the original container of the pourable component, and a second state for receiving a second size of the original container of the pourable component that is different than the first size;

wherein the engaging means includes first engaging means, mounted to the support structure for releasably engaging a first portion of the original container or the pourable component; second engaging means, mounted to the support structure spaced from the first means, the second means engaging a second portion of the original container of the pourable component; and

wherein the original container of the pourable component includes a lid member, wherein the first and second portions of the original container are first and second portions of the lid member.

44. The dispensing system of claim **43** wherein the first size is a quart and the second size is a gallon.

45. The dispensing system of claim **43** wherein the dispensing apparatus further includes:

means for allowing relative movement between the first engaging means and the second engaging means between a primary position, wherein the first and second engaging means receive the first size of the original container of the pourable component, and a secondary position, wherein the first and second engaging means receive the second size of the original container of the pourable component.

46. The dispensing system of claim **45** wherein the support structure includes:

a main support structure to which the first engaging means is mounted; and

an ancillary support structure to which the second engaging means is mounted, wherein the means for allowing relative movement between the first engaging means and the second engaging means between the primary and secondary positions allows the ancillary support structure to move relative to the main support structure between the primary and secondary positions.

47. The dispensing system of claim **43** wherein the original container of the pourable component includes a lid member, and wherein the lid member has a cover element that can be moved between a closed state and an opened state, and wherein the dispensing means includes:

an operating device for releasably engaging the cover element, the operating device being movable between a first position, wherein the cover element is in the closed state and the pourable component is prevented from being dispensed from the original container, and a second position, wherein the cover element is in the opened state and the pourable component is dispensed from the original container and into the receptacle.

48. The dispensing system of claim **47** wherein the dispensing means further includes:

a mechanism for moving the operating device between the first and second positions.

49. The dispensing system of claim **48** wherein the mechanism for moving the operating device includes:

a cylinder member;

a piston member coupled to the operating device, the piston member being movable within the cylinder member, such that movement of the piston member causes the operating device to move between the first and second positions; and

a drive mechanism coupled to the piston member for moving the piston member relative to the cylinder member.

50. The dispensing system of claim **49** wherein the drive mechanism is fluid pressure.

51. The dispensing system of claim **50** wherein the drive mechanism includes:

a cylinder member;

means connecting the cylinder member of the drive mechanism to the cylinder member of the mechanism for moving the operating device;

a piston member movable relative to the cylinder member of the drive mechanism, such that movement of the piston member of the drive mechanism causes movement of the piston member of the mechanism for moving the operating device; and

a drive motor coupled to the piston member of the drive mechanism for moving the piston member of the drive mechanism relative to the cylinder member of the drive mechanism.

52. The dispensing system of claim **51**, and further including:

an apparatus for controlling the dispensing apparatus, including:

a weigh cell for supporting the receptacle and for determining the weight of the pourable component dispensed into the receptacle; and

a control module coupled to the weigh cell and the drive motor for controlling the amount of the pourable component dispensed from its original container, based upon information obtained from the weigh cell.

53. The dispensing system of claim 43, and further including:

an apparatus for controlling the dispensing apparatus, including:

a weigh cell for supporting the receptacle and for determining the weight of the pourable component dispensed into the receptacle; and

a control module coupled to the weigh cell and the dispensing means for controlling the amount of the pourable component dispensed from its original container, based upon information obtained from the weigh cell.

54. The dispensing system of claim 43 wherein the control module includes:

a microprocessor device coupled to the weigh cell and the dispensing means;

data storage device coupled to the microprocessor device;

display monitor device coupled to the microprocessor device; and

a user interface device for allowing a user to communicate with the microprocessor.

55. The dispensing system of claim 54 wherein the user interface is a keyboard.

56. The dispensing system of claim 43 wherein the pourable component is a liquid paint component, the receptacle is a paint receptacle, the formula is a paint formula, and the mixture of pourable components is a liquid paint mixture.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,053,218
DATED : April 25, 2000
INVENTOR(S) : Arie Boers

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 3,
Line 10, please delete "arc" and insert -- are --.

Column 4,
Lines 64-65, please delete "ac dance" and insert -- accordance --.

Column 6,
Line 36, please delete "includes a first" and insert -- includes first --.

Column 10,
Line 11, please delete "ofthe" and insert -- of the --.

Signed and Sealed this

Eighteenth Day of December, 2001

Attest:

Attesting Officer

JAMES E. ROGAN
Director of the United States Patent and Trademark Office