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# United States Patent [19]

**Boers**

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

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[51] **Int. Cl.**[7] ..... **B67B 7/00**

[52] **U.S. Cl.** ..... **222/166**; 222/153.01; 222/472; 222/474; 222/570

[58] **Field of Search** ..... 222/144, 153.01, 222/153.03, 164, 166, 470–474, 570, 571

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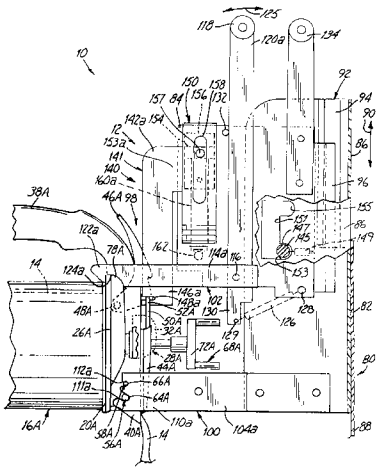
[57] **ABSTRACT**

A lid member for an original container of a liquid paint component. The lid member is usable with a system for dispensing the paint component from its original container into a paint receptacle according to a paint formula to form a liquid paint mixture. The lid member includes a base portion that is adapted to releasably engage an open top of the paint component container. The base portion has a pour spout through which the paint component can be dispensed and a movable cover element. The cover element is movable between a closed state, wherein the cover element covers the pour spout and the liquid paint component is prevented from being dispensed, and an opened state, wherein the pour spout is uncovered and the paint component can be dispensed from its original container and into the paint receptacle. An operating arrangement on the cover element is releasably engagable by an operating device of the dispensing system that moves the cover element between its closed and opened states. An alignment mechanism on the lid member aligns the paint component, while a latching arrangement of the lid member releasably secures the paint component container to the dispensing system.

**24 Claims, 8 Drawing Sheets**



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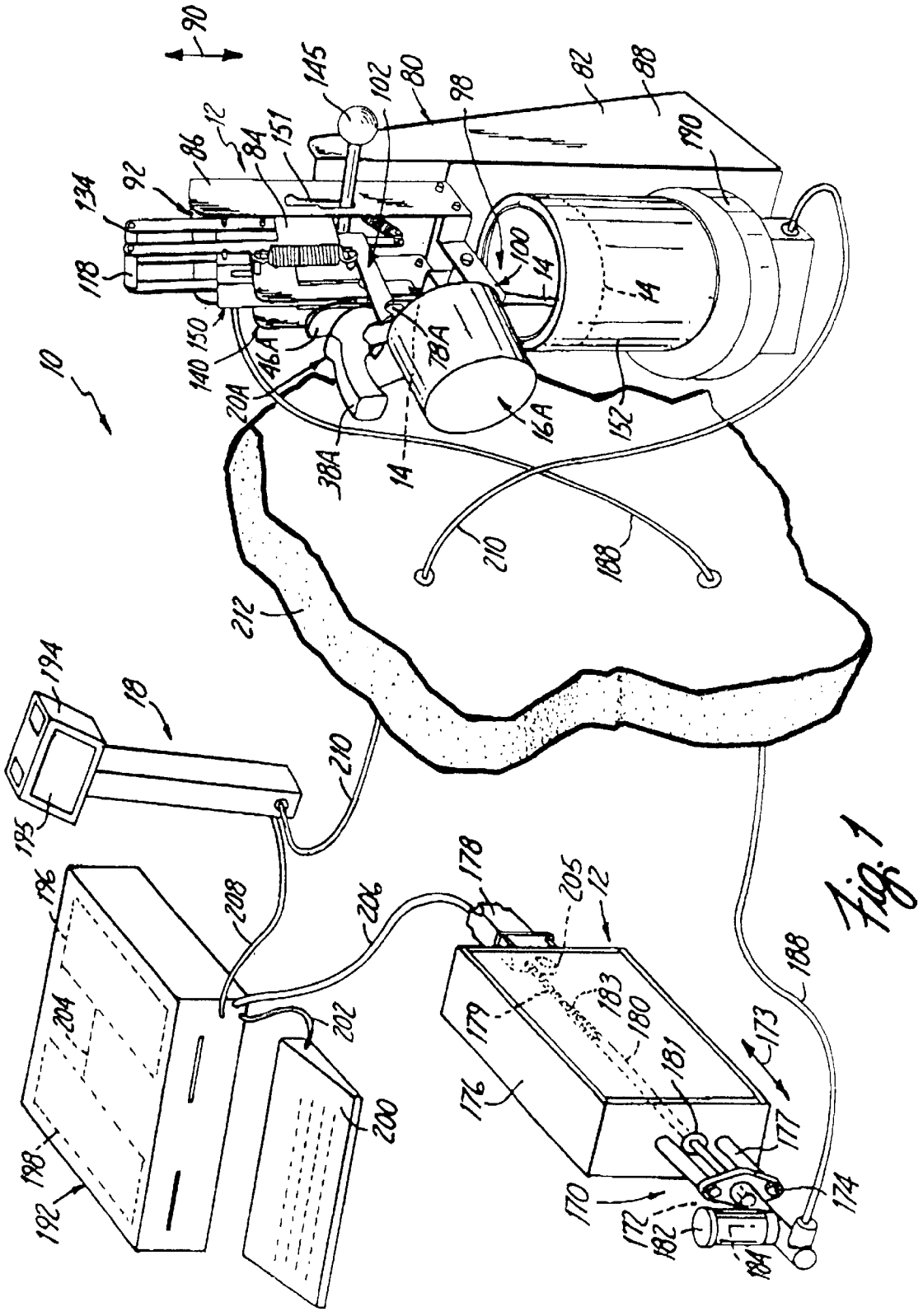
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Fig. 1

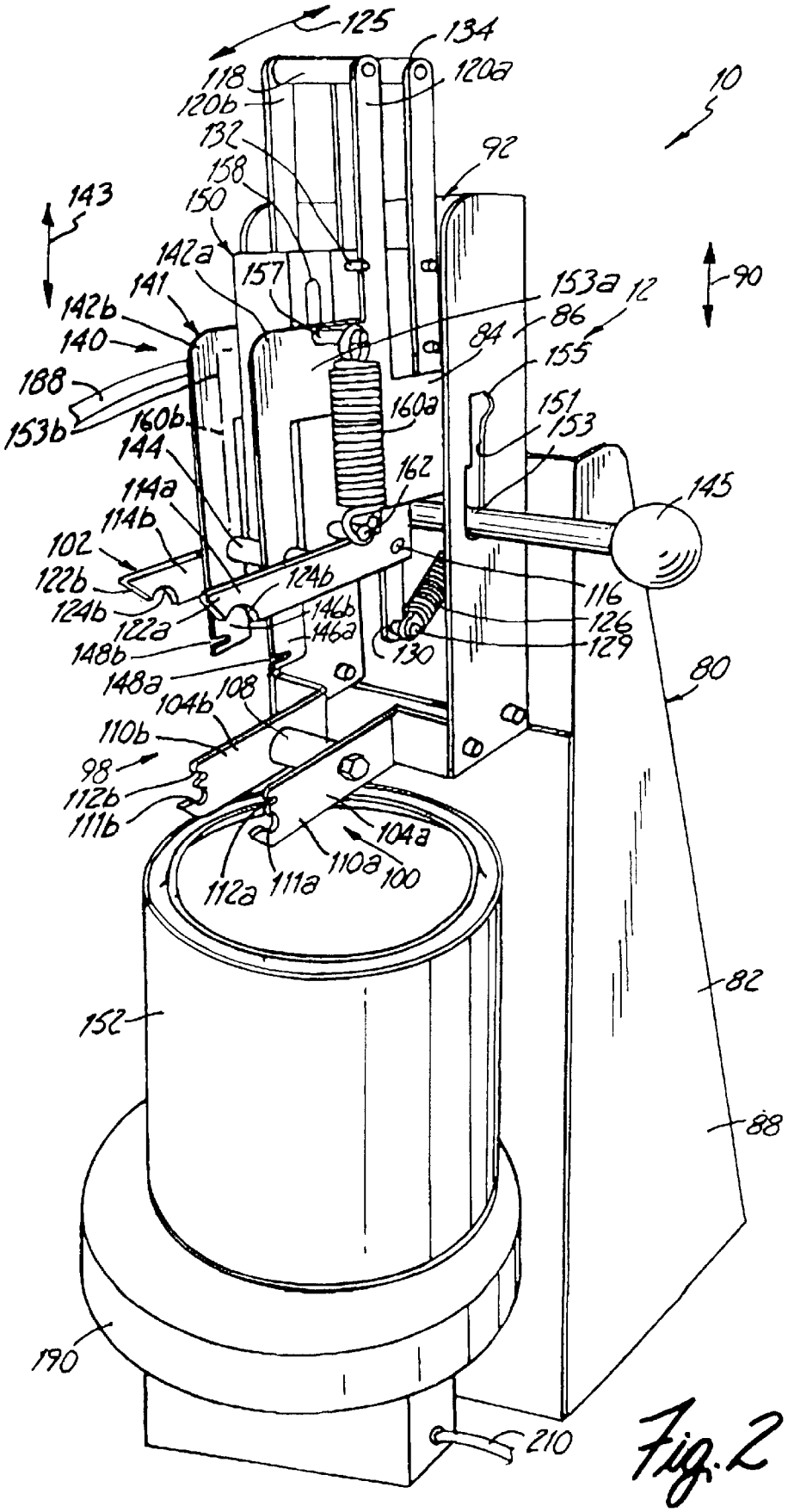
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Fig. 2

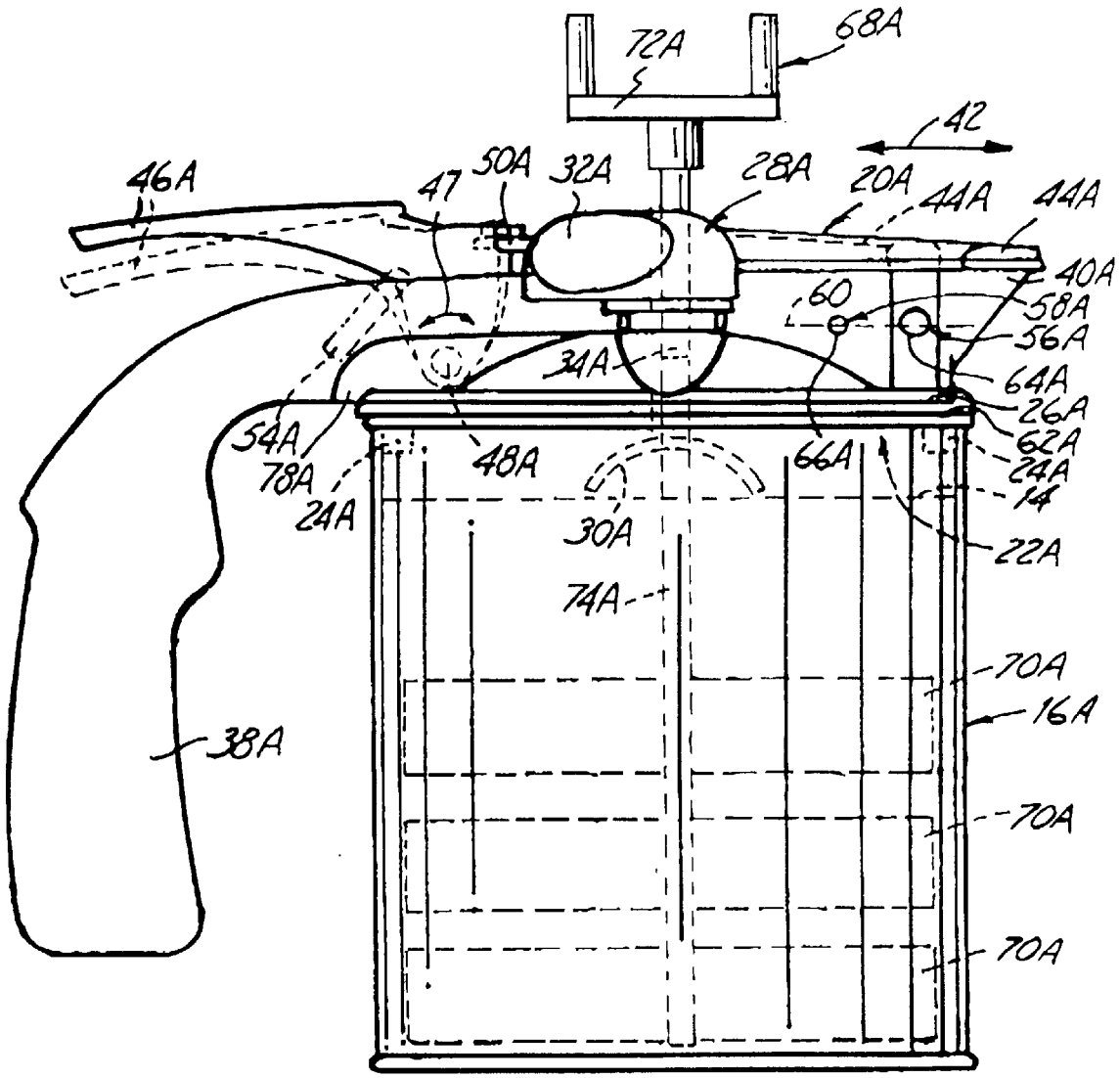
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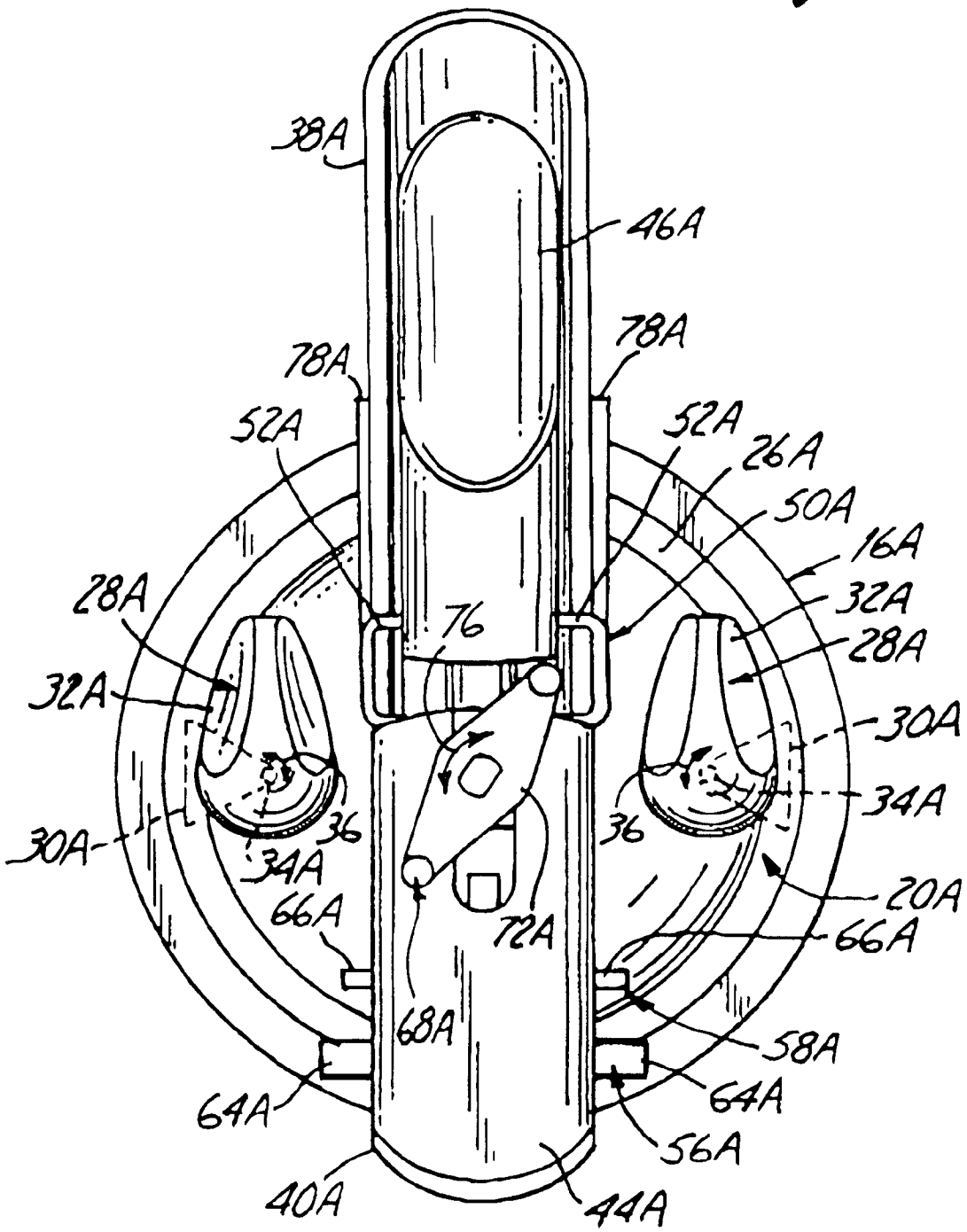
Fig. 3

Fig. 4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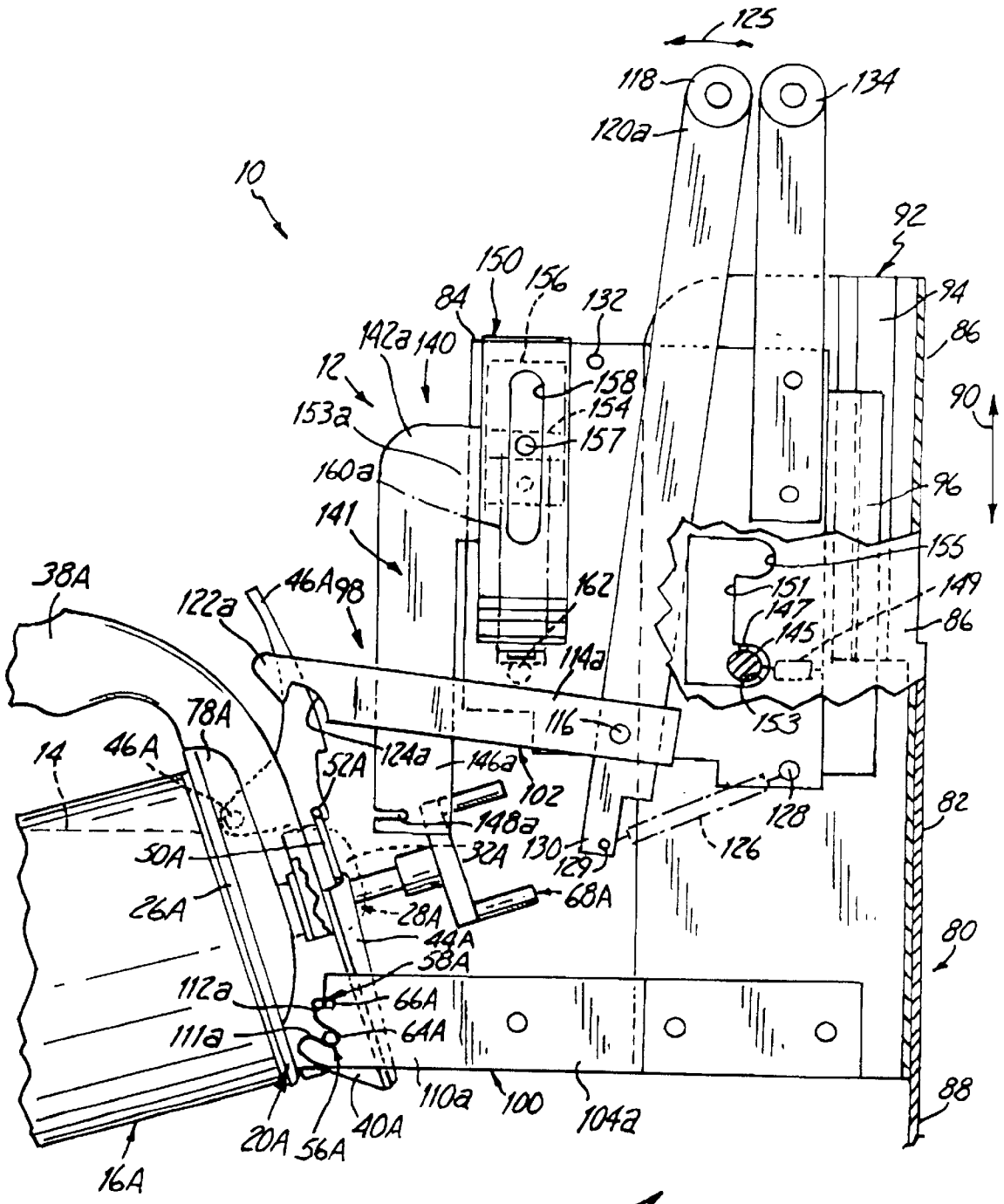
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Fig. 5

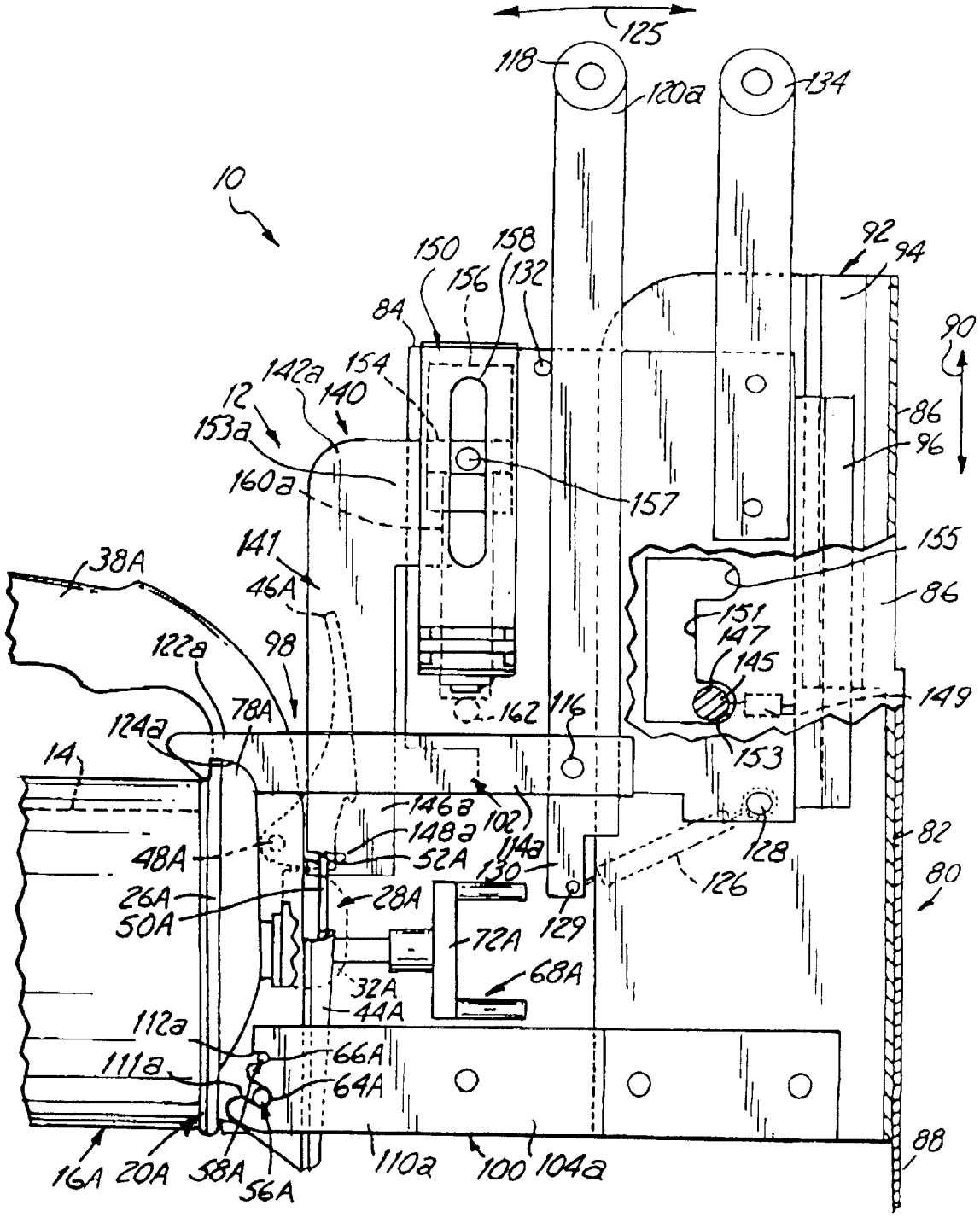
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Fig. 6

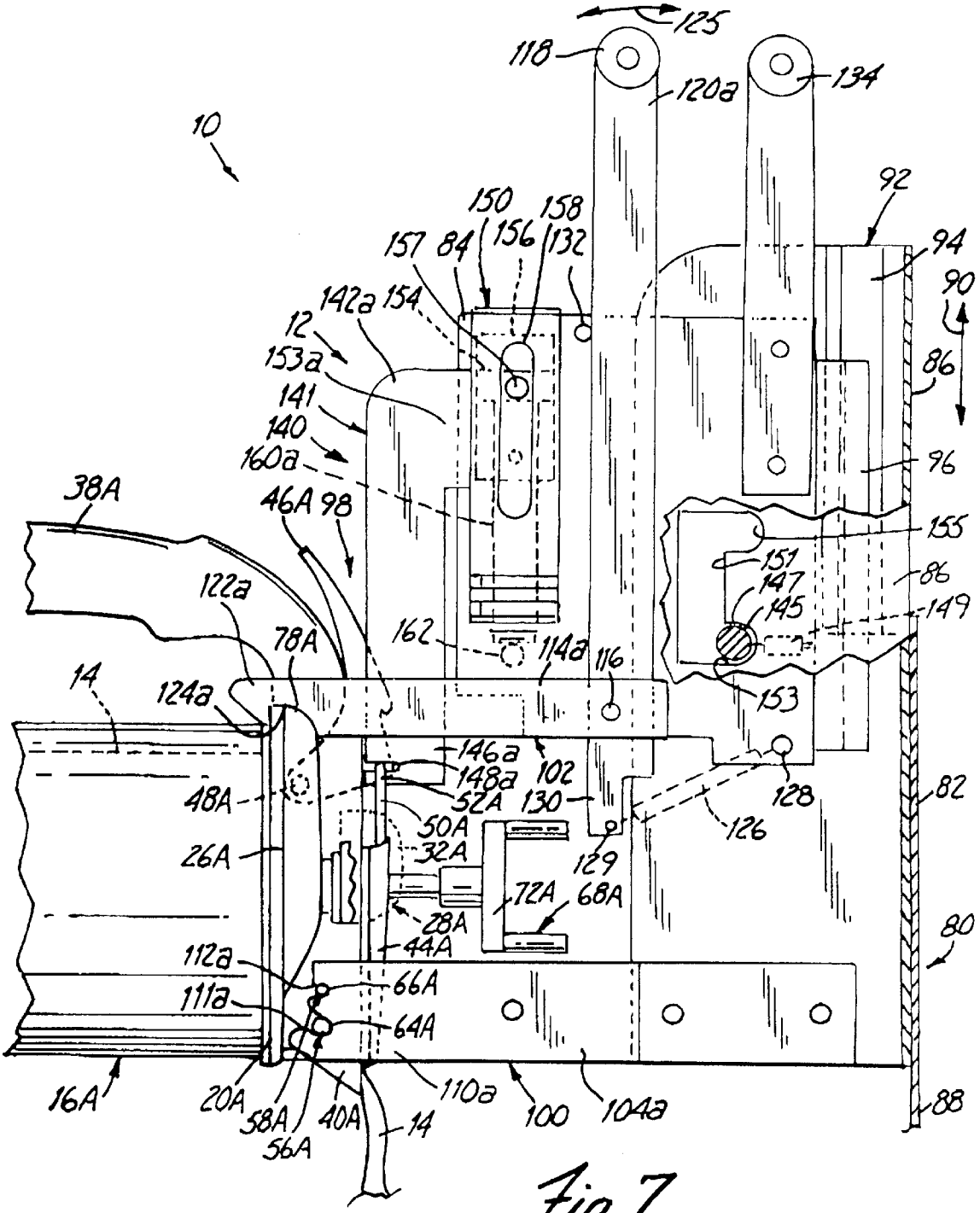
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Fig. 7

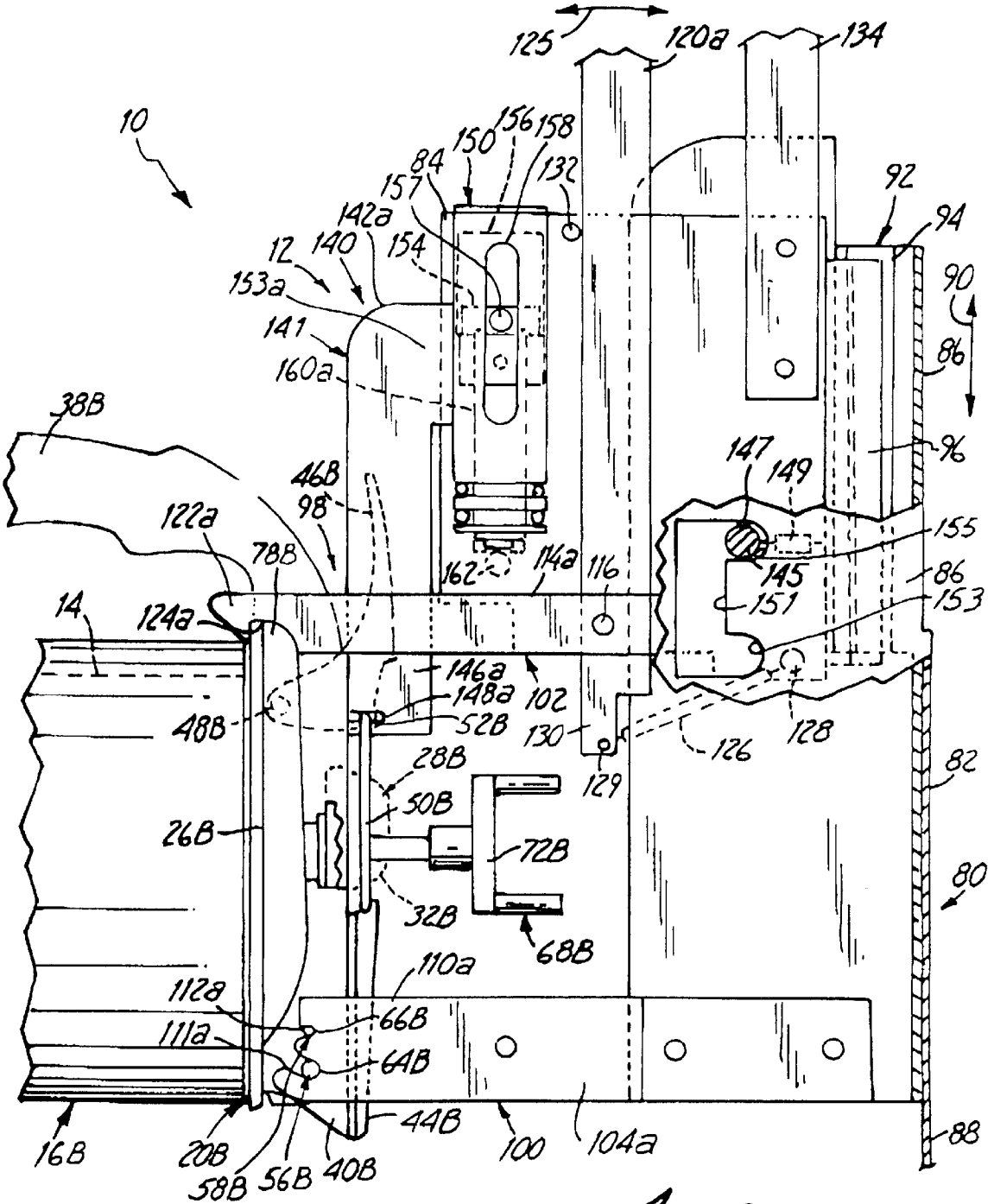
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Fig. 8

# PAINT CONTAINER LID FOR A SEMI-AUTOMATED AUTOMOTIVE PAINT DISPENSING SYSTEM

## CROSS REFERENCE TO RELATED APPLICATIONS

This patent application is related to U.S. patent application Ser. No. 09/189,214, entitled "Semi-Automated System for Dispensing Automotive Paint" filed on even date herewith, assigned to the same assignee, and incorporated herein by reference thereto.

## TECHNICAL FIELD

This invention relates to mixing paint components, such as colorants, tints and pearls, to create automotive paint formulas. In particular, the present invention is a paint container lid that can be secured to an original paint component container, allowing the container to be used with a semi-automated system for dispensing paint components according to a desired paint formula.

## 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 include 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 have 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 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. Generally, 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. Typically, these containers are the original quart and gallon sized metal containers within which the paint components are shipped to the body shop or jobber. The original covers of these containers are replaced by specialized paint container lids that include stirring paddles that work with the stirring mechanism of the rack. These specialized paint container lids also have pour spouts that allow the paint components of the containers to be dispensed (i.e., poured out) into the receptacle atop the weigh cell. The pour spout of the specialized paint container lid is covered by a cover element that helps to protect the paint component within the container from contaminants. The cover element for the pour spout is movable between a closed state and an opened state. In the closed state of the cover element, the liquid paint component is prevented from being poured from its container through the pour spout. In the opened state of the cover element, the paint component can be poured from its container through the pour spout by tipping (i.e., tilting) the container.

To reproduce the desired paint formula, the system operator begins by identifying the first listed paint component of the paint formula to be mixed. The operator then pours, by hand, the paint component into the weigh cell supported paint receptacle, until the weight of the paint component dispensed (i.e., poured) into 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), using the original containers of the liquid paint components and the above described specialized container lids, allows a skilled system operator to dispense the needed paint components 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 this further error may require that some components 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 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 are 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 mixing paint components according to a paint formula. In particular, there is a need for paint container lid members, that can be used with the original containers of the paint components, and are compatible with a system for dispensing paint components according to 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 container lid members together with 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 lid members and 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 lid member for an original container of a pourable component, such as a liquid paint component. The lid member is usable with a system for dispensing the paint component from its original container into a paint receptacle according to a paint formula to form a liquid paint mixture. The lid member includes a base portion that is adapted to releasably engage an open top of the paint component container. The base portion has a pour spout through which the paint component can be dispensed and a movable cover element. A mechanism for securing the cover element to the base portion allows the cover element to move between a closed state, wherein the cover element covers the pour spout and the liquid paint component is prevented from being dispensed from its original container, and an opened state, wherein the pour spout is uncovered and the paint component can be dispensed from its original container, through the pour spout, and into the paint receptacle. An operating arrangement on the cover element is releasably engagable by an operating device of the dispensing system that moves the cover element between its closed and opened states according to the paint formula to form the liquid paint mixture.

An alignment mechanism, defined by first and second alignment rods on the base portion of the lid member, is releasably engagable by a first engaging mechanism of the paint component dispensing system for aligning the original container on the dispensing system so that the operating device is in engagement with the operating arrangement on the cover element. A latching arrangement, defined by a pair of spaced latch lugs on the base portion of the lid member, is releasably engagable by a second engaging mechanism of the paint component dispensing system for securing the original container on the dispensing system so that the operating device can move the cover element between its closed and opened states.

This lid member can be used with the original container of a liquid paint component. In addition, this lid member is compatible with a semi-automated system for dispensing liquid paint components from their original containers that virtually eliminates system operator errors, in particular over pouring errors, that can be costly to a body shop or jobber. The lid member and the semi-automated dispensing system are easy to use, and do not require a highly skilled operator, since operator interface with the lid members and 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 using the aligning mechanism and latching arrangement of the lid member.

The operating arrangement of the cover element of the lid member is releasably engagable with the operating device of the dispensing system which acts to move the cover element between its closed and opened states. This lid member/dispensing system interface automatically dispenses (i.e., pours) the liquid paint components from their containers, thereby ensuring a highly accurate, precision liquid paint component pour. This highly accurate liquid paint component pour substantially limits the additional cost of the added paint components attributable to over pouring errors. In addition, the lid members of the present invention together with the paint dispensing system makes efficient use of the operator's time, since the operator is free to perform other duties instead of manually pouring the proper amounts of the liquid paint components from their containers. This efficiency gain allows the operator to mix a greater number of paint formulas during a work day. Lastly, the paint component lid members, of the present invention, together with the semi-automated dispensing system complies with all regulations and laws (such as being explosion protected) governing the safe 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 incor-

porated 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 using lid members in accordance with the present invention.

FIG. **2** is an 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, in accordance with the present invention, for holding a liquid paint component.

FIG. **4** is top elevational view of the lid member of FIG. **3** in accordance with the present invention.

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/lid member 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/lid member 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/lid member.

FIG. **8** is partial side elevational view with some parts omitted for clarity similar to FIG. **6**, illustrating a gallon size original container/lid member 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 from their original containers **16**A and **16**B using paint container lid members **20**A and **20**B, in accordance with the present invention is illustrated generally in FIGS. **1**, **2** and **8**. 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 in accordance with the present invention, while FIG. **8** illustrates the gallon size original container **16**B having a lid member **20**B in accordance with the present invention. 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, in accordance with the present invention, 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 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 FIGS. **3** and **4**, the first and second alignment rods **56**A and **58**A are parallel to one another and 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

56A and 58A are mounted to the lid member 20A by first drilling holes for the alignment rods 56A and 58A at the pour spout 40A. The first and second alignment rods 56A and 58A are then press fit into the drilled holes.

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

Lastly, as seen best in FIG. 4, the base portion 26A of the lid member 20A includes a pair of spaced latch lugs 78A positioned at a second portion of the lid member 20A to either side of the thumb actuator 46A. The purpose of these latch lugs 78A 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 16A, 16B 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 64A of the first alignment rod 56A for the lid member 20A. The second registration notches 112*a* and 112*b* are adapted to releasably receive (i.e., engage) the registration lugs 66A of the second alignment rod 58A for the lid member 20A. 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 56A and 58A, respectively. As seen in FIG. 5, interengagement of the registration lugs 64A and 66A of the alignment rods 56A and 58A with the registration notches 111*a*, 111*b*, 112*a*, 112*b*, mounts (i.e., secures) and aligns a first portion of the container 16A and lid member 20A 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 78A of the lid member 20A for the original container 16A. 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 16A 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 16A 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 44A of the lid member 20A 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 52A of the wire loop 50A on the lid member 20A (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 52A of the wire loop 50A (which is connected to the cover element 44A), 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 44A of the lid member 20A is in its closed state which prevents the liquid paint component 14 from being dispensed from the original container 16A. In the second position of the operating device 141 (FIG. 7), the cover element 44A is in its opened state which allows the liquid paint component 14 to be dispensed (i.e., poured) from the original container 16A 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 the 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 16A (FIGS. 5–7) and gallon size original containers 16B (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 of the 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 lid member **20**A, **20**B can be used with the original container **16**A, **16**B of a liquid paint component **14**. In addition, this lid member **20**A, **20**B is compatible with the semi-automated dispensing system **10** for dispensing liquid paint components **14** from their original containers **16**A, **16**B that virtually eliminates system operator errors, in particular over pouring errors, that can be costly to a body shop or jobber. The lid member **20**A, **20**B together with the semi-automated dispensing system **10** are easy to use, and do not require a highly skilled operator, since operator interface with the lid members **20**A, **20**B and 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 system **10** using the alignment rods **56**A, **58**A, **56**B **58**B and the latch lugs **78**A, **78**B of the lid member **20**A, **20**B.

The wire loop **50**A, **50**B operating arrangement of the cover element **44**A, **44**B of the lid member **20**A, **20**B is releasably engagable with the operating device **141** of the dispensing system **10** which moves the cover element **44**A, **44**B between its closed and opened states. This lid member/dispensing system interface 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. This highly accurate liquid paint component pour substantially limits the additional cost of the added paint components **14** used due to over pouring errors. In addition, the lid members **20**A, **20**B of the present invention together with the paint dispensing system **10** makes efficient use of the operator's time, since the operator is free to perform other duties instead of manually pouring the proper amounts of the liquid paint components **14** from their containers **16**A, **16**B. This efficiency gain allows the operator to mix a greater number of paint formulas during a work day. Lastly, the paint component lid members **20**A, **20**B, of the present invention, together with the semi-automated dispensing system **10** 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 lid members **20**A and **20**B and the semi-automated dispensing system **10** have been described as useable to dispense liquid automotive paint components **14** from their original containers **16**A and **16**B, the lid members and dispensing system can be used to dispense other pourable components, such as primers, thinners and liquid or powdered chemicals. In particular the lid members **20**A and **20**B and 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 lid member for an original container of a pourable component, the lid member being usable with a system for dispensing the pourable component from its original container into a receptacle according to a formula to form a mixture of pourable components, the lid member comprising:

a base portion adapted to releasably engage an open top of the original container of the pourable component;

a pour spout on the base portion through which the pourable component can be dispensed from its original container;

a cover element for the pour spout;

means for movably securing the cover element to the base portion such that the cover element is movable between a closed state, wherein the cover element covers the pour spout and the pourable component is prevented from being dispensed from the original container, and an opened state, wherein the pour spout is uncovered and the pourable component can be dispensed from its original container through the pour spout into the receptacle;

operating means on the cover element releasably engagable by an operating device of the pourable component dispensing system that moves the cover element between its closed and opened states according to the formula to form the mixture of pourable components; and

alignment means on pour spout of the base portion releasably engagable by an engaging mechanism of the

pourable component dispensing system for aligning the original container on the dispensing system so that the operating device is in engagement with the operating means on the cover element.

**2**. The lid member of claim **1** wherein the alignment means includes:

an alignment rod having opposite free ends, the free ends of the alignment rod defining a pair of registration lugs releasably engagable with the engaging mechanism of the dispensing system.

**3**. The lid member of claim **1** wherein the alignment means includes:

a first alignment rod having opposite free ends, the free ends of the first alignment rod defining a first pair of registration lugs releasably engagable with the engaging mechanism of the dispensing system; and

a second alignment rod spaced from the first alignment rod, the second alignment rod having opposite free ends, the free ends of the second alignment rod defining a second pair of registration lugs that are also releasably engagable with the engaging mechanism of the dispensing system.

**4**. The lid member of claim **3** wherein the first alignment rod is positioned so as to be parallel to the second alignment rod.

**5**. The lid member of claim **3** wherein the first and second alignment rods are positioned so as to define a plane that is parallel to an upper surface of a circumferential lip extending about the open top of the original container when the lid member is attached to the original container of the pourable component.

**6**. The lid member of claim **3** wherein the first alignment rod is longer than the second alignment rod.

**7**. The lid member of claim **3** wherein the first alignment rod has a diameter that is greater than a diameter of the second alignment rod.

**8**. The lid member of claim **3** wherein the base portion has an outer circumferential edge, and wherein the first alignment rod is closer to the outer circumferential edge of the base portion than the second alignment rod.

**9**. The lid member of claim **1**, and further including:

means on the base portion for releasably engaging a circumferential lip extending about the open top of the original container to releasably secure the lid member to the original container.

**10**. The lid member of claim **9** wherein the means on the base portion for releasably engaging a circumferential lip of the original container includes:

a pair of spaced pivotable cam lock mechanisms.

**11**. The lid member of claim **1**, and further including:

means on the base portion for stirring the pourable component within the original container.

**12**. The lid member 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.

**13**. A lid member for an original container of a pourable component, the lid member being usable with a system for dispensing the pourable component from its original container into a receptacle according to a formula to form a mixture of pourable components, the lid member comprising:

a base portion adapted to releasably engage an open top of the original container of the pourable component;

a pour spout on the base portion through which the pourable component can be dispensed from its original container;

a cover element for the pour spout;

means for movably securing the cover element to the base portion such that the cover element is movable between a closed state, wherein the cover element covers the pour spout and the pourable component is prevented from being dispensed from the original container, and an opened state, wherein the pour spout is uncovered and the pourable component can be dispensed from its original container through the pour spout into the receptacle;

operating means on the cover element releasably engagable by an operating device of the pourable component dispensing system that moves the cover element between its closed and opened states according to the formula to form the mixture of pourable components; and

latch means on the base portion releasably engagable by an engaging mechanism of the pourable component dispensing system for securing the original container on the dispensing system against movement relative to the dispensing system and with the operating device in engagement with the operating means of the cover element.

**14**. The lid member of claim **13** wherein the latch means includes a pair of spaced latch lugs releasably engagable with the engaging mechanism of the dispensing system.

**15**. A lid member for an original container of a pourable component, the lid member being usable with a system for dispensing the pourable component from its original container into a receptacle according to a formula to form a mixture of pourable components, the lid member comprising:

a base portion adapted to releasably engage an open top of the original container of the pourable component;

a pour spout on the base portion through which the pourable component can be dispensed from its original container;

a cover element for the pour spout;

means for movably securing the cover element to the base portion such that the cover element is movable between a closed state, wherein the cover element covers the pour spout and the pourable component is prevented from being dispensed from the original container, and an opened state, wherein the pour spout is uncovered and the pourable component can be dispensed from its original container through the pour spout into the receptacle;

operating means on the cover element releasably engagable by an operating device of the pourable component dispensing system that moves the cover element between its closed and opened states according to the formula to form the mixture of pourable components;

alignment means on a first portion of the base portion releasably engagable by a first engaging mechanism of the pourable component dispensing system for aligning the original container on the dispensing system so that the operating device is in engagement with the operating means on the cover element; and

latch means on a second portion of the base portion spaced from the first portion, the latch means being releasably engagable by a second engaging mechanism of the pourable component dispensing system for securing the original container on the dispensing system against movement relative to the dispensing system and with so that the operating device can move the cover element between its closed and opened states.

16. The lid member of claim 15 wherein the alignment means includes:

a first alignment rod having opposite free ends, the free ends of the first alignment rod defining a first pair of registration lugs releasably engagable with the first engaging mechanism of the dispensing system; and

a second alignment rod spaced from the first alignment rod, the second alignment rod having opposite free ends, the free ends of the second alignment rod defining a second pair of registration lugs that are also releasably engagable with the first engaging mechanism of the dispensing system.

17. The lid member of claim 16 wherein the latch means includes a pair of spaced latch lugs releasably engagable with the second engaging mechanism of the dispensing system.

18. A lid member for an original container of a pourable component, the lid member being usable with a system for dispensing the pourable component from its original container into a receptacle according to a formula to form a mixture of pourable components, the lid member comprising:

a base portion adapted to releasably engage an open top of the original container of the pourable component;

a pour spout on the base portion through which the pourable component can be dispensed from its original container;

a cover element for the pour spout;

means for movably securing the cover element to the base portion such that the cover element is movable between a closed state, wherein the cover element covers the pour spout and the pourable component is prevented from being dispensed from the original container, and an opened state, wherein the pour spout is uncovered and the pourable component can be dispensed from its original container through the pour spout into the receptacle; and

operating means on the cover element releasably engagable by an operating device of the pourable component dispensing system that moves the cover element between its closed and opened states according to the formula to form the mixture of pourable components, wherein the operating means is a wire loop secured at a first end to one end of the cover element, the wire loop having end edges releasably engagable with the operating device of the dispensing system.

19. The lid member of claim 18 and further including:

a manually operable actuator for the cover element, the actuator being coupled to the cover element via the wire loop; and

means for pivotably mounting the actuator to the base portion, such that manually pivoting the actuator moves the cover element between its closed and opened states.

20. A lid member for an original container of a pourable component, the lid member being usable with a system for dispensing the pourable component from its original container into a receptacle according to a formula to form a mixture of pourable components, the lid member comprising:

a base portion adapted to releasably engage an open top of the original container of the pourable component;

a pour spout on the base portion through which the pourable component can be dispensed from its original container;

alignment means on a first portion of the base portion releasably engagable by a first engaging mechanism of the pourable component dispensing system for aligning the original container on the dispensing system; and

latch means on a second portion of the base portion spaced from the first portion, the latch means being releasably engagable by a second engaging mechanism of the pourable component dispensing system for securing the original container on the dispensing system against movement relative to the dispensing system, so that the pourable component can be dispensed from its original container, through the pour spout and into the receptacle according to the formula, to form the mixture of pourable components.

21. The lid member of claim 20 wherein the alignment means includes:

a first alignment rod having opposite free ends, the free ends of the first alignment rod defining a first pair of registration lugs releasably engagable with the first engaging mechanism of the dispensing system; and

a second alignment rod spaced from the first alignment rod, the second alignment rod having opposite free ends, the free ends of the second alignment rod defining a second pair of registration lugs that are also releasably engagable with the first engaging mechanism of the dispensing system.

22. The lid member of claim 21 wherein the latch means includes a pair of spaced latch lugs releasably engagable with the second engaging mechanism of the dispensing system.

23. The lid member of claim 22, and further including:

a cover element for the pour spout;

means for movably securing the cover element to the base portion such that the cover element is movable between a closed state, wherein the cover element covers the pour spout and the pourable component is prevented from being dispensed from the original container, and an opened state, wherein the pour spout is uncovered and the pourable component can be dispensed from its original container through the pour spout and into the receptacle; and

operating means on the cover element releasably engagable by an operating device of the pourable component dispensing system that moves the cover element between its closed and opened states according to the formula to form the mixture of pourable components.

24. The dispensing system of claim 20 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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