

Nov. 18, 1958

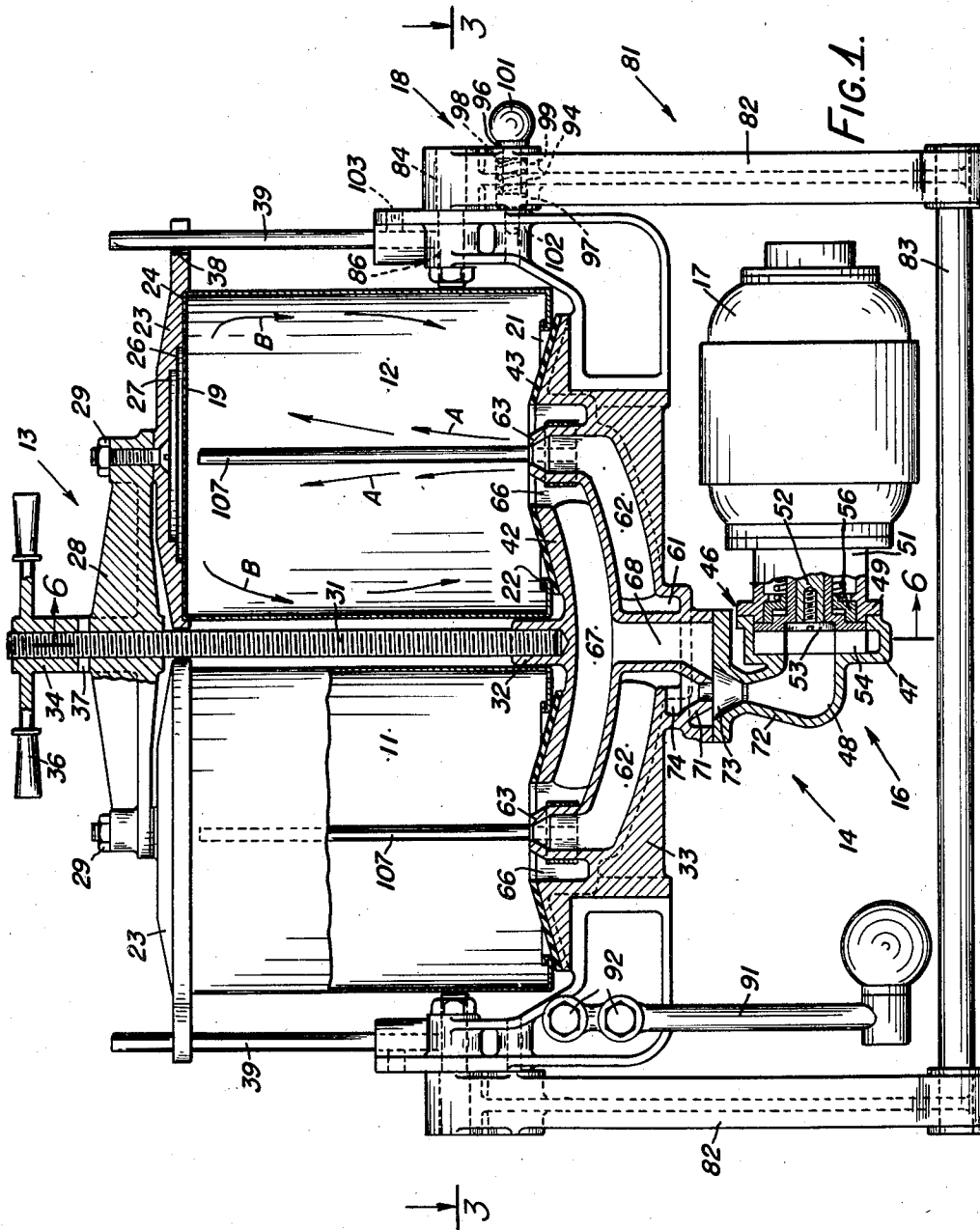
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2,860,857

MIXING APPARATUS FOR MIXING MATERIALS OF DIFFERENT CHARACTERISTICS

Filed May 3, 1955

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

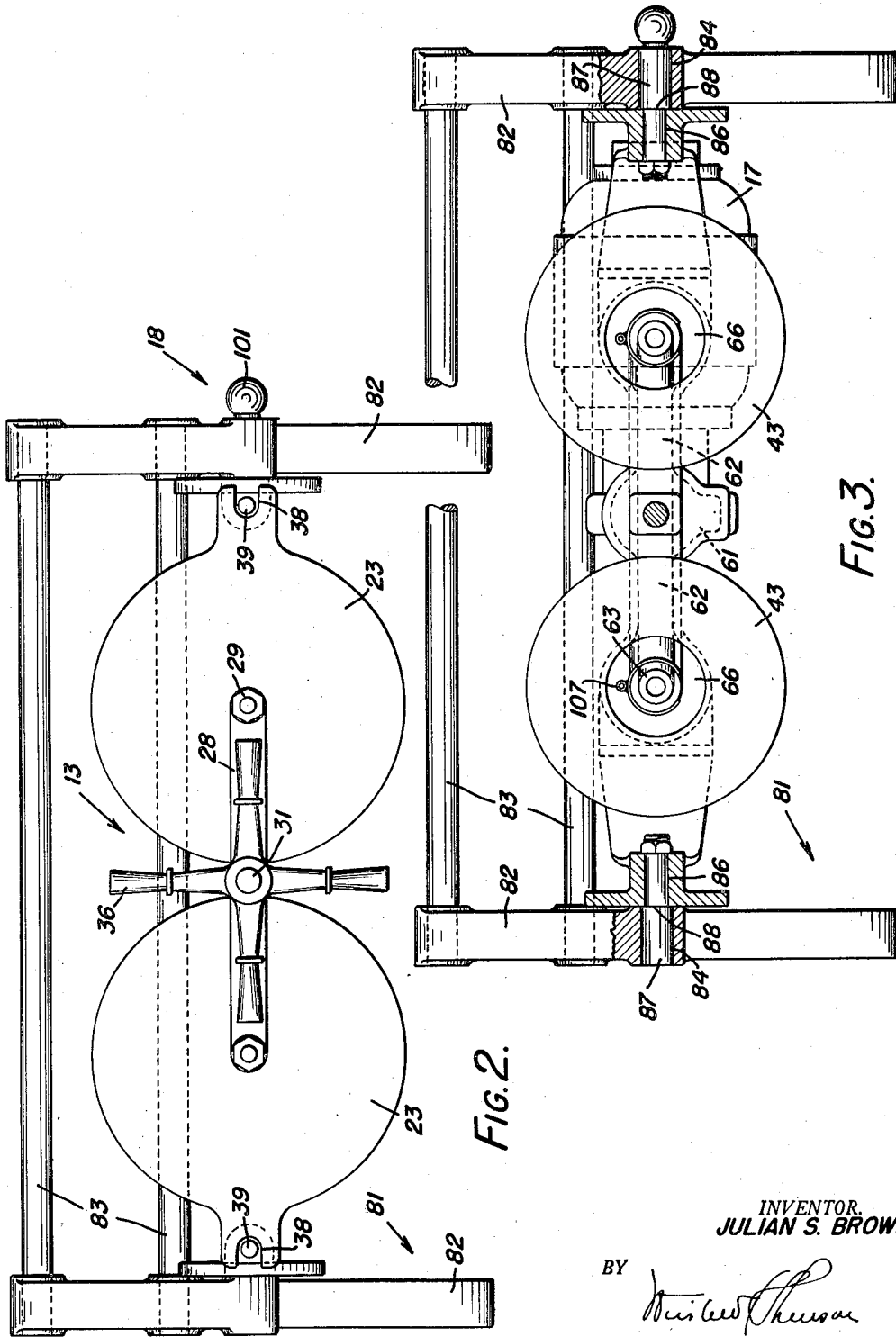


FIG. 2.

FIG. 3.

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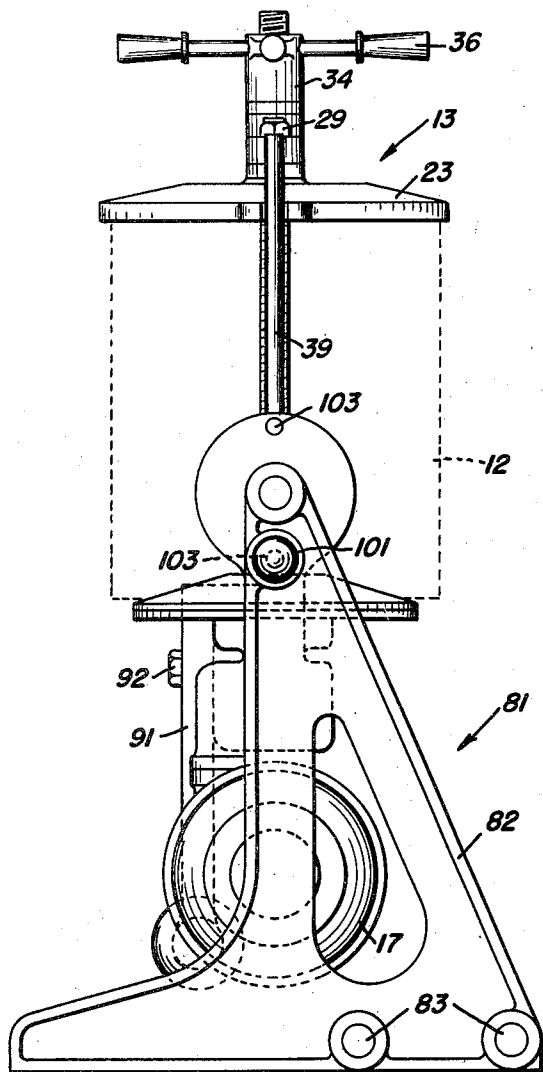


FIG. 4.

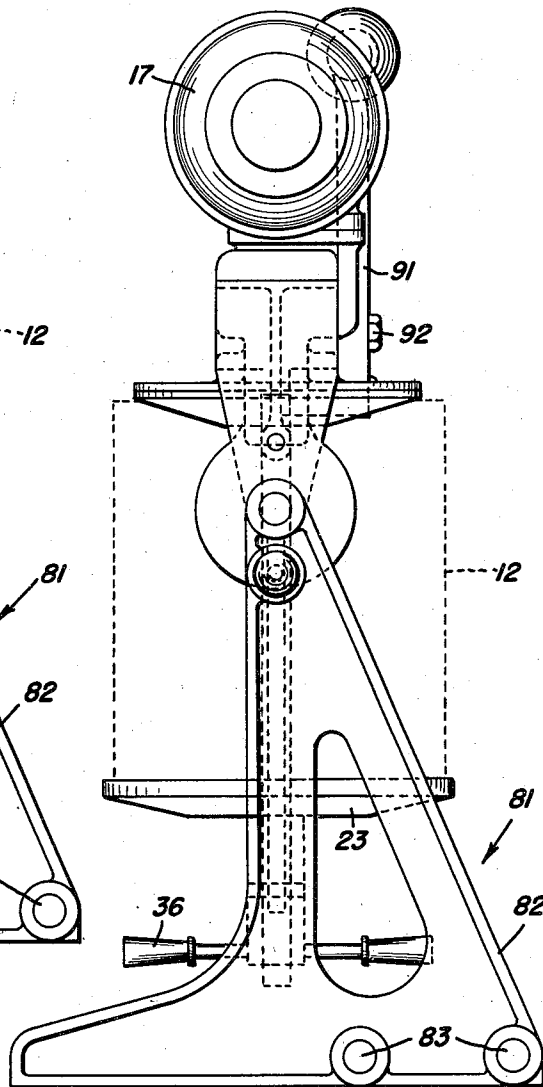


FIG. 5.

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4 Sheets-Sheet 4

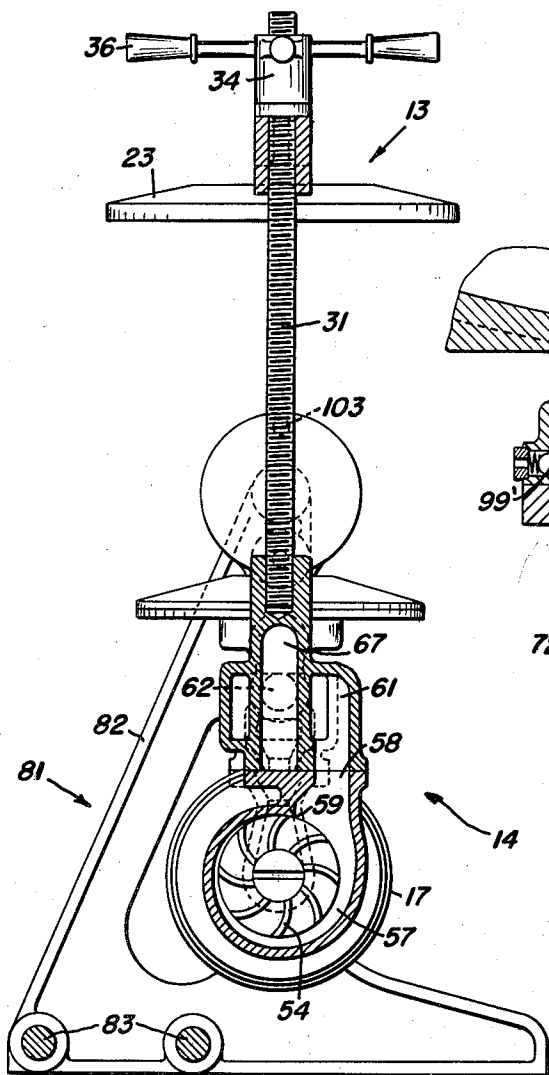


FIG. 6.

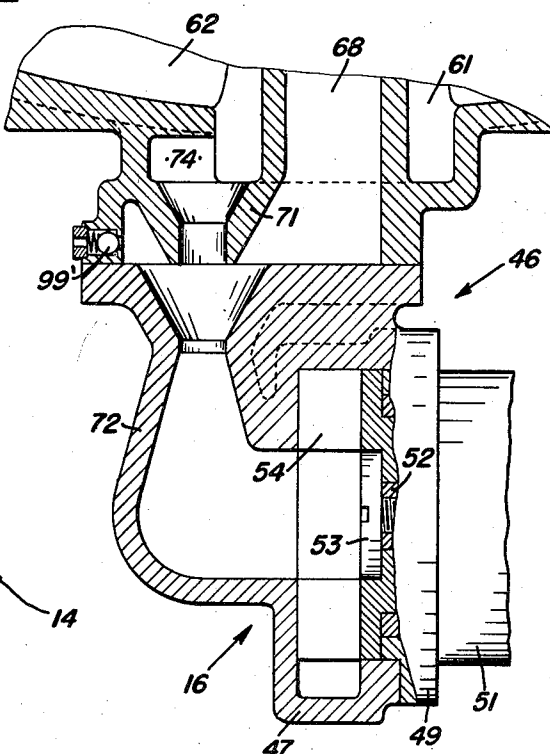


FIG. 7.

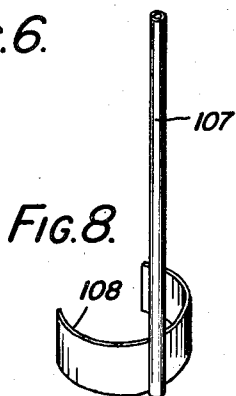


FIG. 8.

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2,860,857

MIXING APPARATUS FOR MIXING MATERIALS OF DIFFERENT CHARACTERISTICS

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Application May 3, 1955, Serial No. 505,790

11 Claims. (Cl. 259—96)

My invention relates to apparatus for mixing materials such as paints, chemicals and other liquids; for example, two or more colors of paints to derive a third desired color.

While the apparatus of my invention has broader application, it is primarily directed to the paint industry and probably has its principal application for use in the retailing of paints. In filling customers needs, a retail paint store is required to carry a large stock of paints in pints, quarts and gallons in a large variety of colors. A well-stocked retail paint store requires an inventory of paints in 100 or more colors and then is unable adequately to fill the requirements of his customers. Professional decorator-painters in decorating a house most frequently use a standard color put out by a paint manufacturer and then add one or more pigments to attain the color desired by the home owner. This is a cut and dry method of arriving at the desired shade and usually it is substantially impossible to reproduce the same shade at a later date should this be desired.

The large stock of various colors of paint required to be carried by a retailer of paint means that in each city only a comparatively few stores are financially able to have the space available to carry a sufficient stock reasonably to meet the demands of the purchasing public. The small paint stores and those stores which endeavor to carry a line of paints somewhat as a sideline such as hardware stores, are unable to carry a sufficient stock to meet the demands of its customers. Partially to overcome this difficulty, various paint manufacturers have endeavored to equip their smaller retail outlets with certain primary colors and then have indicated by a color chart what additional colors may be made-up from the basic colors carried in stock by mixing two of the basic colors in equal parts. For example, one manufacturer supplies its smaller retail outlets with paint in sixteen basic colors and supplies a color chart showing forty-two additional colors which may be made-up by mixing two of the basic colors in equal proportions. This only partially fulfills the needs of the small retail outlet and the mixing of the two colors is a messy job because the paint is thick at the bottom of the cans and must be thoroughly agitated before the two basic colors may be mixed to attain the desired color.

More recently, paint manufacturers have supplied retailers with a number of basic paint colors, an extensive color chart and a large number of squeezable tubes containing primarily pigments which may be mixed with the basic colors to derive a desired color. Often the paint retailer endeavors to sell the consumer the paint and color tube and have him do the mixing. However, many customers do not wish to do this. If the customer fails to mix the basic color and the color tube adequately, streaking will result. They want to purchase a can of paint already mixed in the desired color and ready for use. More frequently, the customer wants the retailer to mix the color tube with the paint and then is dubious

2

as to whether the same color can be reproduced if he requires more paint. While this system has to some extent solved the problems of the small paint retailer, its shortcomings still enable the bulk of the paint business to be done by the large well-stocked paint stores.

An object of my invention is to provide an apparatus whereby a retailer of paints with a basic stock of paints may conveniently make-up a large number of secondary colors and be in a position to guarantee the derived color to the customer.

Another object of my invention is to provide a relatively simple apparatus for mixing paints, which may be manufactured at a reasonable cost so as to be within the price reach of the small paint dealer, hardware store or variety store. A further object of my invention is to provide an apparatus for mixing two or more basic colors to derive a third color wherein the cans containing the basic colors are opened and placed in the machine and thoroughly mixed into a homogeneous desired color and returned to the original cans with very little effort on the part of the retailer and without the usual attendant mess resulting from mixing together two cans of paint by hand in order to derive a third color.

My invention further contemplates the combination of a support for carrying two or more opened cans of paint of different colors together with a pump and conduits between the pump and the cans of paints whereby the pump continuously removes and returns paint from and to the cans while mixing the colors thereof whereby a homogeneous desired color may be derived.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a vertical sectional view through the mixing apparatus of my invention;

Fig. 2 is a top plan view thereof;

Fig. 3 is a sectional view taken substantially on the line 3—3 of Fig. 1 in the direction indicated by the arrows;

Fig. 4 is a side elevation of the apparatus of my invention showing the apparatus in the upright position;

Fig. 5 is a view similar to Fig. 4 but with the apparatus including the cans of paint to be mixed in the upside down position;

Fig. 6 is a sectional view taken substantially on the line 6—6 of Fig. 1 in the direction indicated by the arrows;

Fig. 7 is an enlarged sectional view of a portion of Fig. 1; and

Fig. 8 is a perspective view of one form of device which may be employed in equalizing the pressure within the cans when the cans are inverted prior to and during the mixing operation, also after stopping mixer before inverting cans.

As previously mentioned, the apparatus of my invention is useful in the chemical and other industries. For example, a dealer in chemicals, particularly one selling chemicals in small quantities, may carry in stock a particular acid in containers and in various strengths. A customer orders that acid in a strength not maintained in stock. By the use of the apparatus and method of my invention, it would be possible to supply the customer with the desired acid strength with little effort or expense. While the apparatus and method of my invention has other uses it has been primarily developed for the retail paint industry, the particular problems of which have been set forth above. For this reason, the invention will be described in connection with the mixing of

paints but from the description, other fields of use will become apparent.

The apparatus of my invention and the means by which my novel method may be carried out comprises, as shown in Fig. 1: a pair of opened paint cans 11 and 12 which in Fig. 1 are shown in an inverted position; a support assembly, generally indicated by the numeral 13, for the paint cans; a conduit system communicating with the open ends of the cans and generally indicated by the numeral 14; a circulating pump, generally indicated by the numeral 16, connected to the conduit system; a motor 17 for driving the pump; and means, generally indicated by the numeral 18, for turning the mixing apparatus upside down and causing the paint to flow by gravity into the conduit system 14 and the pump 16.

In the drawings, I have shown the apparatus as being adapted to receive two cans of paint 11 and 12. The cans are of the conventional construction now normally employed in the marketing of paint but the principles of the apparatus and method of my invention may be employed with other types of containers. The containers have a bottom 19 and when the covers are removed, open tops 21, the openings being defined by beaded and rolled edges 22. While I have shown the apparatus of my invention as being adapted to receive two cans of paint, it will be appreciated that, if desired, the apparatus may be constructed to receive for mixing simultaneously three or more cans of paints of various colors.

Upon turning Fig. 1 upside down, the position of the parts of the apparatus when the apparatus is loaded with cans of paint will be clear. The support for the cans of paints, generally indicated by the numeral 13, comprises a pair of platforms 23 which preferably are provided with recesses or stepped depressed parts 24, 26 and 27 for receiving respectively gallon, quart and pint cans. A cross arm 28 is secured by nut and bolt assemblies 29 to the platforms 23. The cross arm 28 is free on a threaded rod or spindle 31 and extends downward between the cans of paint and the lower end thereof is threaded into a socket 32 formed in a casting 33 which contains the conduit assembly 14. A hub 34 having handpieces 36 is threaded on the rod 31. A washer 37 is interposed between the cross arm 28 and the hub 34. The side edges of the platforms 23 are notched, as shown at 38 (Fig. 2), for the reception of guide rods 39 mounted in sockets in the casting 33 and held in position by any suitable means.

The casting 33 has two frusto-conical upper walls 42 which are centered with respect to the several can positions defined by the recesses 24, 26 and 27. The faces of the frusto-conical parts 42 are covered with a suitable sealing material 43 such as rubber, against which the rolled lips 22 of the cans are adapted to seat. It will be apparent from the drawings that regardless of the size of the cans mounted in the apparatus, seals will be formed between the sealing material 43 and the lips or margins of the can openings when pressure is applied on the cans.

Upon turning the drawing of Fig. 1 upside down, it will be apparent that upon turning outward on the hand members 36, the platforms may be dropped down and the cans 11 and 12 mounted on the platforms with their lower margins in the recessed seats 24. Then by threading upward on the hand pieces 36, the arms 28 will carry the platforms upwards, together with the cans carried thereby, until the margins 22 of the openings in the cans seat and seal against the sealing material 43. The mixing apparatus including the motor 17 and the pump 16 which are rigidly connected to the casting 33 may then be rotated through 180 degrees by means which will presently be described, to position the apparatus as shown in Fig. 1.

The pump, generally indicated by the numeral 16,

may be of any suitable type. Preferably a centrifugal pump is employed which includes a casing generally indicated by the numeral 46, part 47 of which is formed integral with an inlet 48 and part 49 of which has a rearwardly extending part 51 bolted to the motor housing. The shaft 52 of the motor 17 extends through the part 51 and is threaded at its end to receive a cap screw 53 which holds the impeller 54 in position. A mechanical seal 56 of any suitable type is provided between the rotating and stationary parts.

Referring now to Fig. 6, the impeller 54 of the pump discharges into a volute-shaped passage 57 which connects with the pump discharge 58. The cutwater 59 of the pump is arranged in substantially a vertical position to avoid a pocket adjacent the cutwater in which paint might remain when the pump is drained, as will presently appear.

The discharge of the pump opens into a chamber 61 (see also Fig. 1) which is annular in cross-section. The chamber 61 opens into two discharge passages 62 (Fig. 1), which terminate adjacent their upper ends, in nozzles 63. The intake passages to the pump comprises annular openings 66 extending in surrounding relation to the nozzles 63. These annular openings 66 connect with a suction passage 67 which opens into a connection 68 connected to the inlet 48 of the pump casing.

From the foregoing, it will be understood that the system defined by the cans of paint positioned in open sealing relation with the sealing material 43, the intake and discharge passages, and the pump, together with its passages, form a closed system essentially air-tight. The system thus operates essentially at atmospheric pressure most of the energy of the pump imparted to the liquid or paint being velocity energy.

The velocity of the paint is increased by the nozzles 63 so that the paint issuing from the nozzles is forced at high velocity towards the bottoms of the cans as indicated by the arrows "A." The velocity is preferably sufficient so that any partially solidified or non-free flowing paint adjacent the bottoms of the cans is dislodged. This action is aided due to the fact that when the apparatus is inverted to the position shown in Fig. 1, the paint runs out of the cans and fills the passages and the pump cavity. Thus prior to turning on the motor 17, most of the paint has drained away from the bottoms of the cans except for such sluggish flowing materials as may cling to the bottom of the can. The velocity of paint issuing from the nozzles is sufficient to break-up any sluggish flowing material tending to cling to the bottoms and lower sidewalls of the cans.

The paint returned to the cans, then flows downward along the inner sidewalls of the cans as indicated by the arrows "B" toward the annular intake openings 66. Because the paint issues from the discharge nozzles 63 at relatively high velocity, there is a tendency to form a vacuum in the area surrounding the nozzles which assists in drawing the material toward the intake openings 66.

For the purpose of increasing the flow velocity, a nozzle 71 and a venturi or diffuser 72 are formed respectively in the casting 33 and the casting which forms part of the pump casing. The diffuser 72 empties into the inlet 48 of the pump. The nozzle 71 and the diffuser 72 are mounted in spaced relation to the space 73 between them forming a part of the intake passage being connected with the passage 68. The nozzle 71 opens into the discharge chamber 61 as shown at 74. It will now be appreciated by employing a nozzle and venturi connected to the discharge of the pump that when the pump is in operation, paint is supplied to the pump under an intake velocity head which has the effect of maintaining a high velocity of paint flow throughout the closed system defined above.

In the mixing apparatus of my invention, the full cans of paint are placed on the platform with the open ends uppermost (the position of Fig. 5). When the apparatus

is rotated through 180 degrees to bring the parts into the position shown in Fig. 1, the cans drain down into the intake and discharge passages and fill the casing of the pumps. It will be particularly noted, upon an examination of Fig. 1, that all the passages drain downward into the pump. No pockets exist in the passages. Thus, the act of rotating the mixing apparatus automatically primes the pump and this fact is one of the important aspects of my invention.

A further important aspect of my invention lies in the fact that when the mixing operation has been completed and the mixing apparatus is rotated to a position such as to bring the open ends of the cans uppermost (the reverse position of Fig. 1), the pump casing and all the passages drain into the cans by gravity. This will be particularly clear from an examination of Fig. 6 when turned upside down. It will be noted when the parts are in this latter position, the entire pump casing drains into chamber 61 and from thence outward through the passages 62 and the nozzles 63 and also through 68, 67 and 66. As previously mentioned, the cutwater 59 is approximately along the vertical center line of the pump so that a pocket is avoided adjacent the cutwater.

The apparatus of my invention is carried by a frame, generally indicated by the numeral 81, which includes a pair of side stands 82 connected together by cross bars 83. The upper ends of each of the side stands has a bore 84 which registers with a bore 86 of decreased diameter formed in the casting 33. A pivot bolt 87 or stud extends through the bores 84 and 86 and has a shoulder 88 engaging the margins of the bore 86. A nut is threaded on the outer end of the pivot bolt 87 to hold the pivot bolt in position. Thus, the mixing apparatus may be rotated with respect to the frame 81 by pivoting on the pivot bolt or stud 87. For the purpose of rotating the mixing apparatus, a handbar 91 is provided which is bolted to the casting 33 as shown at 92.

For the purpose of locking the mixing apparatus in either of its two positions, one of the side stands has a chamber 94 formed therein adapted to receive a locking bolt 96. The locking bolt has an enlarged part 97 upon which a spring 98 seats. The other end of the spring seats against a wall 99 formed as part of the side stand. The locking bolt 96 projects through an opening in the side stand and is provided with a handpiece 101. The opposite end of the locking bolt 96 has an extension 102 adapted to be received in either of two openings 103 formed in the casting 33.

It will be appreciated with the parts in the position shown in Fig. 1, that by grasping and exerting a rotational pressure on the handle 91 while simultaneously releasing the locking bolt 96 against the action of the spring 98, the mixing apparatus may be rotated through 180 degrees to position the cans in an upright position. Upon release of the locking bolt 96, the end 102 of the locking bolt will enter the opening 103 which appears uppermost in Fig. 1 and lock the mixing apparatus with the cans in the upright position. Thus, the mixing apparatus may be locked in a position with the cans upright or the cans turned upside down.

When the system above described is in operation, the paint is circulated through the system at relatively high velocity. The intake and discharge passages and the pump being common to both cans of paint, a complete mixing of the colors occurs in a matter of a few minutes. The two colors of paint are so thoroughly mixed that the paint returned to the cans is substantially homogeneous. When the paint is applied to a wall no streaking of colors occurs because thorough mixing is assured. The nozzle and the diffuser not only serve to increase the flow velocity in the system but cause a vacuum through the intake passages of sufficient value to overcome the vacuum existing at the bottoms of the cans when the cans are inverted (Fig. 1 position). The sluggishly flowing material adjacent the bottoms of the cans is broken up and the paint

flows under a velocity head downward into the intake and discharge passages and from thence into the pump.

One of the important aspects of my invention lies in the fact that the paint manufacturer exercises such excellent control over its processes of manufacturing paint that it is able to guarantee colors as conforming to color charts. The mixing apparatus of my invention is intended to be used in connection with the paint manufacturer's color charts. The paint retailer then by mixing fixed proportions of two or more colors, can guarantee that, for example, a mixture of equal parts of two colors of paint will, when thoroughly mixed, produce a homogeneous color in accordance with the color chart supplied by the paint manufacturer.

It will be further apparent that it would be possible by employing a spacing device between the platform and the bottom of one of the cans to mix a quart of one color with a pint or gallon of another color or to mix a pint of one color with a gallon of another color thus increasing the number of different colors which the paint retailer may supply to his customers from the same stock of basic colors.

In Fig. 8, I have shown an open ended tube 107 which has a partial ring clamp 108 secured thereto. If found necessary or desirable, after the cans are placed on the platforms and the platforms are in their lowermost position with the parts in the position reversed from that shown in Fig. 1, the clamps may be placed around the nozzles with the tubes 107 extended towards the bottoms of the cans. Then, when a sealing pressure is applied to the margins of the openings in the cans and the position of the cans reversed to the position shown in Fig. 1, the tubes will cause an equalization of pressure between the tops and the bottoms of the cans.

Still another alternate method of destroying any vacuum which may be occasioned at the bottom of the cans, when they are inverted to the position shown in Fig. 1, is to employ a spring pressed check valve 99' (Fig. 7). The check valve is placed in the wall of the casting 33 and opens into the space between the nozzle and the diffuser. At this point, a vacuum exists in the system which will draw in air and build up a pressure in the closed system. This air will bubble up through the system and destroy any vacuum existent adjacent the bottoms of the inverted cans.

After a mixing operation has been carried out, it is a simple matter to repeat the operation employing cans of a paint solvent such as carbon tetrachloride or turpentine. The same solvent may be used for a number of cleaning operations. The method described is simple, clean and can be accomplished in a few minutes. The customer is always assured that he will receive the desired color and that the same color can be reproduced at a later date.

While I have shown and described the preferred apparatus of my invention and have described the preferred method of mixing two materials having different characteristics, it will be apparent, that particularly in the form in relation of parts, variations and modifications may be made without departing from the spirit of my invention as set forth in the appended claims.

I claim:

1. Mixing apparatus comprising, in combination, a container, a support for the bottom of the container, said container having its top open, means for engaging the margins of said open top in a sealing manner, a pair of conduits in communication with the container through its open top, a pump for drawing material from the container through one of said conduits and returning it to the container through the other of said conduits and means for turning the apparatus upside down to prime the pump and conduits prior to initiating the priming cycle, said apparatus being turned right side up again at the end of the priming cycle to drain the pump and conduits into the container.

2. Apparatus in accordance with claim 1 in which a clamping device is provided to clamp the container between said support and said sealing means.

3. Apparatus in accordance with claim 1 in which the apparatus is rotatably supported in a frame.

4. Apparatus in accordance with claim 1 in which the apparatus is rotatably supported in a frame and means are provided for rigidly supporting the container in the apparatus and simultaneously pressing the margins of the container opening against said sealing means.

5. Mixing apparatus comprising, in combination, a plurality of containers having open ends a support for said containers, said containers containing materials of different characteristics which are to be mixed and returned to the containers in a mixed condition, said containers being mounted on said support with their open ends uppermost, sealing means for the margins of the open ends of the containers, means for moving said support to clamp said containers against said sealing means, a conduit for withdrawing material from each of said containers, a conduit for returning material to each of said containers, said conduits being connected to the containers through their open ends, a pump having a suction and a discharge, said withdrawing conduits being connected to the suction of the pump and said returning conduits being connected to the discharge of the pump, said pump, conduits and containers constituting a closed substantially air-tight system through which the materials in the containers are circulated until the mixture is substantially homogeneous, a support for said apparatus and means for rotating at least a part of said apparatus including said containers to a position such that the materials in the containers flow by gravity into the pump.

6. Mixing apparatus in accordance with claim 5 in which means are provided for drawing air into said closed system during operation of the pump.

7. Mixing apparatus in accordance with claim 5 in which said support is provided with means for supporting different sizes of containers.

8. Mixing apparatus comprising, in combination, a plurality of containers, means for supporting said containers with their bottoms closed and their tops open and facing upward, said containers containing materials of different characteristics which are to be mixed and returned to the containers in a mixed condition, conduits sealed with respect to the open ends of the containers and connected thereto for withdrawing the materials from the containers, conduits sealed with respect to the open ends of the containers and connected thereto for returning the materials in a mixed condition to the containers, means including a pump having a suction to which said withdrawing conduits are connected and a discharge to which said returning conduits are connected and means for rotating said conduits, said containers and said pump to a position in which the open ends of the containers are lowermost so that the material will flow from the containers through the conduits into the pump by gravity.

9. Mixing apparatus comprising, in combination, a plurality of containers having open ends for the material to be mixed, said containers containing materials having different characteristics, means for supporting the containers, means for sealing the margins of the open ends of the containers, means including conduits for withdrawing the material from the containers, mixing it and returning it to the containers, said means including a pump for imparting velocity to the liquids being mixed, said containers and said two last mentioned means together with

said sealing means comprising a closed circuit adapted to be maintained under a high velocity of fluid flow, said supporting means being adapted to receive the bottoms of the containers, means for applying the sealing means when the containers are right side up and means for inverting the containers, the support and said closed circuit.

10. Mixing apparatus comprising, in combination, a plurality of containers having open ends, a support for said containers, said containers containing materials of different characteristics which are to be mixed and returned to the containers in a mixed condition, said containers having their bottoms closed and their tops open with the open tops of the containers facing downward, a conduit for withdrawing material from each of the containers, a conduit for returning the material to each of the containers said conduit being connected to the containers through their open ends, means including a pump having a suction to which said withdrawing conduits are connected and a discharge to which said returning conduits are connected, sealing means for the margins of the tops of the containers, said conduits and said pump constituting a closed system through which the materials in the containers are circulated under a high velocity of fluid flow, said containers being placed on the support with their opened ends uppermost and means for turning said closed system including the containers upside down so that the material in the containers flows through said conduits into the pump by gravity.

11. Mixing apparatus comprising, in combination, a plurality of containers having open ends, a support for said containers, said containers containing materials of different characteristics which are to be mixed and returned to the containers in a mixed condition, said containers having their bottoms closed and their tops open with the open tops of the containers facing downward, a conduit for withdrawing material from each of the containers, a conduit for returning the material to each of the containers, said conduit being connected to the containers through their open ends, means including a pump having a suction to which said withdrawing conduits are connected and a discharge to which said returning conduits are connected, sealing means for the margins of the tops of the containers, said conduits and said pump constituting a closed system through which the materials in the containers are circulated under a high velocity of fluid flow, pressure applied means movable into engagement with and pressure sealing contact with the margins of the containers and means for rotating said closed system from a position in which the open ends of the containers are uppermost to a reversed position so that the materials in the containers will flow by gravity through said conduits into the pump.

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