

Oct. 20, 1959

P. J. DANIELS
LIQUID DISPENSERS

2,909,125

Filed Jan. 16, 1956

3 Sheets-Sheet 1

FIG. 1.

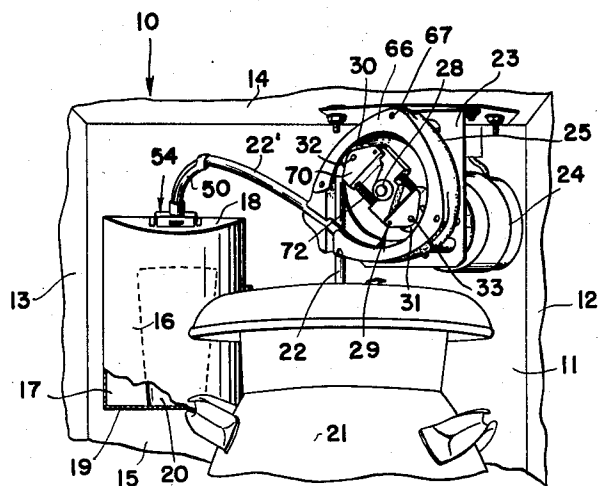
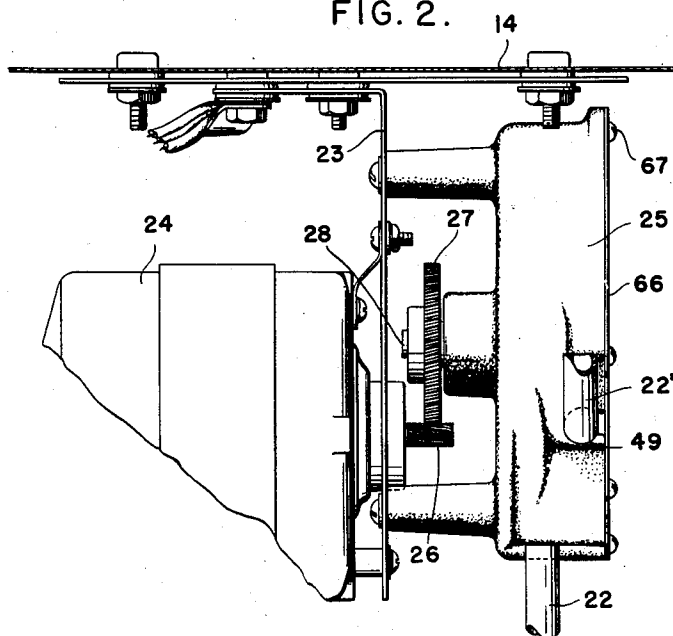


FIG. 2.



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3 Sheets-Sheet 2

FIG. 5.

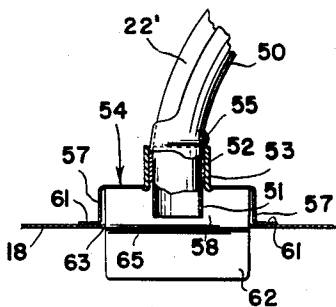


FIG. 6.

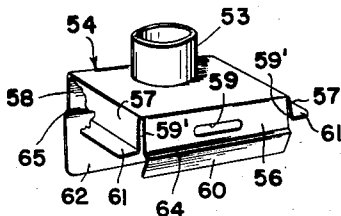


FIG. 3.

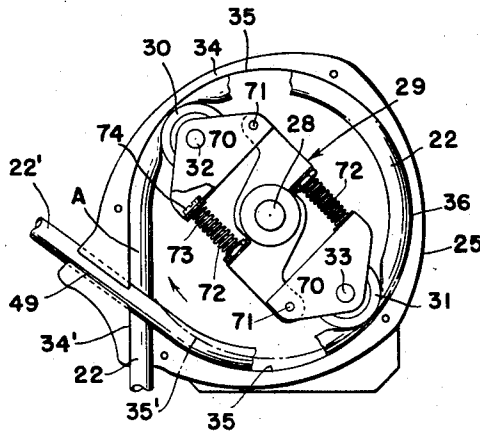


FIG. 7.

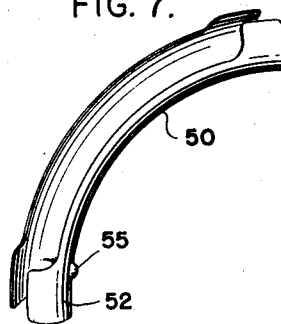
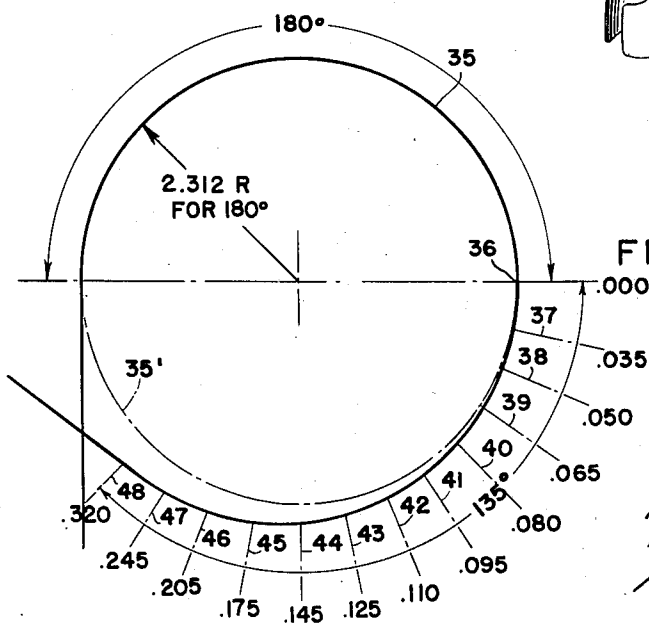


FIG. 4.



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3 Sheets-Sheet 3

FIG. 8.

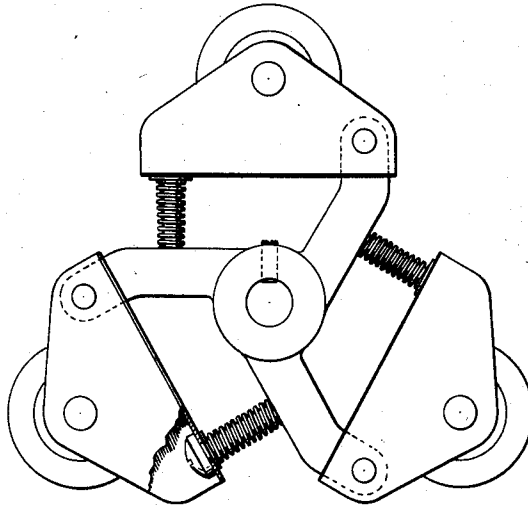
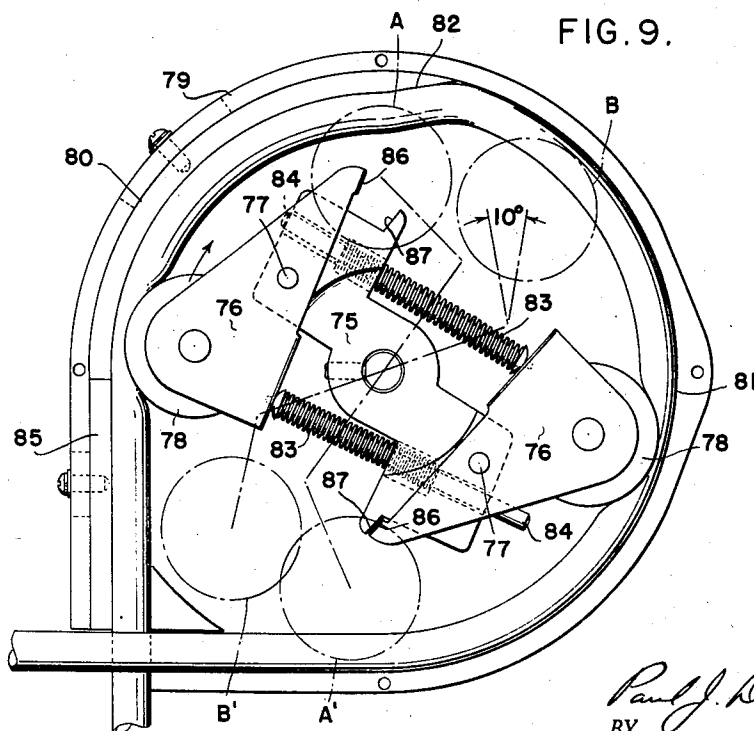


FIG. 9.



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1

2,909,125

LIQUID DISPENSERS

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Application January 16, 1956, Serial No. 559,297

4 Claims. (Cl. 103—149)

This invention relates to improvements in Liquid Dispensers, and is an improvement upon the devices disclosed in my prior patents, Nos. 2,694,984, 2,695,117 and 2,695,121.

The present invention relates in general to dispensers of the type adapted for use in automatic portion controlled self-service devices, and is particularly useful in dispensing milk or other edible liquids in cafeterias, drive-ins, factories and institutions.

The present invention is generally of that type wherein there is a flexible delivery tube leading from a supply container to a dispensing outlet, and wherein there is a rotary lift unit or pump having spaced rollers which progressively compress a portion of the length of tubing during rotation to cause fluid to be withdrawn from the container and to flow through the tube to the dispensing outlet.

In automatic liquid vending, where there is no attendant, it is important to avoid pulsations which might cause splashing, drippage or excessive foam during delivery. This is particularly important in the dispensing of milk to school children, where sanitation is essential. It is also important to avoid problems in that portion of the delivery tube which leads from the pump to the dispensing outlet. If any kinks occur in this portion of the tubing, there is a loss of surface tension with resulting dripping. Kinks are also likely to cause back pressure which prevents the maintenance of a smooth flow. Therefore, from the sanitation aspect, it is important that the lift or pump deliver the liquid without pulsations, and that the portion of the tube which leads from the pump to the delivery outlet be maintained in fully open perfect dispensing position.

In this type of dispenser, the flexible tubing is replaced each time a new can of milk or other liquid to be dispensed is loaded into the device. It is, therefore, important that any mechanism for holding the flexible tubing in perfect position be of such nature that it can be quickly removed when the flexible tubing is to be replaced, and it is important that any tube-holding mechanism be easily cleanable.

It is a general object of the present invention to provide a liquid dispensing device wherein the liquid is dispensed without pulsations, and wherein the portion of the flexible tubing leading to the dispensing outlet is readily removably maintained in perfect position so as to not interfere with said pulse-free delivery, the entire assemblage resulting in the dispensing of liquid without splashing, dripping or excessive foam.

A more specific object of the invention is to provide, in a liquid dispensing device having spaced rotatable rollers for progressively compressing a flexible tube, novel means for so holding the tube with respect to the rollers as to provide for full engagement of a roller with the tubing during only part of its circle of movement, the tubing dropping away from the rollers during another part of the circle of movement or there being other equivalent means for bringing about relief of

2

roller pressure to effectively eliminate pulsations during delivery.

A further object of the invention is to provide novel, readily removable fittings co-operable with the discharge end of the tubing for maintaining said tubing in perfect position so as to eliminate dripping and back pressure and eliminate any interference with the smooth flow from the pump.

A further object of the invention is to provide tube-holding mechanism having means for allowing refrigerated air from the interior of the dispensing cabinet to constantly circulate around the spout and thus maintain a temperature approximating that of the interior of the cabinet.

A still further object of the invention is to provide, in liquid dispensing mechanism as above described, means for protecting the spout portion of the dispensing tube from manual contact.

A still further object of the invention is to provide, in a device as above described, means whereby the dispensing portion of the tube is adjustably held in such a manner as to take up slack which might result from the use of containers of different size or height.

Other objects of the invention are to provide an improved liquid dispensing device which is relatively simple to manufacture, foolproof in operation, easy to service, and completely sanitary both in servicing and dispensing.

With the above and other objects in view, the invention consists of the improved liquid dispensing device, and all of its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the accompanying drawings, illustrating one complete embodiment of the preferred form of the invention, in which the same reference numerals designate the same parts in all of the views:

Fig. 1 is a fragmentary elevational view looking into the interior of a dispensing device from the rear thereof, and illustrating generally the improved features of the present invention;

Fig. 2 is a vertical sectional view through the top wall of the dispensing cabinet showing a side view of the liquid pump and drive mechanism therefor;

Fig. 3 is a front elevational view of the pump with the front holding ring removed;

Fig. 4 is a diagram illustrating how the tube-holding wall of the casing progressively drops away from the rollers to obtain a pulse-free lift and delivery;

Fig. 5 is a vertical sectional view through the top wall of the cup port showing the tube-holding fittings in operative position, parts of the upper curved fitting being broken away, and the lower fitting being shown in vertical section;

Fig. 6 is a perspective view of the lower fitting which constitutes the spout holder and guard;

Fig. 7 is a perspective view of the cooperating arcuate tube-holding fitting;

Fig. 8 is a modification showing a rotor with three rollers; and

Fig. 9 is a view similar to Fig. 3 showing a modification.

Referring more particularly to the drawings, the numeral 10 designates a dispensing cabinet having a suitably refrigerated interior compartment 11 (adapted to be closed by a rear door which is not shown) with said compartment having side walls 12 and 13, a top wall 14, and a front wall 15. The front wall is equipped with a cup port 16 fitted in a front opening 17, the cup port preferably having a semi-cylindrical wall as illustrated which forms a convex projection into the compartment 11, said cup port having a semi-circular top wall 18 which may incline slightly inwardly and there being a bottom wall

3

10 on which a cup 20 to be filled with milk or other liquid is adapted to be supported, said cup being insertable into the open front of the cup port from the front of the cabinet.

In the case of a milk dispenser, there is supported on the floor of the compartment 11 a standard milk can 21 which may be either a five- or ten-gallon size. Leading upwardly from the cover of the milk can is a flexible tube 22 preferably of rubber, which tube has suitable communication with the contents of the container in ways such as those disclosed in my prior patents. Suitably connected to the top wall 14 and depending therefrom is a vertically disposed mounting plate 23. An electric motor 24 is supported on one side of the mounting plate and a housing 25 for the lift or pump is connected to the other side of the mounting plate. The drive shaft of the motor 24 is fitted with a helical gear 26 which projects rotatably through the mounting plate 23 and meshes with a helical wheel 27 rigidly mounted on a pump shaft 28. Rigidly mounted on the pump shaft 28 is a roller assembly 29 having oppositely disposed rollers 30 and 31 rotatably mounted on pins 32 and 33. Each of the pins 32 and 33 is mounted in a like roller assembly which includes a bracket 70 pivotally mounted to the roller assembly as at 71 for movement against the tension of a coil spring 72 surrounding a rod 73. Each rod extends through the bottom of its bracket 70 and has a head 74 which forms a stop. Thus when the bracket pivots on 71 it will slide inwardly on the rod 73 while compressing the spring 72. The pump housing has a peripheral wall 34 with an interior surface 35. More than two equally spaced rollers may be employed. Fig. 8 shows a three-roller assembly which may be substituted for the assembly 29, the pivoted brackets operating the same as the brackets 70 of Fig. 3.

The upper portion of the inner surface 35 of the wall 34 is completely concentric with the axis of rotation of the roller assembly 29 as indicated in the diagram, Fig. 4, for approximately 180°. Beginning at point 36, however, on the diagram, and as a preferred way of bringing about progressive lessening of roller pressure on the tube, the wall portion starts to fall progressively farther away from a true circle for approximately 135°, as shown in Fig. 4, the dot-and-dash lines 35' indicating the continuation of the true circle. As a result of this arrangement, the wall 35 is .035" away from the true circle at station 37, .050" at station 38, .065" at station 39, .080" at station 40, .095" at station 41, .110" at station 42, .125" at station 43, .145" at station 44, .175" at station 45, .205" at station 46, .245" at station 47, and .320" at station 48.

The flexible tubing 22 leading from the milk can is guided through an opening 34' in the pump housing to extend around the inner periphery of the casing in contact with the wall 35. The tube then passes out of the casing through an opening 49.

With the roller assembly rotating in the direction of the arrow shown in Fig. 3, it is apparent that as the roller 30 rolls along from the position of Fig. 3, it is compressing the tubing to a maximum extent to draw milk or other liquid from the container 21, the roller being somewhat compressed against the tension of the spring 72. In the intake tube there is developed 23" of vacuum which results in a suction lift action because there is a vent in the neck of the cover of the can 21. After the roller 31 reaches the position A it will also start to compress the tubing and there will be a quantity of milk in the tube between the rollers 31 and 30, which milk will be pushed by the roller 31. As soon as roller 30 reaches position 36, the inner wall 35 of the housing, against which the tube 22 rests, begins to gradually and progressively fall farther and farther away from the true circle as shown in the diagram so that the roller 31 is compressing the tube to a progressively lesser extent as it moves through the stations 37-48, inclusive, the stop 74 at the end of the rod limiting the outward movement of the roller to a predetermined maximum. As this roller pressure is gradually relieved,

4

the milk which is being pushed by the roller 30, and which was initially trapped between the rollers 30 and 31, is gradually freed so that there is no abrupt or sudden pulsation created as the milk is directed into the discharge portion of the tube.

The portion 22' of the rubber tubing which leads out of the pump is slipped into a metal fitting 50 (see Fig. 7) so that the fitting is close to the end of the tube leaving a short length of the tubing 51 projecting (see Fig. 5). The metal fitting 50 is arcuate and adapted to prevent kinking of the portion 22' of the rubber tubing by holding it in the proper position shown in Fig. 1.

The lower end of the fitting 50 has a portion 52 which is of a diameter to be removably inserted in a neck 53 which projects upwardly from a fitting 54, the part 52 being retained frictionally in position, and there being protrusions 55 which limit downward movement.

The lower fitting 54 which forms a spout holder and guard is generally rectangular, having a front wall 56, side walls 57, and a rear wall 58. The front wall 56 is preferably formed with a slotted opening 59 and has a depending yielding flange 60, bent at an angle from a protruding shoulder 64. The side walls 57 have right angularly outwardly bent seating flanges 61, and the rear wall has a relatively long depending skirt 62, there being a protruding bead 65. The fitting 54 is, of course, open on the bottom and there is a co-operating opening 63 in the top wall of the cup port. The slot 59 as well as the open corners 59' allow refrigerated air from the compartment 11 to circulate around the spout 51 of Fig. 5 to maintain a relatively cool temperature around said spout.

When installing a new length of tubing, the flanges 60 and 62 are inserted in the opening 63 of the top 18 of the cup port until the shoulders 64 and 65 snap beneath the wall. The flanges 61 of the side walls 57 seat on top of the wall 18, as shown in Fig. 5. Next, the rubber tubing is squeezed so that it can be inserted in the arcuate fitting 50 with a short portion 51 projecting therebelow. The lower end 52 of the fitting 50 is then inserted in the sleeve 53 as shown in Fig. 5. Thus, the lower end 51 of the dispensing tube is protected within the recess formed in the fitting 54 from accidental manual contact during use of the dispensing machine. In addition, the spout portion of the tube is held firmly in position while the portion 22' of the tube which leads from the pump is so maintained that kinking is impossible. In addition, the fitting 50 may be swivelled to any position in the sleeve 53 so that slack can be taken up in the tube 22', if there is any.

When a can of milk has been used up the empty can, together with the used tubing, must be removed. With the present invention this can be quickly done by first withdrawing the fitting 50 from the top of the cut port insert. The next steps are the removal of the tubing from the fitting 50, and then the removal of the tubing from the pump. Before replacing a new can having a new length of tubing, the metal fittings 50 and 54 can be cleaned, and this can be done very quickly and easily, as the fitting 54 can be removed by inserting an instrument in the hole 59.

In the modification of Fig. 9 there is a roller assembly 75 having brackets 76 mounted on pivots 77, each bracket carrying a roller 78. The surrounding casing wall 79 has a part 80 of its inner wall with a shorter radius than another part 81, either by use of an insert or by milling, there being a relatively abrupt jog 82 in the inner wall leading from portion 80 to portion 81 to provide a cam action. As a result of this arrangement, when the rollers are in the full line position of Fig. 9 the left-hand bracket 76 is pivoted backward on the pivot 77 against the tension of a spring 83 mounted on a slidable rod 84. This increases the distance between the two rollers to somewhat more than 180°. This backward pivoting movement is caused by the shorter radius for the wall portion 80. The starting engagement with a roller on the suction stroke may be varied somewhat if desired by vary-

ing the thickness of an insert plate 85. When the left-hand roller is pivoted as shown in full lines in Fig. 9, the right-hand roller and its bracket 76 are in a normal position with stop members 86 and 87 in engagement, the spring having urged the parts to this position as permitted by the increased radius of the wall portion 81.

During use of this form of the invention and with the rotor assembly rotating in a clockwise direction, as the left-hand roller 78 moves toward dot-and-dash line position A it is compressing the tube to a maximum extent to draw milk or other liquid from the container. Just after the roller reaches position A the jog 82 leading to the increased radius of the wall portion 81 will allow spring 83 to push the bracket 76 back to a normal position as indicated at B and the roller will, in effect, snap from position A to position B. When it reaches position B it will still compress the tubing, but the pivoting of the bracket 76 back to normal position has reduced the distance between the two rollers shown by dot-and-dash lines at B and B' to 180°, thereby shortening the length of the column of milk between the rollers. It is to be noted that when one roller is in position A, the opposite roller is in the position A' just ready to leave the tubing so that the column of milk is shortened just before it is pushed out of the discharge portion of the tubing to effectively take up any voids in the tubing caused by previous compression of the tube by a roller. By having the one roller bracket pivot backwards as shown by full lines in Fig. 9 to increase the distance between rollers to more than 180°, the pressure on the column of milk between the two rollers is eased immediately after the ends of the column of milk are sealed by the rollers. Then, as each roller reaches the jog 82, it is permitted to jump to position B and offset the void in the tube previously caused by roller depression of the tube.

Summary of operation

After a new can of milk, together with a new piece of tubing 22—22' has been inserted in the device in the manner shown in Figs. 1, 3 and 5, then the machine is ready for a dispensing operation. The customer at the front of the machine places a cup 20 in the cup port as shown in Fig. 1, and starts the electric motor 24 in operation. This may be accomplished either by way of a push button switch on the front of the cabinet, or starting may be responsive to the insertion of a coin. Operation of the motor will act through the helical gear 26 and helical wheel 27 to rotate the rotor 29 in the direction of the arrow in Fig. 3. This will cause lifting of milk from the can and discharge of the same from the spout 51 into the cup 20. By use of suitable timing mechanism, the motor 24 may be made to shut off after a predetermined number of revolutions of the rotor 29 to supply a metered amount of liquid. Due to the fact that the lower portion of the wall 35 of the pump casing falls progressively away from a true circle, as shown in Figs. 3 and 4 and as heretofore explained, there is a gradual relief which gets progressively greater to eliminate all possibility of pulsations in the discharge portion of the tube. Thus the possibility of splashing, dripping and excessive foam is eliminated.

While it is preferred to provide the relief in the manner shown in Figs. 3 and 4, is it obvious that any equivalent method may be employed, such as that of Fig. 9.

In addition, the fittings 50 and 54 hold the discharge portion 22' of the tubing in perfect position so that there is no interference with the pulse-free delivery. There is no loss of prime because the instant one roller starts to relieve the other comes into full engagement to hold the prime.

It is obvious that the invention may be used for liquids other than milk. It is also clear that three or more equally spaced rollers may be used in lieu of the oppositely spaced rollers 30 and 31 illustrated.

Reference is made to divisional application, Serial No. 649,764 filed April 1, 1957.

Various other changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims.

What I claim is:

1. In a liquid dispensing device, a pump casing having a peripheral wall, a flexible dispensing tube having a part of its length in contact with said peripheral wall and having an inlet portion and an outlet portion, a rotor rotatably mounted within said casing and having spaced diametrically opposed roller-bracket supports each with a spring seat, a roller bracket pivoted to each support, a roller rotatable in each roller bracket and positioned to engage a portion of the tube which is in contact with said wall to compress the same, resilient means between each roller bracket and the support for the other roller bracket normally urging each roller into contact with said tube, said peripheral wall for a predetermined distance from said tube inlet portion being closer to the axis of rotation of the rotor than the portion of said wall which leads toward said tube outlet, the pivotal mounting for each roller bracket being so positioned that a roller is swung backwardly when it is in contact with the wall portion which is closest to the axis of rotation to increase the circumferential distance between rollers.

2. In a liquid dispensing device, a pump casing having a surrounding wall, a flexible dispensing tube having inlet and outlet portions and having a part of its length within said casing in contact with said surrounding wall, said casing having inlet and outlet openings for said tube so positioned that the axis of the inlet portion of the tube intersects the axis of the outlet portion of the tube within the outline of the casing, a rotor rotatably mounted within said casing and having two oppositely disposed rollers positioned 180° apart to engage the portion of the tube which is within the casing to compress the same, said surrounding wall for a substantial distance from said tube inlet portion being concentric with the axis of rotation of said rotor, and the portion of the wall which follows and which leads towards the tube outlet opening being farther away from said axis of rotation to provide for relief of roller pressure on the tube and avoid pulsations, there being an abrupt jog in the wall between said two portions, said portion of the wall which is farther away from the axis being so located with respect to said axis of rotation that said portion of the tube which is against said last mentioned wall portion is held so that it is relatively lightly engaged by the roller nearly to the point of intersection of the axis of the tube inlet and outlet portions.

3. In a liquid dispensing device, a pump casing having a peripheral wall, a flexible dispensing tube having inlet and outlet portions and having part of its length within said casing in contact with said peripheral wall, a rotor rotatably mounted within said casing and having spaced pivoted roller brackets, a roller rotatably carried by each roller bracket, spring means on said rotor coaxing with said roller brackets to normally urge the rollers outwardly, co-operating stop means on the rotor and brackets providing a predetermined limit to said spring-urged outward movement, said peripheral wall with which the tube is in contact having a portion for a substantial distance from said tube inlet which is concentric with the axis of rotation of the rotor and having a following portion of substantial length which leads toward the tube outlet which is further away from said axis of rotation so that the pressure on the tube which is against this latter portion is less when the brackets are in their extreme outwardly limited position than the pressure exerted on the tube which is against the first-mentioned wall portion, said pivotal mounting for each roller bracket permitting inward yielding movement of the roller away from said peripheral wall.

4. In a liquid dispensing device, a pump casing having a surrounding wall, a flexible dispensing tube having inlet and outlet portions and having a part of its length within said casing in contact with said surrounding wall, a rotor rotatably mounted within said casing and having spaced 5 rollers positioned to engage the portion of the tube which is within the casing to compress the same, said surrounding wall with which the tube is in contact having a portion for a substantial distance from said tube inlet portion which is concentric with the axis of rotation of said 10 rotor and having a portion which follows and which leads towards the tube outlet opening which is farther away from said axis of rotation to provide for relief of roller pressure on the tube and avoid pulsations, there being an abrupt jog in the wall between said two portions, said portion of the wall which is farther away 15 from the axis being so located with respect to said axis of rotation that said portion of the tube which is against

said last-mentioned wall portion is held so that it is relatively lightly engaged by the roller.

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