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CONTAINER CLAMP FOR LIQUID MIXING APPARATUS

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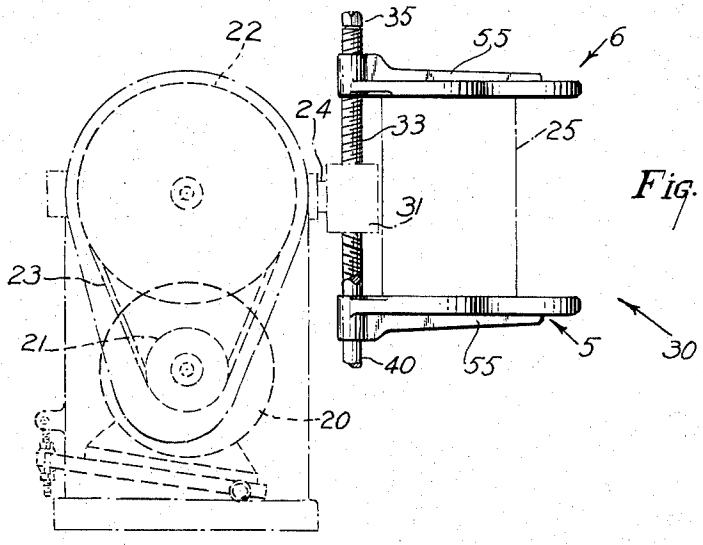


Fig. 1

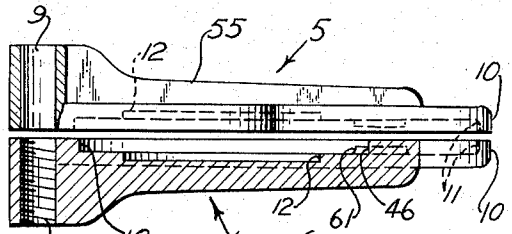


Fig. 4

Fig. 5

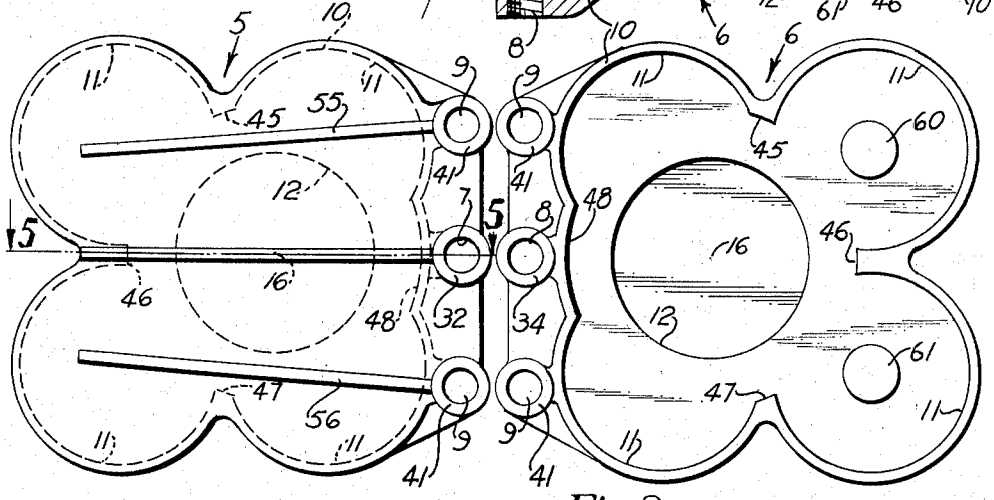


Fig. 2

Fig. 3

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CONTAINER CLAMP FOR LIQUID MIXING APPARATUS

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5 Claims. (Cl. 24—263)

This invention relates generally to a clamp for a liquid mixing apparatus and more particularly to an improved clamp especially adapted for securely clamping either a plurality of small liquid containers or a single large liquid container while the mixing apparatus oscillates the containers to agitate the liquid contained therein for mixing it.

The improved clamp of the present invention is especially adapted for utilization on paint mixing apparatus of the type employed by retail outlets for mixing the contents of cans of paint that have been purchased by customers. The paint is usually packaged in pint, quart or gallon cans by the manufacturer, and as the paint is stored in inventory, the pigment settles to the bottom of the can, separating from the vehicle or liquid portion of the mixture. Before being applied, these components of the paint must be thoroughly mixed to form a uniform mixture, and as a service to the customers, many retailers are equipped with a power operated mixing apparatus which vigorously oscillates the can of paint to mix its contents so that the customer need only stir it lightly immediately before using it.

In such paint mixing machines, a clamp is provided for firmly securing the can of paint to the apparatus while the apparatus operates to oscillate the can for the purpose of mixing its contents. The clamp usually comprises two jaws, with the can being located between the jaws which are tightened onto the can to secure it. The jaws presently available for this purpose are constructed so that only one can of paint can be mixed at a time, whether it be a gallon, quart or pint can. Frequently a customer will purchase several quart or pint cans of paint, and since the jaws of the clamp will only receive one can of paint at a time, considerable time is consumed while each can is placed in the mixing apparatus individually for its contents to be mixed, wasting the time of both the customer and the salesclerk.

It is therefore a general object of the present invention to provide an improved clamp for paint mixing apparatus which is especially adapted to receive up to four quart or pint cans of paint for clamping them to the machine.

Another object of the invention is to provide an improved clamp for paint mixing apparatus having jaws that will secure one gallon can, or four or less quart or pint cans between them in a minimum area, so that the size of the jaws is not much larger than the jaws which will accept only one can at a time.

Another object of the invention is to provide improved jaws for the clamp of paint mixing apparatus which will clamp up to four quart or pint cans between them and will apply a substantially equal pressure to the several cans between the jaws to firmly secure them to the machine.

A further object of the invention is to provide an improved clamp for paint mixing apparatus which is of simple and inexpensive but sturdy construction and efficient in operation.

According to this invention the improved container clamp comprises a pair of jaws adapted to clamp either one gallon can or from one to four quart or pint cans of paint between them at a time. The two jaws are of like construction with one complementing the other for receiving the cans of paint between them. Each of the jaws is of a four leaf clover configuration having a lip or ridge about its entire edge with the lip extending laterally from the surface of the jaw for retaining the cans of paint within the area of the jaw. As the lip progresses about the edge of the jaw it forms four approximately semi-circular arcs, each of sufficient radius to receive the top or bottom of a quart can of paint within the arc, so that up to four quart cans may be clamped between the jaws at one time.

Each of the four arcs terminates at a line which is on a circle of a diameter slightly larger than the diameter of a gallon can of paint. As the lip progresses from the terminal of one arc to the terminal of the successful arc it follows the path of the same circle to create four arcs of relatively short length spaced about the circle. Since these four short arcs formed by the lip have the same radius, they will receive the one gallon can of paint with the lip extending beyond the bottom or the top of the gallon can to retain the can between the two jaws as the mixing operation is being performed and the one gallon can will occupy a portion of the area that would otherwise be occupied by the one quart cans. Thus the jaws will accommodate one gallon can or up to four quart cans in a minimum of space.

The foregoing and other objects of the invention, which will become more fully apparent from the following detailed description, may be achieved by means of the apparatus described in connection with the accompanying drawings in which:

Figure 1 is a side elevational view of a liquid mixing machine clamp incorporating the features of the present invention, the clamp being shown assembled to the mixing machine which is indicated by broken lines;

Figure 2 is an enlarged plan view of the top jaw of the clamp shown in Figure 1;

Figure 3 is an enlarged plan view of the bottom jaw of the clamp shown in Figure 1;

Figure 4 is an enlarged view of the top jaw of the clamp illustrated in Figure 1, being shown partly in side elevation and partly in vertical section; and

Figure 5 is an enlarged view of the bottom jaw of the clamp depicted in Figure 1, being shown partly in side elevation and partly in vertical section with the view being located directly adjacent to the view of the top jaw in Figure 4 to illustrate how the two jaws complement each other.

Reference is now made more particularly to the drawings and specifically to Figure 1 thereof illustrating a paint and liquid mixing aparatus equipped with a container clamp incorporating the features of the present invention. The apparatus comprises an electric motor **20** having a pulley **21** connected to drive a cooperating pulley **22** by a V belt **23**. The pulley **22** is connected to drive a motion producing apparatus which functions to effect a rotary reciprocating movement of a shaft **24** and may at the same time oscillate the shaft **24** axially or laterally to generate a compound motion for mixing paint or other liquid contained in a receptacle **25** which is indicated in Figure 1 by broken lines.

The cylindrical container **25** is secured to the mixing apparatus by a clamp generally identified by the reference numeral **30** and which is attached to the shaft **24** for movement with it to agitate the contents of the receptacle **25**. The features of the present invention are incorporated in the clamp **30** which is adapted to be employed with a variety of motion producing apparatus,

and since the latter does not form a part of the present invention it is illustrated in broken lines in Figure 1.

The clamp **30** is secured to the shaft **24** by means of a bracket **31** that is fixedly secured to the shaft **24** for movement with it. The clamp **30** comprises a pair of oppositely disposed clamp jaws **5** and **6** that are arranged to clamp one or more receptacles **25** between them. The jaw **5** is provided with a cylindrical boss **32** having a left hand female thread **7** formed therein for engagement with a cooperating thread formed on the lower portion of a screw **33**. The top jaw **6** is provided with a similar cylindrical boss **34** having a right hand female thread **8** formed therein for engagement with the complementary thread formed on the upper portion of the screw **33**.

The screw **33** is journalled in the bracket **31** with its axis intersecting the axis of the shaft **24** so that it is centrally located relative thereto. The upper extremity of the screw **33** is provided with a squared end **35** for receiving a crank (not shown) by means of which the screw **33** may be rotated for producing a movement of the jaws **5** and **6** toward or away from each other depending upon the direction of rotation of the screw **33**. Such movement of the jaws **5** and **6** in opposite directions is achieved by reason of the fact that the lower jaw **5** is provided with a left hand thread in engagement with a left hand threaded portion of the screw **33** while the upper jaw **6** is provided with a right hand thread in engagement with a right hand threaded portion of the screw **33**.

The bracket **31** also supports a pair of guide rods **40** which are rigidly secured to the bracket **31** with one guide rod **40** being disposed on each side of the screw **33** and extending parallel thereto. The guide rods **40** are in sliding engagement with bores **9** formed in cylindrical bosses **41** that are attached to the jaws **5** and **6** as clearly shown in Figures 2 and 3. Therefore, as the jaws **5** and **6** are moved relative to each other by rotating the screw **33**, they are guided in their vertical movement by the guide rods **40** sliding within the bores **9**. With this arrangement, the cylindrical receptacles **25** which contain the paint or liquid to be mixed are securely clamped in position to be agitated by placing the receptacle between the jaws **5** and **6** and rotating the screw **33** to tighten the jaws upon the receptacle. After the paint or liquid containing receptacle **25** has been thus secured to the mixing apparatus, the motor **20** is energized to actuate the motion producing mechanism for effecting the combined rotary reciprocal and axial or lateral oscillating movement of the shaft **24**. Since the clamp **30** is attached to the shaft **24** through the bracket **31**, such movement of the shaft **24** is transmitted to the receptacle **25** which is secured within the clamp **30** to cause a thorough agitation of its contents for mixing it.

The advantages of the present invention lie in the unique arrangement of the jaws **5** and **6** which enable the jaws to clamp either one large can, such as a one gallon can, or four small cans, such as four one quart or four one pint cans between them. Paint is usually furnished by the manufacturer in cylindrical cans of one gallon capacity, one quart capacity, or one pint capacity in addition to the smaller size cans which would not normally be mixed by a power operated apparatus as described above. The conventional clamp jaws **5** and **6** which were previously available for this purpose have been usually provided with concentric recesses for receiving either the one gallon can, the one quart can or the one pint can. However, because of the concentricity of the recesses, only one can could be accommodated at a time regardless of its size. The jaws were constructed in this manner because it was felt that if they were arranged to accommodate more than one can of a particular size, they would have to be too large and cumbersome for the capacity of the machine to provide sufficient area for accommodating the several cans simultaneously. The present invention however, provides a novel arrangement of the jaws **5** and **6** which enables the jaws to accommodate either a single one gallon can, or up to four one quart or one pint cans without unduly enlarging the area of the jaws. This is accomplished by providing suitable recesses for the cans that are to be placed within the jaws while permitting the four one quart or one pint cans to overlap into the space that would be occupied by the single one gallon can between the jaws.

Such overlapping arrangement is achieved by the unique configuration of a lip or ridge **10** which is disposed about the entire ridge of the jaws **5** and **6** and extends from the surface thereon. The lip **10** extends downwardly from the upper jaw **6** and extends upwardly from the lower jaw **5** so that the cylindrical containers are disposed within the lip **10**. The reciprocating and oscillating motion which is imparted to the containers **25** by the mixing apparatus is extremely vigorous and may overcome the clamping pressure exerted by the jaws **5** and **6**. The ridges **10** on the jaws **5** and **6** are therefore essential as a safety measure to prevent the cans from accidentally slipping from between the jaws while the contents are being agitated in the event that sufficient clamping pressure has not been applied to the ends of the containers.

The jaws **5** and **6** are identical in construction with one complementing the other for cooperatively clamping the containers **25** between them and it will therefore only be necessary to refer to one of the jaws in this description. It will be observed from the view in Figure 3 that the configuration of the jaw **6** resembles a four leaf clover and the jaw **5** shown in Figure 2 is of like construction. Since the ridge **10** extends about the entire edge of the jaw **6** it progresses through four arcs **11** of uniform radius with each of the four arcs having radii of equal length. The radius of the arcs **11** is just slightly larger than the radius of the standard cylindrical one quart paint can so that a quart can may be placed within the area defined by each of the arcs **11**. Therefore, four one quart cans may be encompassed by the jaw **6** and each can will be within the ridge **10** to prevent its slipping from between the jaws **5** and **6**. Since the diameter of the one pint cans in which paint is furnished is smaller than the diameter of the one quart can, these one pint cans may be also received within the arcs **11** and the ridge **10** will prevent their slipping from between the jaws.

In order to enable the jaws **6** to also accommodate a single one gallon can of paint or other liquid, the ridge **10** is arranged to confine such one gallon can between the jaws while permitting the area which it occupies to overlap upon the area that would be occupied by the one quart cans within the arcs **11**. To this end, the ridge **10** extends from the terminal of one arc **11** to the terminal of the succeeding arc **11** by progressing along an arc that proceeds along the periphery of a circle of a diameter just slightly larger than the diameter on a one gallon can. Since there are four arcs **11**, there are four connecting arcs which connect the terminals of the arcs **11**, and the four connecting arcs will be spaced relative to each other about the periphery of the circle.

Thus, an arc **45** is of a relatively short length and is of a uniform radius about an axis **16**. It will be noticed that the arc **45** extends from the terminal of one arc **11** to the terminal of the succeeding arc **11** to connect the two arcs together. In a similar manner, a short arc **46** is generated about the axis **16** and is of the same radius as the arc **45** being disposed to connect the terminals of two succeeding arcs **11**. Another short arc **47** connects the terminals of the following arcs **11** and is of the same radius as the arcs **45** and **46** with the axis **16** serving as its center. A relatively longer arc **48** is likewise of the same radius drawn from the axis **16** and serves to connect the terminals of the succeeding arcs **11**.

Thus, the four arcs **45**, **46**, **47** and **48** all lie in the

periphery of the same circle by virtue of the fact that they have the same radius from the same axis **16**. This circle upon which the four arcs **45**, **46**, **47** and **48** lie is just slightly larger than the radius of a one gallon can as previously mentioned, so that a one gallon can may be placed within this circle and it will be retained therein by that portion of the ridge **10** which lies within the four arcs **45**, **46**, **47** and **48**. It will also be noted that the circle overlaps into the area that would be occupied by the one quart cans within the arcs **11** so that the different size cans may be accommodated by the jaws **5** and **6** in a minimum of area to avoid the necessity of requiring excessively large clamp jaws without in any way detracting from the ability of the jaws to retain the cans between them while they are being subjected to the agitating motion.

It is frequently necessary to mix the contents of a single one quart can of paint and if such single one quart can were placed within one of the arcs **11** it would tend to unbalance the apparatus to cause undue vibration of the mixing apparatus itself. In order to accommodate such single one quart can without placing it within one of the arcs **11**, a recess **12** is provided in each of the jaws **5** and **6** in complementary relationship for receiving the single one quart can, the recess **12** being of circular configuration and of a diameter just slightly larger than the diameter of a one quart can. When the single can is placed within this recess **12** it will be substantially centrally located on the jaws **5** and **6** so that the mechanism will be in balance to perform its operation.

As clearly shown in Figure 2, the jaws **5** and **6** are each provided with reinforcing ribs **55** and **56** that extend from the bosses **41** toward the far end of the jaws. These ribs **55** and **56** serve to resist flexing of the jaws from the force to which they are subjected when the clamping pressure is applied. However, since the threaded engagement of the female threads **7** and **8** with the screw **33**, and the sliding engagement of the bores **9** with the guide rods **40** cannot be made absolutely tight, and some flexing may occur in the jaw structure when four one quart cans are tightly clamped within the arcs **11**, the extremities of the jaws **5** and **6** opposite the end in engagement with the screw **33** may tend to shift outwardly out of parallelism, causing the extremities of the jaws to separate slightly when the clamping pressure is applied.

This slight separating movement of the outer ends of the jaws **5** and **6** is compensated for by the provision of two pads **60** and **61** which are formed concentrically with the two outer arcs **11** of the jaw **6** and are raised slightly from the surface of the jaw. The two outer one quart cans located within the two outer arcs **11** of the jaws will therefore be raised slightly from the surface of the jaw **6** and when separation of the outer edges of the jaws does occur, the distance from the surface of the pads **60** and **61** to the surface of the complementary portion of the jaw **5** will be substantially equal to the distance between the surfaces of the two jaws at the inner edge in the vicinity of the screw **33**. The clamping pressure applied upon the two outer one quart cans will therefore be approximately equal to the pressure applied to the two one quart cans located within the inner two arcs **11**. However, it is to be understood, that the pads **60** and **61** do not extend from the surface of the jaw **6** as high as the ridge **10** which forms the arc **11** so that the ridge **10** will still function to prevent the slippage of the one quart cans from between the jaws **5** and **6** while they are being subjected to the agitating motion.

From the foregoing detailed description of the structure and operation of the illustrative embodiment of the present invention, it will be apparent that there has been provided a new and improved container clamp for a paint or liquid mixing apparatus that is especially adapted to clamp either a single one gallon can or four or less one quart or one pint cans between a pair of movable jaws by means of a unique ridge construction which permits the jaws to be constructed with a minimum amount of area.

Although the illustrative embodiment of the invention has been described in considerable detail for the purpose of making a full disclosure of a practical operative structure by means of which the invention may be practised, it is to be understood that various novel features of the invention may be incorporated in other structural forms without departing from the spirit and scope of the invention as defined in the subjoined claims.

The principles of the invention having now been fully explained in connection with the foregoing description of embodying structure, I hereby claim as my invention:

1. In a clamp for a liquid mixing machine for securing cylindrical liquid containers of large sizes and of small sizes to the machine for agitation and having a pair of jaws movable toward and away from each other for clamping the liquid containers between them, each of said jaws comprising; a flat plate for receiving the containers; a plurality of relatively small radius ridges protruding from one surface of said plate, each of said ridges extending along the periphery of said plate in an arcuate path of a radius thereof slightly greater than the radius of the small size containers so that a small size container can be partially received within each of said arcs; and a plurality of relatively large radius ridges protruding from the surface of said plate from which said small radius ridges protrude, each of said large radius ridges extending from a terminal of one of the arcs formed by said small radius ridges to an adjacent terminal of the succeeding arc formed by said small radius ridges so that the terminals of the several arcs formed by said small radius ridges are connected together in series by said large radius ridges, each of said large radius ridges being spaced from each other and extending along the surface of said plate in an arcuate path of uniform radius with each of the arcs being of the same radius generated from the same center so that the arcs formed by the large radius ridges all lie along the periphery of the same circle, the circle being of a diameter slightly greater than the diameter of the large size containers; whereby several small size containers may be clamped between the jaws of the clamp simultaneously with each small container being partially contained within one of the arcs formed by said small radius ridges to confine them within the area of said plates or one large size container may be clamped between the jaws of the clamp with the large container being contained within the arcs formed by said large radius ridges to confine the large container.

2. In a clamp for a liquid mixing machine for securing cylindrical liquid containers of large sizes and of small sizes to the machine for agitation and having a pair of jaws movable toward and away from each other for clamping the liquid containers between them, each of said jaws being complementary to each other and comprising; a flat plate for receiving the containers to be clamped between the jaws; a plurality of relatively small radius ridges protruding from one surface of said plate, each of said small radius ridges extending along the periphery of said plate in an arcuate path of a radius thereof slightly greater than the radius of the small size containers so that a small size container can be partially received within each of the arcs, the several arcs being disposed so as to form a cloverleaf configuration; and a plurality of large radius ridges protruding from the surface of said plate from which said small radius ridges protrude, said large radius ridges being spaced from each other and extending along a surface of said plate in an arcuate path of uniform radius with each of the arcs being of the same radius generated from the same center so that the arcs formed by the large radius ridges all lie along the periphery of the same circle, the circle being of a diameter slightly greater than the diameter of the large size containers for receiving the end of a large size container with the circle lying inside of the area occupied by the arcs formed by said small radius ridges so that the periphery of the

circle does not intersect the arcs formed by said small radius ridges but overlaps a portion of the area that would be occupied by the smalll size containers when located within the arcs formed by said small radius ridges; whereby several small size containers may be clamped between the jaws of the clamp simultaneously with each small container being partially contained within one of the arcs formed by said small radius ridges to confine them within the area of said plates or one large size container may be clamped between the jaws of the clamp with the end of the large container being contained within the arcs formed by said large radius ridges to confine the large container.

3. In a clamp for a liquid mixing machine for securing cylindrical liquid containers of large sizes and of small sizes to the machine for agitation and having a pair of jaws supported along one side for movement toward and away from each other for clamping the liquid containers between them, each of said jaws being complementary to each other and comprising; a flat plate for receiving the containers to be clamped between the jaws, said flat plate having a substantially centrally located circular recess of a diameter slightly greater than the diameter of the small size containers for receiving the end of a small size container; a plurality of relatively small radius ridges protruding from one surface of said plate, each of said small radius ridges extending along the periphery of said plate in an arcuate path of a radius thereof slightly greater than the radius of the small size containers so that a small size container can be partially received within each of the arcs, the several arcs being disposed in a manner to form a cloverleaf configuration; a plurality of relatively large radius ridges protruding from the surface of said plate from which said small radius ridges protrude, said large radius ridges being spaced from each other and extending along the surface of said plate in an arcuate path of uniform radius with each of the arcs being of the same radius generated from the same center so that the arcs formed by the large radius ridges all lie along the periphery of the same circle, the circle being of a diameter slightly greater than the diameter of the large size containers for receiving the end of a large size container with the circle lying inside of the area occupied by the arcs formed by said small radius ridges so that the periphery of the circle does not intersect the arcs formed by said small radius ridges but overlaps a portion of the area that would be occupied by the small size containers when located within the arcs formed by said small radius ridges; and a pair of pads on said flat plate, each of said pads being formed concentrically with one of the two small radius arcs that are located along the side of said plate that is remote from the side that is supported, said pads being raised slightly from the surface of said plate to provide a bearing surface for receiving the end surface of the two small size containers within the small arcs for the purpose of compensating for the separation of the remote ends of the two jaws due to the clamping pressure; whereby a single small size container may be received within the recess of said plate and clamped between the jaws or several small size containers may be clamped between the jaws of the clamp simultaneously with each small container being partially contained within one of the arcs formed by said small radius ridges to confine them within the area of said plates or one large size container may be clamped between the jaws of the clamp with the large container being contained within the arcs formed by said large radius ridges to confine the large container.

4. In a clamp for a liquid mixing machine for securing cylindrical liquid containers of large sizes and of small sizes to the machine for agitation and having a pair of jaws supported for movement toward and away for each other for clamping the liquid containers between them, each of said jaws being complementary to each other and comprising; a flat plate for receiving the containers to be clamped between the jaws, said flat plate having a substantially centrally located circular recess of a diameter slightly greater than the diameter of the small size containers for receiving the end of a small size container; a plurality of relatively small radius ridges protruding from one surface of said plate, each of said small radius ridges extending along the periphery of said plate in an arcuate path of a radius thereof slightly greater than the radius of the small size containers so that a small size container can be partially received within each of the arcs; and a plurality of relatively large radius ridges protruding from the surface of said plate from which said small radius ridges protrude, said large radius ridges being spaced from each other and extending along the surface of said plate in an arcuate path of uniform radius with each of the arcs being of the same radius generated from the same center so that the arcs formed by the large radius ridges all lie along the periphery of the same circle, the circle being of a diameter slightly greater than the diameter of the large size containers for receiving the end of a large size container with the circle lying inside of the area occupied by the arcs formed by said small radius ridges so that the periphery of the circle does not intersect the arcs formed by said small radius ridges but overlaps a portion of the area that would be occupied by the small size containers when located within the arcs formed by said small radius ridges; whereby a single small size container may be received within the recess of said plate and clamped between the jaws or several small size containers may be clamped between the jaws of the clamp simultaneously with each small container being partially contained within one of the arcs formed by said small radius ridges to confine them within the area of said plates or one large size container may be clamped between the jaws of the clamp with the large container being contained within the arcs formed by said large radius ridges to confine the large container.

5. In a clamp for a liquid mixing machine for securing cylindrical liquid containers of large sizes and of small sizes to the machine for agitation and having a pair of jaws supported along one side for movement toward and away from each other for clamping the liquid containers between them, each of said jaws being complementary to each other and comprising; a flat plate for receiving the containers to be clamped between the jaws; a plurality of small radius ridges protruding from one surface of said plate, each of said small radius ridges extending along the surface of said plate in an arcuate path of a radius thereof slightly greater than the radius of the small size containers so that a small size container can be partially received within each of the arcs, the several arcs being disposed in a manner to form a cloverleaf configuration; a plurality of relatively large radius ridges protruding from the surface of said plate from which said small radius ridges protrude, said large radius ridges being spaced from each other and extending along the surface of said plate in an arcuate path of uniform radius with each of the arcs being of the same radius generated from the same center so that the arcs formed by the large radius ridges all lie along the periphery of the same circle, the circle being of a diameter slightly greater than the diameter of the large size containers for receiving the end of a large size container with the circle lying inside of the area occupied by the arcs formed by said small radius ridges so that the periphery of the circle does not intersect the arcs formed by said small radius ridges but overlaps a portion of the area that would be occupied by the small size containers when located within the arcs formed by said small radius ridges; and a pair of pads on said flat plate, each of said pads being formed concentrically with one of the two small radius arcs that are located along the side of said plate that is remote

from the side that is supported, said pads being raised slightly from the surface of said plate to provide a bearing surface for receiving the end surface of the two small size containers within the small arcs for the purpose of compensating for the separation of the remote ends of the two jaws due to the clamping pressure; whereby several small size containers may be clamped between the jaws of the clamp simultaneously with each small container being partially contained within one of the arcs formed by said small radius ridges to confine them within the area of said plates or one large size container may be clamped between the jaws of the clamp with the end of the large container being contained within the arcs

formed by said large radius ridges to confine the large container.

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