Sept. 1, 1959 R. J. STAHL ET AL 2,901,805

PAINT SHAKER CLAMP

Filed Oct. 3, 1956

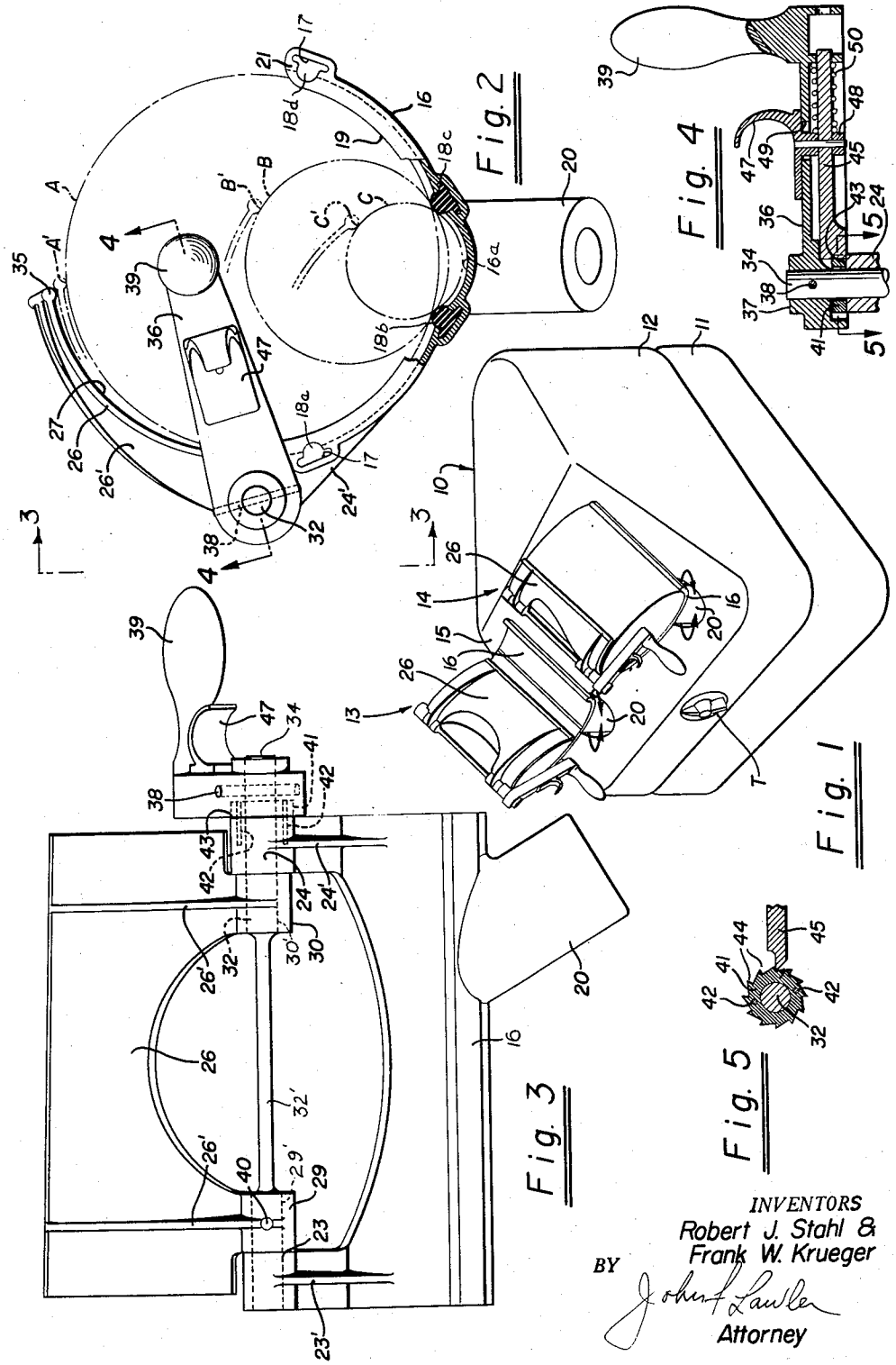


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

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2,901,805

Patented Sept. 1, 1959

2,901,805

PAINT SHAKER CLAMP

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Application October 3, 1956, Serial No. 613,771

7 Claims. (Cl. 24—250)

This invention relates to a clamping mechanism for holding an object such as a can of paint on a mixing machine or shaker.

The can-holding clamps for paint shakers are subjected to considerable vibration and oscillatory motion during normal operation of the machine. This condition tends to loosen the clamp unless a positive lock is applied to the relatively movable parts of the clamp. However, positive locking of such clamps by devices heretofore proposed have complicated the clamping operation and have detracted from the ease and speed with which clamping and unclamping of cans can be accomplished. Furthermore, prior clamp devices with which we are familiar have provided a rigid or unyielding engagement between the adjustable clamp part and the paint can, which has the disadvantage of effectively transmitting magnified vibrations of the filled paint can to the lock member, tending to loosen it.

A primary object of our invention is to provide a clamp which does not loosen its grip on an object, even when subjected to rapid vibrations and oscillatory movements over prolonged periods. Another object is to provide a conveniently operable clamp which safely holds a paint can in locked position on a shaker and which may be quickly released and reclamped. A more specific object is to provide a universal clamp that automatically accommodates a large number of different sizes of paint cans without requiring adjustment of the clamp. A further object is the provision of a clamp with means for yieldably engaging the object to be clamped within the jaw members without the use of conventional springs. Still another object is to provide resilience in the movable clamp member which dampens vibration that would otherwise be transmitted to the clamp-locking mechanism. Another object is to provide a clamp in which the locking mechanism is pre-loaded when the clamp is locked, thereby preventing slipping of the lock and opening of the clamp. Another object is to provide a clamp of this character which has a minimum number of parts and which is economical to produce.

These and other objects of our invention will become apparent from the following description of a preferred embodiment thereof, reference being had to the accompanying drawings in which:

Figure 1 is a perspective view of a paint can mixing machine having clamps embodying our invention.

Figure 2 is an end view of the clamp with the movable plate shown in a partly open position.

Figure 3 is a side elevation of the clamp as viewed on the line 3—3 of Figure 2.

Figure 4 is a section through the clamp-locking mechanism, taken on line 4—4 of Figure 2.

Figure 5 is a section taken on line 5—5 of Figure 4.

Referring now to the drawings, a preferred embodiment of our invention is shown in conjunction with a paint shaking machine **10**, having a base **11**, an upper housing **12**, and a pair of can-holding cradles or clamps **13** and **14**, supported above the forward inclined surface **15** of the housing as shown in Figure 1. Housing **12** contains a motor and linkage mechanism which drive the cradles in rapid oscillatory movement in the direction of the arrows in Figure 1, and thereby cause the paint cans or similar containers of material to be mixed, which are mounted on the cradles, to oscillate rapidly. The longitudinal axis of each cradle, that is, the longitudinal axis of a can supported in the cradle, preferably extends parallel to the inclined housing surface **15** and at an angle to the vertical axis of the drive shaft. The axis about which the paint can oscillates therefore extends diagonally through the can, and thorough mixing and conditioning of the paint in the can are assured.

Our invention is directed to the novel construction of the can-holding cradles **13** and **14**, and, in particular, to the clamping mechanism of the cradle by means of which cans may be quickly inserted within, clamped and released from each cradle. Since the cradles shown in Figure 1 are identical in construction, only one of the cradles will be described hereinafter, and like reference characters identify like parts in the drawings.

Cradle **13** comprises a lower semi-cylindrical member **16** having an inside surface formed with a plurality of longitudinal arcuately spaced grooves **17** for receiving as many resilient rubber-like strips **18***a*, **18***b*, **18***c* and **18***d* which protrude slightly above the inner surface of the member for resiliently supporting the can to be shaken. Flanges **19** at opposite ends of the cradle member **16** serve to seat the can within the cradle and prevent longitudinal movement of the can during the shaking operation. The spacing between inside strips **18***b* and **18***c* preferably is less than the diameter of the smallest can C (Figure 2) to be shaken, that is, a ¼-pint can, and the inside surface **16***a* of member **16** between strips **18***b* and **18***c* is formed sufficiently deep to provide clearance with the side of the can C. The underside of member **16** has an integral hub **20** secured to the drive shaft, not shown, and the axis of the hub intersects the longitudinal axis of the cradle at an acute angle as shown in Figure 3. The side edge **21** of member **16**, as viewed to the right in Figure 2, is flared and rounded, and the opposite side edge has a pair of axially spaced integral hinge bosses **23**, **24**, reinforced by ribs **23'** and **24'**, respectively.

The upper half of the cradle comprises an arcuately shaped clamp member **26** hinged to lower member **16** by a hinge shaft **32** which extends through bosses **29** and **30**, see Figure 3, on the side edge of member **26** and through bosses **23** and **24** on member **16**. Bosses **29** and **30** are axially spaced apart, as shown, and fit closely within bosses **23** and **24**, respectively; all the bosses being bored to receive the enlarged ends of hinge shaft **32**. The central portion **32'** of shaft **32** between bosses **29** and **30** has a reduced diameter in order to make this part of the shaft torsionally resilient as is explained below. For example, in one embodiment of our invention which has been tested successfully, reduced portion **32'** of the shaft, preferably made of steel, has a diameter of ¼" and a length of approximately 4½". Shaft **32** extends throughout the entire axial length of member **16** and has one end **34** projecting beyond boss **24** for engagement with clamp actuating handle **36**.

Upper clamp member **26** is an arcuately shaped plate, reinforced by external ribs **26'** and having a longitudinal, preferably serrated, bead **35** along its outer side edge. The axis of bead **35** preferably is slightly skew to the longitudinal axis of lower cradle member **16** in order to distribute clamping forces more effectively from upper member **26** to the can. It will be noted also the longitudinal axis of member **26** inclines slightly inwardly in a direction from left to right as viewed in Figure 3, so that the right or forward end of the upper clamp member is spaced more closely than the left end there-

of to lower member 16. This is accomplished, for example, by axially offsetting the bores 29' and 30' of hinge bosses 29 and 30, respectively, so that upper member 26 is hingedly supported obliquely with respect to lower member 16. The purpose of this relative inclination of the cradle members is to facilitate resilient locking of the clamp mechanism as explained hereinafter.

The projecting end 34 of shaft 32, to the right as viewed in Figure 3, extends through the hub 37 of a handle 36 and is secured thereto by a transverse pin 38. Handle 36 constitutes a crank which extends radially out from the shaft and has a handgrip 39 at its outer end by which an operator pivots the handle. Clamp member 26 is secured to hinge shaft 32 axially remote from handle 36 by a transverse pin 40 which extends through hinge boss 29 of member 26 and the portion of shaft 32 within the boss. It will be noted that the connection of member 26 to shaft 32 by pin 40 is at the left end (Figure 3) of member 26 which is spaced a maximum distance from lower member 16. Handle 36 and upper clamp member 26 pivot together about the hinge axis since these two parts are connected to opposite ends of the hinge shaft. However, when the forward end of member 26 engages a cam in the cradle, further angular displacement of handle 36 torsionally stresses shaft 32 so that the shaft is under stress when upper member 26 or bead 35 thereof ultimately engages the can through the length of member 26.

In order to hold member 26 in locked position against a can or other object in the cradle, a ratchet wheel 41, see Figures 3 and 4, is secured by pins 42 to the outer face 43 of hinge boss 24 of lower member 16 and has its teeth 44 engaged by a dog shaft 45 carried by the handle. Shaft 45 is radially slidably mounted on handle 36 and is moved out of engagement with the ratchet by means of a slide trigger 47 having a projection 48 extending through a slot 49 in the handle for connection with the dog shaft. Spring 50 urges shaft 45 inwardly into engagement with the teeth on the ratchet wheel, and the operator, by squeezing the trigger 47 toward handgrip 39, withdraws the dog shaft from engagement with the ratchet wheel. The teeth 44 of ratchet wheel 41, see Figure 5, are so shaped that dog shaft 45 rides over the teeth when handle 36 is turned in a clockwise direction as viewed in Figure 2 but prevent rotation of the handle in the opposite direction unless the dog shaft is retracted from the teeth by compression of spring 50. Clamping of a paint can in the cradle is effected rapidly by pivoting handle 36, and thus upper member 26, toward lower cradle member 16 until member 26 engages the can; the spring-loaded dog shaft preventing outward pivoting of the upper member. The clamp members are positively locked by the dog and ratchet as distinguished from a friction-type lock, such as a screw.

It will be noted that handle 36 and upper member 26 are connected to hinge shaft 32 at axially spaced points along the hinge shaft, that is, pin 38 connects handle 36 to one end of the hinge shaft and pin 40 connects member 26 to the opposite end of this shaft. Torque applied to the hinge shaft by handle 36 at connecting pin 38 is transmitted through the reduced central portion 32' of the shaft to upper member 26 at pin 40. When member 26 is moved in a clockwise direction as viewed in Figure 2 for clamping the can in the cradle, initial engagement of the front end of member 26 with the can prevents further free rotation of the member. Additional torque applied to hinge shaft 32 by handle 36 causes member 26 to roll down against the can and the shaft is torsionally stressed, handle 36 and the associted dog shaft 45 being progressively angularly displaced relative to ratchet wheel 41. Since engagement of the dog in the ratchet wheel locks the handle in its displaced position with respect to member 26, a resilient or yieldable clamping force of magnitude proportional to the angular displacement of handle 36 relative to member 26 is applied to the can as a result of the twisting of hinge shaft 32. Thus, the clamped can is positively yieldably locked in the cradle.

Vibrations transmitted to member 26 incident to shaking of a can by the shaker mechanism are damped by the torsionally stressed hinge shaft 32 and do not appear in any substantial proportion between dog shaft 45 and ratchet wheel 41. The stressing of hinge shaft 32 also presses the tooth of dog shaft 45 tightly against the adjacent tooth of the ratchet wheel, creating a strong frictional bond between these parts which prevents accidental slipping of the dog shaft out of engagement with the ratchet wheel. Interengagement of the dog shaft and ratchet wheel is practically unaffected by vibrations in the parts of the cradle, and the danger of release of the lock during operation of the machine is avoided.

The desired torsional resilience in hinge shaft 32 may be achieved by reducing the diameter of a portion of the shaft 32, as shown in Figure 3; the enlarged outer ends of the shaft providing a substantial bearing area for hingedly supporting the upper member 26 on the lower member 16, and also providing for secure engagement of handle 36 and upper member 26 to the shaft, through the respective pins 38 and 40. It will be understood, however, that shaft 32 may be formed with different shapes or may have the same diameter throughout its length, without departing from the principle of our invention, which is to provide torsional resilience in the hinge shaft for operation of the mechanism as described above.

In operation, the cradle is opened to receive a can to be shaked by pivoting handle 36 in a counterclockwise direction as viewed in Figure 2, the operator simultaneously squeezing trigger 47 to disengage the dog shaft from the ratchet wheel. The can is placed on its side within lower cradle member 16 and handle 36 is rotated in a clockwise direction. When the front end 27 of upper member 26 engages the top side of the can it stops, but continued movement of the handle causes torsional stressing of hinge shaft 32 as the upper member progressively engages the can. The handle is prevented from rotating in the opposite direction by the engagement of dog shaft 45 with ratchet wheel 41 and upper cradle member 26 is held against the can under the pressure of the stressed hinge shaft.

The shaker mechanism is then turned on by timer switch T, see Figure 1, and mixing of the paint continues for a predetermined time. The operator then grasps handgrip 39, squeezes trigger 47 to withdraw dog shaft 45 from engagement with the ratchet wheel 41 and pivots the handle in a counterclockwise direction to open the cradle. The can is then removed and the operation repeated for another mixing cycle.

The geometry of the upper and lower members of our clamping cradle is such that the clamping forces, applied to cans of varying sizes and diameters, prevent relative movement between the can and cradle parts. Bead 35 of member 26 engages the largest can A, see Figure 2, approximately along the vertical central plane of the can, that is, along a line A' under the bead and, as member 26 is pivoted inwardly toward member 16 to engage successively smaller cans B and C along lines B' and C', respectively, bead 35 reaches beyond the vertical central planes of the cans, and member 26 overlies more than half the body of each can. The direction of clamping force applied by member 26 to each of the cans A, B and C is such as to press each can tightly against resilient support strips 18*b* and 18*c* on the lower cradle member and to prevent relative movement between the can and the cradle.

Those skilled in the art will appreciate that various changes and modifications can be made in the preferred

form of paint shaker clamp described and illustrated herein, by way of example, without departing from the spirit and teachings of the invention.

The scope of our invention and patent therefor is defined in the appended claims.

We claim:

1. A clamp having first and second clamp members, a spring shaft having an axis and journalled on said first member, said second member being secured to said shaft for rotation with said shaft about said axis relative to said first member, a handle secured to said shaft remote from the connection of said second member to the shaft, a ratchet secured to said first member adjacent said handle and concentrically of the axis of said shaft, a dog on said handle releasably engageable with said ratchet, a portion of the shaft between its connections to said handle and said second member being torsionally resilient whereby said shaft twists when the handle is turned after relative movement between portions of the second and first members is restricted.

2. A clamp comprising a pair of clamp members having means for connecting said members to pivot toward and away from each other for clamping and releasing an article therebetween, a handle, spring means connecting said handle to one of said members, said spring means being adapted to yield when relative movement between portions of said members toward each other is restricted by the article being clamped, and releasable lock means associated with one of said members and with said spring means for holding said members in clamped position.

3. In combination with article-clamping means of shaking apparatus, a pair of relatively pivotable clamping members, a spring pivot shaft extending through adjacent parts of said members and having an axis about which one member pivots relative to the other, means for connecting one member to said shaft, handle means connected to said shaft remote from the connection of said one member to the shaft, and releasable one-way lock means on said handle means and engageable with the other of said member to permit movement of said members toward each other and to restrict movement of said members away from each other.

4. In combination with can clamping means of paint shaking apparatus, a pair of clamping members, a hinge shaft between said members, means for rigidly connecting one of said members to said shaft, a handle secured to said shaft remote from the connection of said one member to the shaft, a portion of said shaft intermediate said handle and said last mentioned means being torsionally yieldable whereby to permit angular displacement of said handle relative to said one member, a ratchet on said other member adjacent said handle, a dog mounted on said handle for movement to and from locking engagement with said ratchet, and spring means disposed to urge said dog into locking engagement with said ratchet.

5. Mechanism of the type described, comprising a pair of members, a torsionally resilient hinge shaft between said members, said members being pivotally connected to each other by said hinge shaft, a connection between one of said members and said shaft, means to rotate said shaft to pivot said members toward and away from each other, and releasable one-way lock means connected with said first-named means and engageable with the other of said members for permitting movement of said members toward each other and for preventing movements of said members away from each other.

6. Mechanism according to claim 5 in which the diameter of said shaft between said connection and said first-named means is reduced.

7. Mechanism of the type described, comprising a pair of members adapted for relative movement toward and away from each other about an axis for clamping and releasing an object therebetween, releasable positive lock means associated with said members for preventing movement of said members away from each other, a torsion spring element between said members disposed concentrically of said axis and connected at one end to one of said members, and means for rotating said spring element about said axis to pivot said one member toward and away from the other member, said spring element being stressed only when relative movement of said members toward each other is resisted by the clamped object.

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