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CLAMP FOR SIEVE STACK ASSEMBLIES OF RECIPROCATING AIR
COLUMN SIFTERS AND THE LIKE

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3 Sheets-Sheet 1

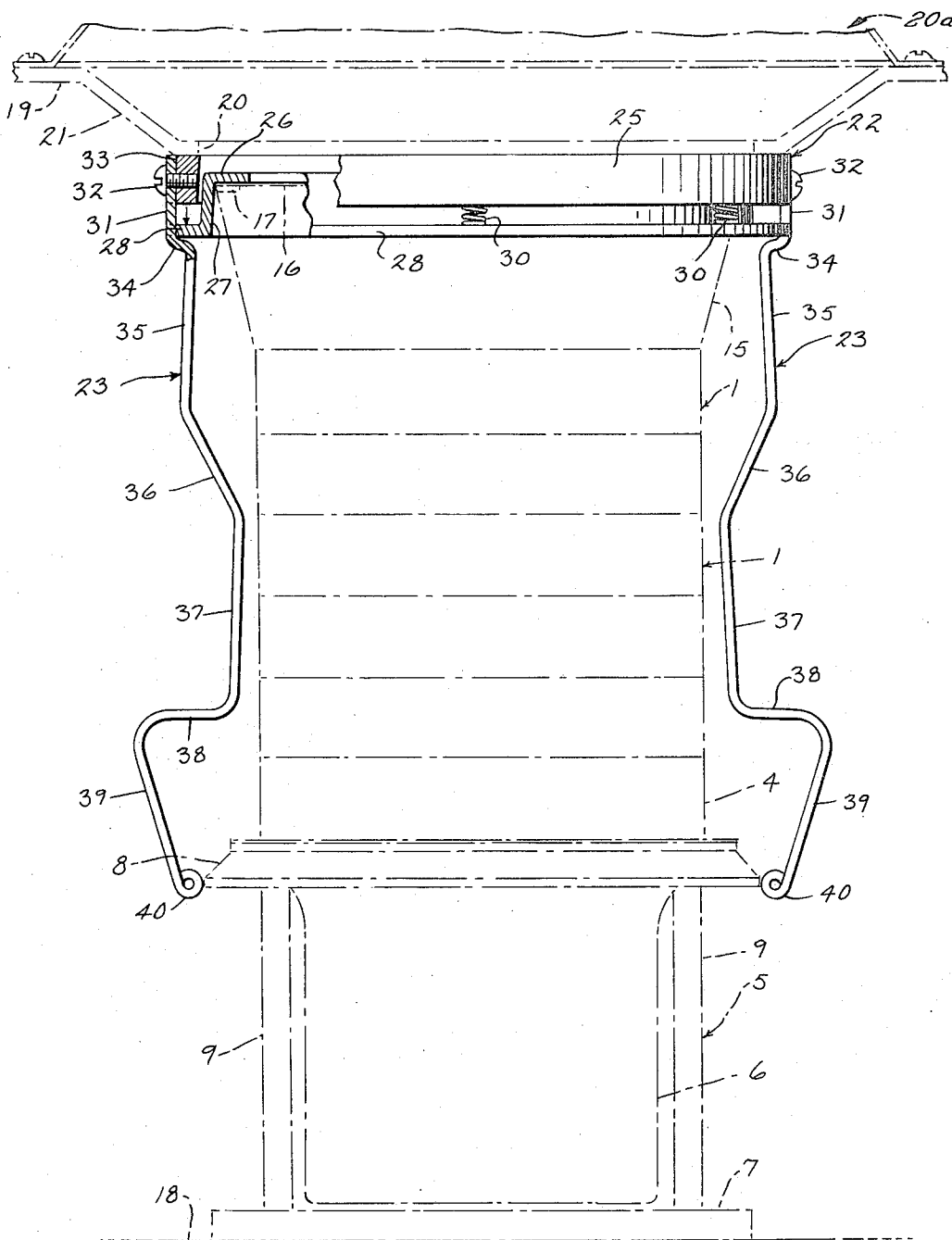


Fig. 1

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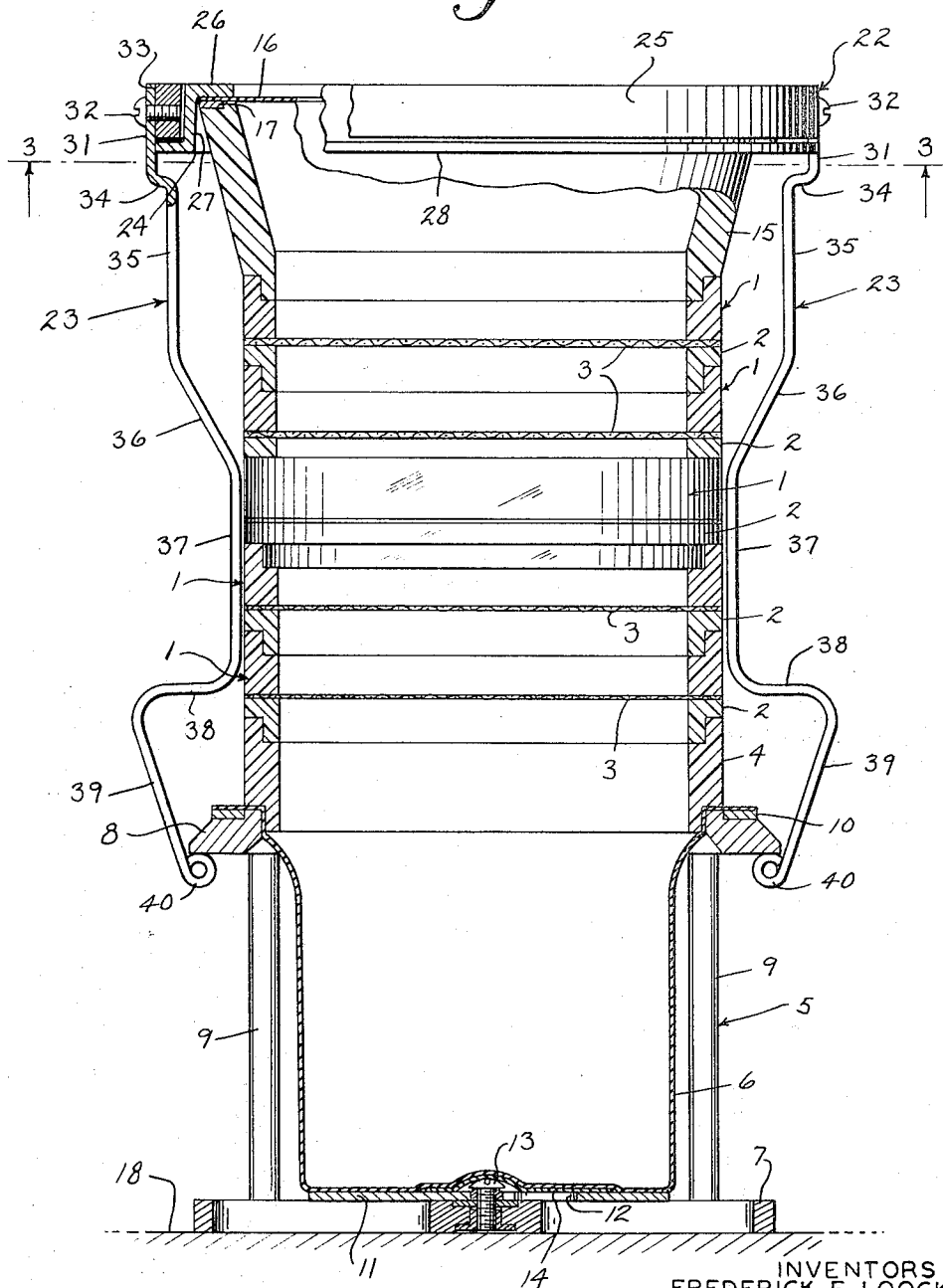
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Fig. 2



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Fig. 3

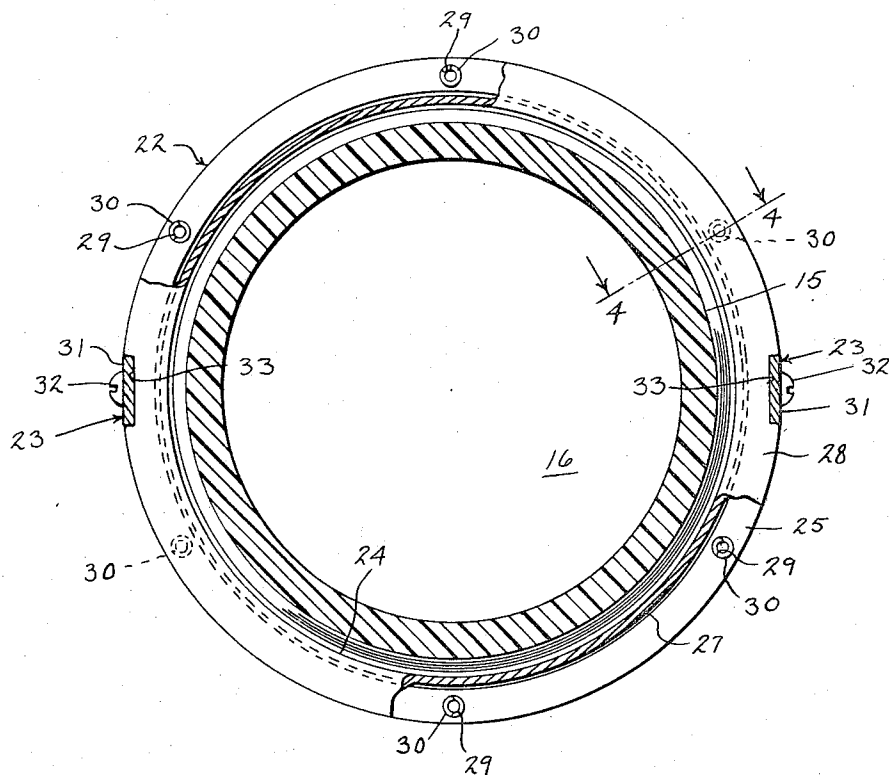
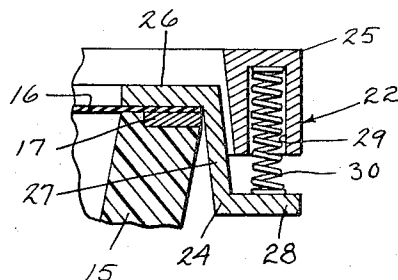


Fig. 4



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CLAMP FOR SIEVE STACK ASSEMBLIES OF RECIPROCATING AIR COLUMN SIFTERS AND THE LIKE

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4 Claims. (209—312)

ABSTRACT OF THE DISCLOSURE

A reciprocating air column sifter has a working chamber with a floor and ceiling, a sonic vibrator that faces downwardly through an opening in the ceiling, and a sieve stack assembly comprising a plurality of stacked components that rests on the floor and has an open upper end facing the opening. A clamp for the sieve stack assembly comprises a lower, ring-like rim and has an offset cross section including an upper inwardly extending clamping flange adapted to bear against the upper end of the sieve stack assembly, an intermediate vertical wall portion and a lower outwardly extending shelf. A sealing ring is telescoped about the rim and bias springs operate between the ring and the shelf to urge the ring and rim vertically apart. A pair of oppositely disposed tongs are attached to the ring and extend downwardly to be releasably engageable with the lowermost component of the stack. The clamp is movable between a clamped position in which the tongs are in engagement with the lowermost stack component and the ring is close to the rim and a released position in which the tongs are disengaged and the ring is remote from the rim and bears against the ceiling, the ring still overlapping the vertical wall portion of the rim at least partially in this position. The tongs are inwardly offset immediately below the shelf to define ledges engageable with the shelf to limit relative movement of the rim and ring, and below the ledges the tongs have S-shaped configurations to define manually engageable loop portions.

This invention relates to a clamp useful, for example, for the sieve stack assembly of a reciprocating air column sifter. It resides more particularly in a double-acting clamp which can be engaged to hold the components of such a stack assembly in place for handling purposes and can also be released to resiliently hold the assembly between the floor and ceiling of a sifter working chamber. The preferred embodiment of the invention shown herein includes a cap assembly having a rim adapted to engage the top component of a stack and a sealing ring resiliently biased away from the rim, together with tong means attached to and depending from the sealing ring and adapted to releasably engage the bottom component of the stack.

Reciprocating air column sifters are shown in U.S. Patent No. 3,045,817 to C. W. Ward and the co-pending application of Howard O. Suhm et al., Ser. No. 473,949, filed July 22, 1965. In general, such sifters include a dynamic speaker and a sieve stack assembly defining an air column. The sieve stack assembly is placed under the speaker which serves as a sonic vibrator to establish reciprocating air movement in the column to aid in sifting material down through the assembly.

The sieve stack assembly usually includes a number of components. For a sifter used for laboratory powder analysis, for example, the stack includes a group of sieves

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arranged in serial order, a fines collector assembly below the sieves and a sealing diaphragm above the sieves. These elements must necessarily be somewhat loosely stacked so that they can readily be separated for weighing and cleaning operations and the like. Handling such a stack can present a problem since if it is not handled carefully the components may become separated and a sample may be lost or the components may be misplaced or damaged. The problem is quite acute in laboratory applications where very small samples of fine powders are often involved. In such cases, the loss of even a small amount of material could significantly affect results.

When the sieve stack assembly is in the sifter, some means must be provided to hold it firmly in place, since the stack is subjected to rather powerful vibrations. If it is not held securely, the elements may become separated and material may escape between them. A small laboratory sample could easily be lost entirely through a small opening.

It is the general object of this invention to provide a double-acting clamp which can be used to hold a sieve stack or similar assembly together for handling and which can be released to clamp the stack assembly in place between a floor and ceiling.

It is an object of this invention to provide a clamp that may easily be manually engaged and released, and that may readily be placed on and removed from a stack assembly.

It is another object of this invention to provide a clamp particularly adapted for use with a hollow stack assembly, in which the clamp engages only the periphery of the top of the assembly and does not cover the stack entirely.

It is a further object of this invention to provide a clamp in which the tong means is formed to provide a stop limiting relative movement between two portions of the cap assembly to keep these portions together.

It is still another object of this invention to provide a clamp in which a cap rim and sealing ring overlap to seal off the air gap between a stack assembly and a ceiling when the stack is in place.

It is a still further object of the invention to provide a clamp having the foregoing advantages which is relatively simple and inexpensive to manufacture and assemble.

Other objects and advantages will appear from the description to follow. In the description, reference is made to the accompanying drawings, forming a part hereof, in which there is shown, by way of illustration and not of limitation, a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a view in elevation, with parts shown broken away and in cross-section, showing a clamp formed according to the invention and a sieve stack assembly in place in the working chamber of a sifter, with the clamp released to hold the stack assembly between the floor and ceiling of the chamber, the stack assembly and floor and ceiling being shown in dotted lines,

FIG. 2 is a view in elevation similar to FIG. 1, but showing the clamp in a clamped position on the sieve stack assembly, the sieve stack being shown in cross-section,

FIG. 3 is a view in cross-section in the plane 3—3 shown in FIG. 2, and

FIG. 4 is an enlarged fragmentary view in cross-section in the plane 4—4 shown in FIG. 3.

The sieve stack assembly of FIGS. 1 and 2 is like that shown in the aforementioned co-pending application of Howard O. Suhm et al., and includes a stack of five sieves 1 of the type shown and described in the co-pending ap-

plication of Frank A. Grabarczyk, Ser. No. 474,065, filed July 22, 1965. Each sieve 1 comprises a circular ring 2 and a screen 3, with the rings 2 being of two part construction with the screens 3 clamped between the parts as can be seen in FIG. 2. All of the sieves 1 are substantially identical to one another except that the screens 3 are of different meshes, the sieves 1 being arranged in serial order with the one having the most open mesh on top. As can be seen in FIG. 2, the rings 2 are provided with stepped edges that mate so that the sieves 1 can be stacked in alignment to form a column. Below the sieves 1 is a spacer 4, which is a ring of substantially the same configuration as the rings 2.

Below the spacer 4 is a fines collector assembly including a supporting frame designated generally by the reference numeral 5, and a thin rubber fines collecting bag 6. The frame 5 comprises a base member 7, an upper ring member 8 and three vertical connecting legs 9. The upper edge of the bag 6 is adhesively secured to a rigid washer-like ring 10, which rests in a recess formed on the top surface of the ring 8. The bottom of the spacer 4 is received and rests in the ring member 8 as can be seen in FIG. 2. As can also be seen in FIG. 2, the ring 8 extends outwardly to serve as an annular catch projection for engagement with latching toes as will be described.

The closed bottom of the bag 6 is adhesively attached to a rigid metal plate 11 provided with a keyhole slot 12 releasably engageable with a screw locking post 13 projecting from the base 7. A relatively thick rubber sheet 14 is adhesively secured to the bottom of the bag 6 above the slot 12 to guard against tearing or other damage which might be caused by the head of the locking post 13.

A funnel 15 is stacked above the sieves 1. A thin rubber diaphragm 16 covers the top of the stack and is adhesively attached to a rigid ring 17 which rests in a recess formed in the top surface of the member 15.

The reference numeral 18 designates the floor of the working chamber of a reciprocating air column sifter, and the reference numeral 19 indicates the ceiling of the chamber, seen in FIG. 1, which has an opening 20 therethrough surrounded by a dished rim 21. It will be appreciated by those skilled in the art that a conventional dynamic speaker 20a will be mounted above and in alignment with the opening 20. When the sieve stack assembly is brought in place under the speaker, the speaker can be operated to establish reciprocating air movement in the air column formed by the sieve stack to aid in sifting material down through the sieves 1, the fines being collected in the bag 6.

The clamp of the invention comprises, in general, a circular cap assembly designated generally by the reference number 22 and a pair of oppositely disposed depending tongs or arms 23. The cap assembly 22 comprises two relatively movable portions, a bottom or inner rim 24 and an upper or outer sealing ring 25 telescoped about the rim 24. The rim 24 has an offset configuration in cross-section as can be seen clearly in FIGS. 1 and 2. This provides an upper horizontal inwardly extending clamping flange 26 which has a width approximately equal to the thickness of the conical member 15 and which rests atop the outer edge of the diaphragm 16 and the ring 17 when the clamp is in place. Depending from the outer edge of the flange 26 is an intermediate vertical wall 27 and at the bottom of the wall 27 is an outwardly extending horizontal shelf 28.

The sealing ring 25 of the cap 22 has a generally rectangular cross-section and is of a height approximately equal to the height of the wall 27 and a width approximately equal to the width of the shelf 28. The inner surface of the ring 25 faces the wall 27 and is only slightly spaced therefrom to have a minimal gap therebetween. The lower surface of the ring 25 faces the shelf 28 and is in alignment therewith so that the outer ring 25 is concentric with and surrounds the rim 24. As can be seen most clearly in FIGS. 3 and 4, the lower surface of the ring 25 is provided with six symmetrically placed down-

wardly opening recesses 29. These receive compression springs 30 which bear against the shelf 28 to urge the members 24 and 25 apart.

The tongs 23 are formed of a stiff but resilient metal and have upper ends 31 which are securely attached to the ring 25 by screws 32. The upper ends 31 are received in outwardly opening notches 33 formed in the shelf 28, and this engagement serves to prevent relative rotation of the members 24 and 25 while allowing them to move relatively in a vertical direction.

Below the shelf 28, the tongs 23 are offset to provide ledges 34 engageable with the underside of the shelf 28 to limit relative movement of the parts 24 and 25. Below the ledges 34, the tongs 23 are formed to define upper vertical leg portions 35 spaced from the sieves 1, inwardly angled knees 36, lower vertical leg portions 37 lying close to the sieves 1, outwardly extending horizontal offsets 38 and inwardly oblique feet 39 which terminate in curled ends or latching toes 40 at about the level of the ring or catch projection 8. The toes 40 are biased toward one another as a result of the resilience of the tongs 23.

The operation of the clamp can be understood with reference to FIGS. 1 and 2. In FIG. 2, the clamp is shown in a clamped position holding together the various elements of the sieve stack assembly. That is, the clamping flange 26 is in abutting engagement with the periphery of the diaphragm 16 and thus bears against the uppermost member of the stack. The tongs 23 have been pulled downwardly to move the ring 25 downwardly against the springs 30 to a retracted position and the latching toes 40 are in abutting engagement with the underside of the catch projection 8. Thus, the clamp is bearing against both the top and bottom members of the stack and the springs 30 provide a biasing force to hold the various elements together.

In FIG. 1, the sieve stack assembly is shown in a sifter with the clamp in a released position. To release the clamp, the tongs 23 are spread apart against their natural bias to move the latching toes 40 out from under the ring 8. The springs 30 are then free to move the ring 25 upwardly with respect to the rim 24 to an extended position where it sealingly engages the rim 21 of the ceiling 19. In this position, the clamp bears against the ceiling 19 and the springs 30 urge the rim 24 and the whole sieve stack assembly downwardly against the floor 18 to hold all the elements resiliently in place. It will be appreciated that the distance between the top of the clamp and the ceiling 19 should be selected to be less than the maximum movement afforded by the ledges 34. When the ring 25 is in its extended position, its inner surface and the wall 27 are still in partially overlapping relationship and the minimal gap therebetween insures that there is an effective seal at the top of the sieve stack assembly.

The entire clamp may easily be removed from the sieve stack assembly by releasing the latching toes 40 and raising the clamp until the bottom of the rim 24 clears the top of the stack and then pulling the clamp laterally. Having the upper leg portions 35 laterally spaced from the sieves 1 provides sufficient space for the flared upper end of the funnel 15 as the clamp is being removed.

The generally S-shaped configuration of the tongs 23 provides inwardly and outwardly opening loop portions which make it quite easy to operate the clamp. That is, the knees 36, legs 37 and offsets 38 define outwardly opening loops to receive the fingers of the user for handling the stack when the clamp is in clamped position, with the offsets 38 providing bearing surfaces when the arms 23 are to be pulled downwardly. The offsets 38 and feet 39 define inwardly opening loops for the fingers of the user to make it simple to spread the tongs 23 to release the toes 40.

Although the clamp of this invention has been shown and described with particular reference to a reciprocating air column sifter by way of example, it will be appreciated that a clamp of this general type may find usefulness

wherever it is desired to clamp together and handle a stack of articles and to provide for clamping them in place between a floor member and a ceiling member. Also, it should be apparent that variations may be made in the particular preferred embodiment shown herein without departure from the invention. As a result, the invention is not intended to be limited by the showing herein, except insofar as limitations specifically appear in the following claims.

We claim:

1. A clamp for the sieve stack assembly of a reciprocating air column sifter and the like, said clamp comprising: a cap assembly including a ring-like rim having an outwardly extending annular shelf that is provided with a pair of oppositely disposed, outwardly opening notches, and a sealing ring telescoped about the rim in alignment with said shelf, said sealing ring being movable between a retracted position near said shelf and an extended position in which it is spaced above said shelf; a pair of oppositely disposed resilient tongs attached to and depending from the sealing ring that are received in the notches of the shelf and extend downwardly therebelow to terminate at lower ends that are resiliently biased toward one another and have inwardly extending latching toes thereon, said tongs being offset near the shelf to form ledges engageable with the underside of the shelf to limit relative movement between the sealing ring and rim, said tongs having generally S-shaped configurations below said ledges to define inwardly and outwardly opening manually engageable loop portions; and bias means interposed between the rim and sealing ring to urge the sealing ring toward its extended position.

2. A clamp for the sieve stack assembly of a reciprocating air column sifter and the like, said clamp comprising: a cap assembly including a ring-like rim having an offset cross-section including an upper inwardly extending clamping flange, an intermediate vertical wall portion, and a lower outwardly extending shelf that is provided with a pair of oppositely disposed outwardly opening notches, and a sealing ring telescoped about the rim and having a lower surface facing the shelf that is provided with a plurality of downwardly opening recesses and an inner surface facing and close to said wall portion, said sealing ring being movable between a retracted position near said shelf and an extended position in which it is spaced above said shelf and in which the inner surface of said upper cap portion and the wall portion of said rim overlap at least partially; a pair of resilient, oppositely disposed tongs attached to and depending from the sealing ring that are received in the notches of the shelf and extend downwardly therebelow to terminate at lower ends that are resiliently biased toward one another and have inwardly extending latching toes thereon, said tongs being inwardly offset below the shelf to define ledges engageable with the underside of the shelf to limit relative movement of the rim and sealing ring, said tongs having gen-

erally S-shaped configurations below said ledges to define inwardly and outwardly opening manually engageable loop portions; and a plurality of compression springs seated in the recesses of said sealing ring that bear against said shelf to urge the sealing ring toward its extended position.

3. In a reciprocating air column sifter including means defining a working chamber with a floor and ceiling, a sonic vibrator facing downwardly through an opening in the ceiling, and a sieve stack assembly comprising a plurality of stacked components that rests on the floor and has an open upper end below the ceiling and in alignment with the opening, the combination therewith of a clamp comprising: a lower ring-like rim bearing against the periphery of the upper end of the sieve stack assembly; an upper ring that is in alignment with the rim and is adapted to bear against the ceiling about the periphery of the opening; bias means interposed between the ring and rim to urge them vertically apart; and a pair of oppositely disposed tongs attached to and depending from the ring to be releasably engageable with the lowermost component, the clamp being movable between a clamped position in which the tongs are engaged with the lowermost component and the ring is relatively closer to the rim, the bias means then serving to hold the components against one another, and a released position in which the tongs are disengaged and the ring is more remote from the rim and bears against the ceiling, the bias means then serving to hold the components against one another and against the floor.

4. The combination of claim 3 wherein the rim has an offset configuration to define an upper, inwardly extending annular flange that bears against the upper end of the sieve stack assembly, an intermediate generally vertical wall portion, and a lower outwardly extending annular shelf; and wherein the ring is telescoped about the vertical wall portion of the rim to face the shelf and at least partially overlaps the same when the clamp is in its released position; and wherein the bias means comprises compression spring means operating between the ring and the shelf.

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