Feb. 13, 1962 R. J. HARRY 3,021,169

CRANES

Filed Dec. 21, 1959 2 Sheets-Sheet 1

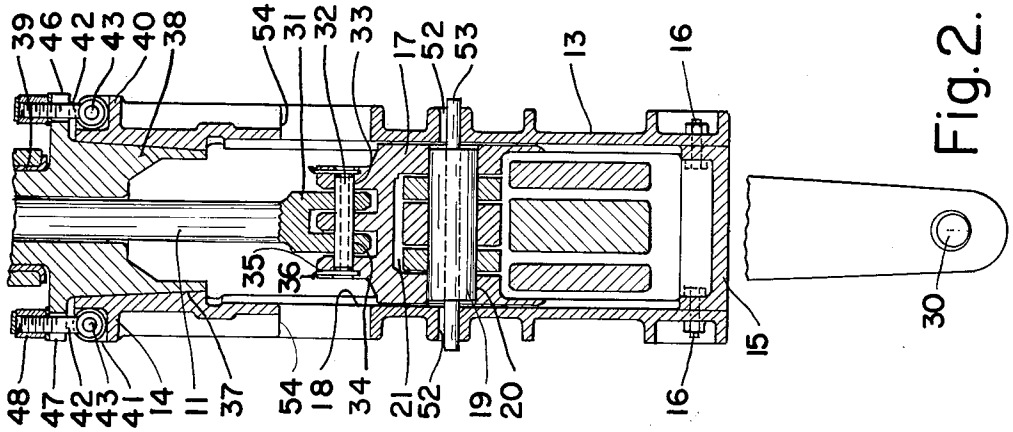


Fig. 2.

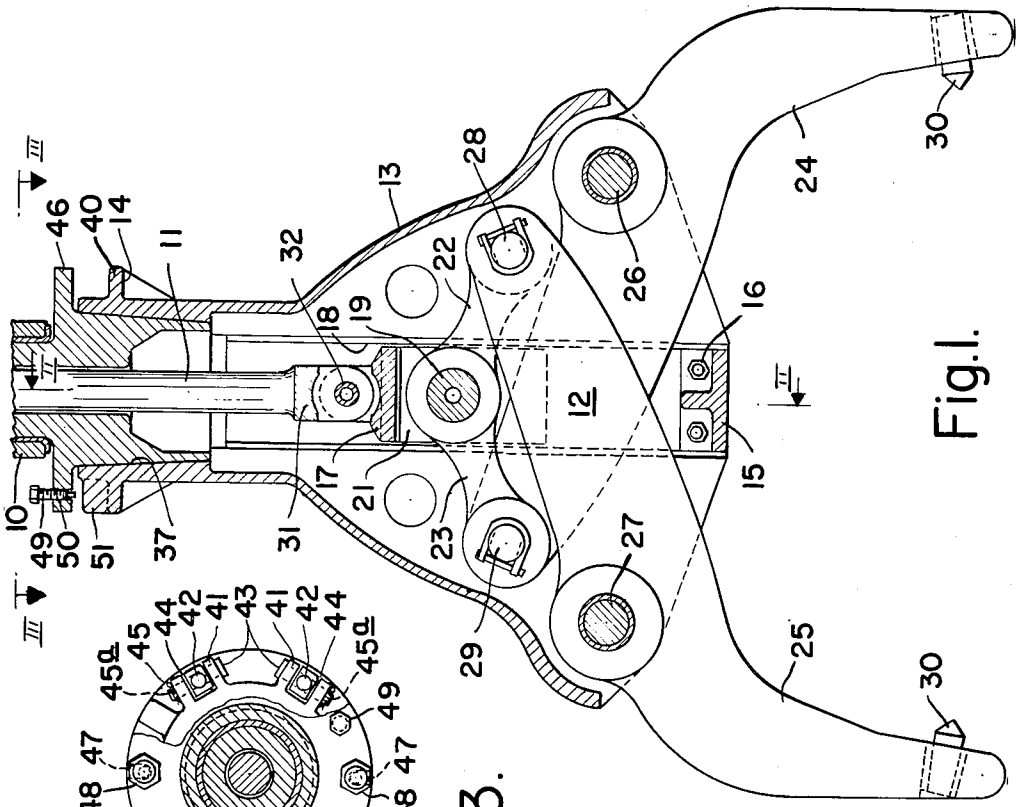


Fig. 1.

Fig. 3.

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Feb. 13, 1962 R. J. HARRY 3,021,169

CRANES

Filed Dec. 21, 1959 2 Sheets-Sheet 2

Fig. 4.

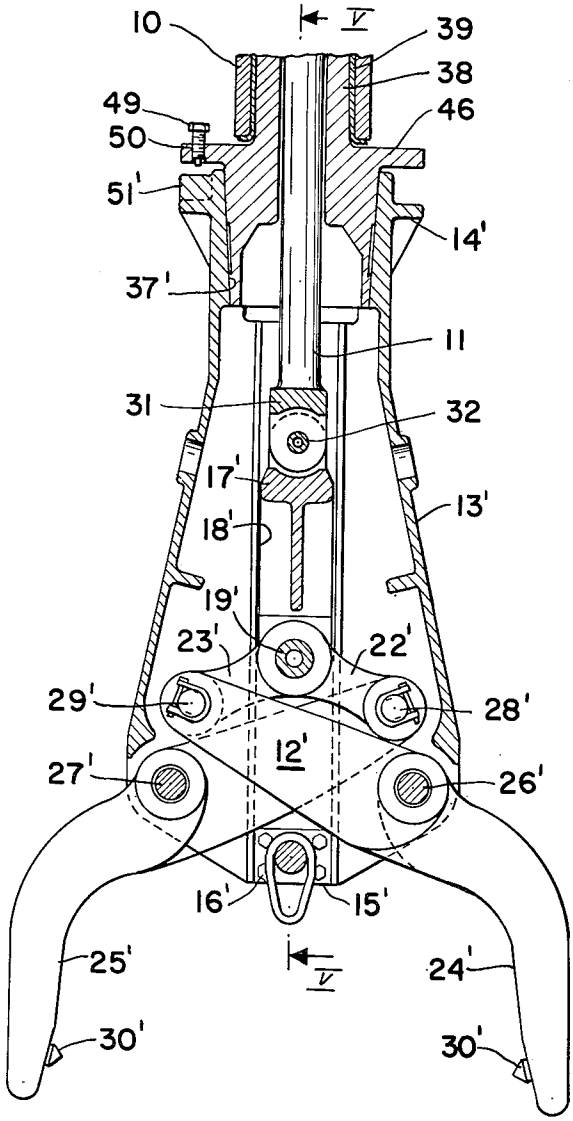
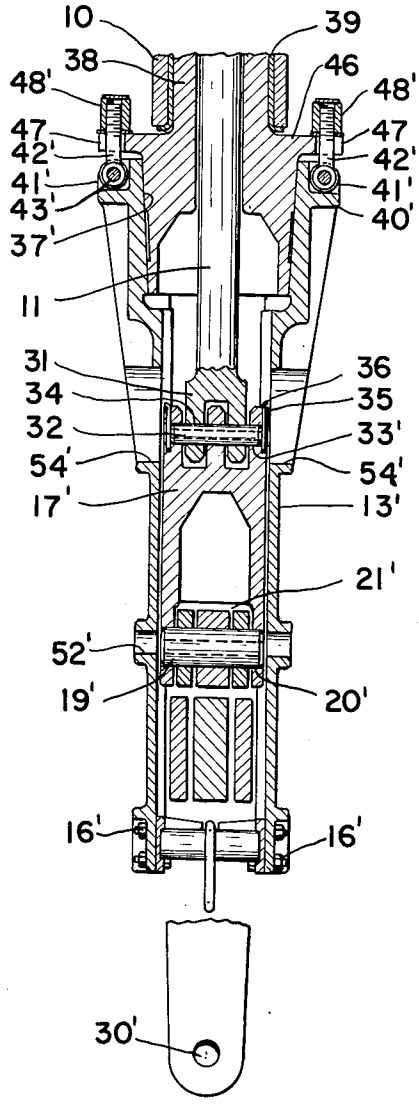


Fig. 5.



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3,021,169

CRANES

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11 Claims. (Cl. 294—115)

This invention relates to cranes and particularly to a new and novel structure for soaking pit cranes adapted to selectively and interchangeably employ a plurality of tongs members individually as a part thereof.

A problem presented in handling ingots of varying sizes is that after handling large size ingots, e.g. 100 inches or more in width, where it is necessary to use a soaking pit crane with large tongs, it may be necessary to next handle small size ingots, for example 40 inches in width, for which the large tongs are quite disadvantageous. When using large size tongs to handle relatively small size ingots, the operator's view of the work is often so obstructed that he cannot properly see the work or the work areas. Thus, it is necessary to employ additional workmen to direct the operator in his operation. This is not only inefficient in that the operator cannot do the work as well as he could with an unobstructed view, but also is inefficient in that additional labor is required to direct the operator. That the workman may thus be exposed to great danger is quite clear in such circumstances.

It is further understandable that small ingots must be spaced wider apart on their stools or in the pits for the large tongs to handle them with a consequent reduction in efficiency. Thus, it can be seen that to handle small ingots with large tongs is not only inefficient and therefore more costly, but also is awkward and dangerous.

It is desirable, therefore, to provide smaller tongs for handling smaller ingots whereby the operator of the crane can see the work and the work area. It is also desirable that the smaller and larger tongs of the pit crane be available in one crane and that they be quickly interchangeable.

The present invention provides such a soaking pit crane. More specifically, I provide a soaking pit crane comprising a plurality of interchangeable tongs elements to be used individually in said soaking pit crane, each of said tongs elements having a substantially identical tapered opening in the crown thereof, drive means operable to open and close a tongs element upon engagement therewith, a releasable drive arm member adapted to engage said drive means with said tongs element, said drive means having a tapered head element with said drive arm member extending therethrough, the taper of said head element corresponding to the taper of said crown opening whereby said head element is compatibly received within said crown opening for engagement with said tongs element, and means releasably adapted to retain said tapered head element within said tapered crown opening in engagement with said tongs element.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings, I have shown a present preferred embodiment of the invention in which,

FIGURE 1 is a vertical section through the tongs of my invention using a large range tongs;

FIGURE 2 is a section on the line II—II of FIGURE 1;

FIGURE 3 is a section on the line III—III of FIGURE 1;

FIGURE 4 is a vertical section through the tongs of my invention using a small range tongs; and

FIGURE 5 is a section on the line V—V of FIGURE 4.

Referring now to the drawings and initially to FIGURE 1, I provide a cylinder 10 with a pressure driven drive arm 11 extending therefrom to operatively engage tongs 12. Tongs 12 is comprised of a hollow body 13 with an annular crown portion 14 at the top thereof and a cross brace 15 bolted thereto at the bottom thereof by bolts 16. Within body 13 is a sliding block 17 which slides in guideways 18 formed in the side of body 13. Block 17 supports hollow pivot bar 19 which extends through block openings 20 and block cavity 21. Pivot bar 19 in turn pivotally supports lever arms 22 and 23 at one end thereof within the block cavity 21. Gripping arms 24 and 25 are pivotally supported adjacent their central portions in body 13 by pivot rods 26 and 27, respectively.

Gripping arms 24 and 25 and lever arms 22 and 23 are pivotally connected at their respective ends by pivot bars 28 and 29, respectively. Grippers 30 are anchored in the gripping ends of gripping arms 24 and 25.

The upper or drive side of slide block 17 is suitably formed to receive the clevis 31 formed at the end of drive arm 11 and is secured thereto by pin 32 passing through block openings 33 and clevis openings 34 in block 17 and clevis 31, respectively. Holes 35 are provided in slide block 17 for the reception of lock pins 36 which obstruct block openings 33 to prevent pin 32 from working out of the jointure.

Annular crown portion 14 of body 13 contains an annular tapered opening 37 therethrough. Opening 37 being larger at the entrance thereto and narrowing as it proceeds into the hollow body 13.

Drive arm 11 extends through a cylinder head 38 which is securely engaged in cylinder 10 at the drive end of cylinder 10 with suitable bushing 39 therebetween to allow head rotation. Column head 38, extending outwardly from cylinder 10, is annular and tapered, being smaller in diameter at the end thereof and increasing in diameter toward cylinder 10. The taper of cylinder or column head 38 and crown opening 37 are substantially identical to provide a compatible engagement when cylinder head 38 is positioned in crown opening 37.

Formed outside and adjacent the end of crown portion 14 is ring portion 40 of body 13 with clevis like extensions 41 spaced thereon to form a part thereof. Bolts 42 are secured in the clevis like extensions 41 by pins 43 which extend through the heads of bolts 42 and openings 44 in clevis extension 41 and are secured therein by the insertion of cotter pins 45 in holes 45a adjacent the end of pins 43. Bolts 42 are thus swingable about pins 43.

Formed outside and adjacent the larger portion of tapered cylinder head 38 is ring portion 46 containing U-slots 47 therein. Said U-slots 47 being spaced about ring portion 46 to correspond with the spacing of bolts 42 about ring portion 40. Cylinder head 38 is positioned in crown opening 37 so that U-slots 47 register with bolts 42 whereby the threaded ends of bolts 42 may be swung into U-slots 47 and secured therein by nuts 48, thus securely engaging tongs 12 with cylinder head 38. Threaded studs 49 extend through threaded openings 50 spaced about ring portion 46 of cylinder head 38 and by turning may be brought to bear on pads 51 spaced on and forming a part of ring portion 40 of tongs 12 to break loose or separate cylinder head 38 from tongs 12.

In operation, movement of drive arm 11 will correspondingly move slide block 17 in body 13 which in turn moves lever arms 22 and 23 to pivot gripping arms 24 and 25 into either an opening or closing direction, depending upon the direction of movement of drive arm 11.

Tongs 12 may be of varying sizes, depending on the size of the ingots to be handled. However, it is necessary that the crown portions 14 of tongs 12 with the associated tapered openings 37, ring portions 40 as well as the portion of slide block 17 that receives clevis 31 be substan-

tially identical so that the various size of tongs 12 may be interchangeably used with cylinder head 38 and drive arm 11.

In order to demonstrate the uniqueness of my new soaking pit crane, let us assume that my crane has been utilizing large tongs in handling large size ingots and that the next job to be handled is of small size ingots. It is therefore, desired that small tongs be substituted in my soaking pit crane for the large tongs. This is accomplished by extending drive arm 11 from cylinder 10 until the opening in hollow pivot bar 19 registers with body openings 52 provided in body 13 of tongs 12. A block rod 53 is thereupon inserted to extend through both body openings 52 and hollow pivot bar 19 and thus restricts movement of slide block 17. This prevents tongs 12 from collapsing when slide block 17 is released from clevis 31. Body openings 52 are positioned in body 13 so that drive arm 11 must approximate its furthest extension to register hollow pivot bar 19 with body openings 52. Thus, when the tongs is blocked with block rod 53, it is substantially in its most opened position in which position it is much more stable and easier to handle when released. Tongs 12 is then braced or otherwise supported prior to being released. Pin 32 which engages clevis 31 with slide block 17 is now in registry with access ports 54 of body 13. The operator may now reach through ports 54, pull out cotters 36 and remove pin 32 to disengage drive arm 11 from slide block 17. The operator now loosens nuts 48, swings bolts 42 out of U-slots 47 and then may lift cylinder head 38 with drive arm 11 out of tongs 12.

The taper of the cylinder head 38 and crown opening 37 not only facilitates a firm engagement but facilitates separation as well. If, for any reason, cylinder head 38 should bind or otherwise refuse to part from crown opening 37, threaded studs 49 may be turned down and brought to bear on pads 51 of ring portion 40 to insure quick disengagement of cylinder head 38 from tongs 12.

Cylinder head 38 with drive rod 11 is now ready to be positioned in crown opening 37' of the small tongs 12', whereupon the operator may quickly and easily insert pin 32 in block openings 33' and clevis openings 34 and then place cotter 36 in holes 35 to securely connect drive rod 11 to slide block 17'. The operator then swings bolts 42' into position in U-slots 47 and tightens nuts 48' to securely engage cylinder head 38 in crown opening 37'. Lastly, the operator removes block rod 53' from hollow pivot bar 19' and body openings 52' and my soaking pit crane is ready to go to work on the small size ingots.

For subsequent changes to different size tongs, the procedure is substantially the same.

While I have shown and described a present preferred embodiment of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. In a soaking pit crane having a lift column suspended from a moving trolley the improvement comprising a tongs housing having a crowned portion with a tapered opening therein, tongs elements pivoted in said housing, drive means operable through the lift column to open and close the tongs element upon engagement therewith, a releasable drive arm member on said drive means adapted to engage said tongs element, said lift column having a tapered head element with said drive means extending therethrough, the taper of said head element corresponding to the taper of said crown opening whereby said head element is compatibly received within said crown opening in engagement with said tongs housing, and means releasably engaging the lift column and housing to retain said tapered head element within said tapered crown opening in engagement with said tongs element.

2. In a soaking pit crane having a lift column suspended from a moving trolley the improvement comprising a tongs housing, tongs elements pivoted in said housing, drive means operable through the lift column to open and close the tongs element upon engagement therewith, means releasable connecting said drive means to said tongs element, said tongs housing having a crown portion with an annular tapered opening therein, said lift column having a tapered head element corresponding to the taper of said crown opening whereby said tapered head element is compatibly received within the tapered crown opening of said tongs housing, and releasable keeper means engageable between the lift column and housing to hold said tapered head element within said tapered crown opening in jointure with said tongs housing.

3. In a soaking pit crane having a lift column suspended from a moving trolley the improvement comprising a plurality of elements for individual use in said ingot pit crane, each of said tongs elements having a substantially identical tapered opening in the crown thereof, drive means operable through the lift column to open and close a tongs element upon engagement therewith, a releasable drive arm member adapted to engage said drive means with said tongs element, said lift column having a tapered head element with said drive means extending therethrough, the taper of said head element corresponding to the taper of said crown opening whereby said head element is compatibly received within said crown opening for engagement with said tongs element, and means releasable engaging the lift column adapted to retain said tapered head element within said tapered crown opening in engagement with said tongs element.

4. In a soaking pit crane having a lift column suspended from a moving trolley the improvement comprising a plurality of tongs elements for interchangeable use in an ingot crane each of said tongs elements having a substantially identical annular tapered opening in the crown thereof, drive means operable through the lift column to open and close a tongs element upon engagement therewith, means releasable connecting said drive means to said tongs element, said lift column having a tapered head element, the circumference of said head element increasing from the end thereof, the circumference of said crown opening decreasing from the entrance of said opening at a degree corresponding to that of said tapered head element whereby said tapered head element is compatibly received within the tapered crown opening for engagement with said tongs element, and releasable keeper means engaging the lift column to retain said tapered head element within said tapered crown opening in engagement with said tongs element.

5. In a soaking pit crane having a lift column suspended from a moving trolley the improvement comprising a tongs housing having a crowned portion with a tapered opening therein, tongs elements pivoted in said housing, drive means operable through the lift column to open and close the tongs element upon engagement therewith, a releasable drive arm member on said drive means adapted to engage said tongs element, said lift column having a tapered head element with said drive means extending therethrough, the taper of said head element corresponding to the taper of said crown opening whereby said head element is compatibly received within said crown opening in engagement with said tongs housing, means releasable engaging the lift column and tongs housing to retain said tapered head element within said tapered crown opening in engagement with said tongs element, and means between the lift column and tongs housing operable to disengage said tapered head element from the tapered crown opening of said tongs element upon release of said last mentioned means.

6. In a soaking pit crane having a lift column suspended from a moving trolley the improvement comprising a plurality of tongs elements for individual use in an ingot crane each of said tongs elements having a housing with a substantially identical tapered opening in the crown thereof, drive means operable through the lift column to open and close a tongs element upon engage-

ment therewith, a releasable drive arm member adapted to engage said drive means with said tongs element, said lift column having a tapered head element with said drive means extending therethrough, the taper of said head element corresponding to the taper of said crown opening whereby said head element is compatibly received within said crown opening for engagement with said tongs element, means releasable engaging the lift column and housing adapted to retain said tapered head element within said tapered crown opening in engagement with said tongs element, and disengaging means operable betwen the lift column and housing to disengage said tapered head element from the tapered crown opening of said tongs element upon release of said last mentioned means releasable and said drive arm member.

7. In a soaking pit crane having a lift column suspended from a moving trolley the improvement comprising a pluraltiy of tongs elements for interchangeable use in an ingot pit crane each of said tongs elements having a housing with a substantially identical annular tapered opening in the crown thereof, drive means operable through the lift column to open and close a tongs element upon engagement therewith, means releasable connecting said drive means to said tongs elements, said lift column having a tapered head element, the diameter of said head element increasing from the end thereof, the diameter of said crown opening decreasing from the entrance of said crown opening at a degree corresponding to that of said tapered head element whereby said tapered head element is compatibly received within the tapered crown opening for engagement with said tongs element, releasable keeper means engaging the lift column and housing to retain said tapered head element within said tapered crown opening in engagement with said tongs element, and parting means operable between the lift column and the housing to disengage said tapered head element from the tapered crown opening of said tongs element upon release of said first mentioned means releasable and said keeper means.

8. In a soaking pit crane having a lift column suspended from a moving trolley the improvement comprising a tongs element having a housing with a crowned portion with a tapered opening therein, drive means operable through the lift column to open and close the tongs element upon engagement therewith, a releasable drive arm member adapted to engage said drive means with said tongs element, said lift column having a tapered head element with said drive means extending therethrough, the taper of said head element corresponding to the taper of said crown opening whereby said head element is compatibly received within said crown opening in engagement with said tongs element, means releasable engaging the lift column and housing adapted to retain said tapered head element within said tapered crown opening in engagement with said tongs element, and means operable to retain said tongs element in a substantially fixed position relative to the opening and closing thereof subsequent to disengagement from said drive means.

9. In a soaking pit crane having a lift column suspended from a moving trolley the improvement comprising a plurality of tongs elements for individual use in an ingot pit crane, each of said tongs elements having a housing with a substantially identical tapered opening in the crown thereof, drive means operable through the lift column to open and close a tongs element upon engagement therewith, a releasable drive arm member adapted to engage said drive means with said tongs element, said lift column having a tapered head element with said drive means extending therethrough, the taper of said head element corresponding to the taper of said crown opening whereby said head element is compatibly

received within said crown opening for engagement with said tongs element, means releasable engaging the lift column and housing adapted to retain said tapered head element within said tapered crown opening in engagement with said tongs element, and means operable to retain said tongs element in a substantially fixed position whereby said tongs element is substantially restrained from collapsing subsequent to disengagement from said drive means.

10. In a soaking pit crane having a lift column suspended from a moving trolley the improvement comprising a tongs element, drive means operable through the lift column to open and close the tongs element upon engagement therewith, means releasable connecting said drive means to said tongs element, said tongs element having a housing with a crown portion with an annular tapered opening therein, said lift column having a tapered head element, the taper of said head element corresponding to the taper of said crown opening whereby said tapered head element is compatibly received within the tapered crown opening of said tongs element, releasable keeper means engaging the lift column and housing adapted to hold said tapered head element within said tapered crown opening in jointure with said tongs element, disjoining means operable between the lift column and the housing to disjoin said tapered head element from the tapered crown opening of said tongs element upon release of said first mentioned means releasable and said keeper means, and blocking means operable to preserve said tongs element in a substantially fixed position relative to the opening and closing thereof subsequent to disengagement from said drive means.

11. In a soaking pit crane having a lift column suspended from a moving trolley the improvement comprising a plurality of tongs elements for interchangeable use in an ingot pit crane, each of said tongs elements having a housing with a substantially identical annular tapered opening in the crown thereof, drive means operable through the lift column to open and close a tongs element upon engagement therewith, means releasable connecting said drive means to said tongs element, said lift column having a tapered head element, the diameter of said head element increasing from the end thereof, the diameter of said crown opening decreasing from the entrance of said crown opening at a degree corresponding to that of said tapered head element whereby said tapered head element is compatibly received within the tapered crown opening for engagement with said tongs element, releasable keeper means engaging the lift column and housing adapted to retain said tapered head element within said tapered crown opening in engagement with said tongs element, parting means between the lift column and the housing operable to disengage said tapered head element from the tapered crown opening of said tongs element upon release of said first mentioned means releasable and said keeper means, and blocking means operable to restrain said tongs element in a substantially fixed position subsequent to disengagement from said drive means whereby said tongs are substantially restrained from collapsing.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,021,169 February 13, 1962

Robert J. Harry

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 15, after "of" insert -- tongs --; column 5, line 18, for "pluraltiy" read -- plurality --.

Signed and sealed this 12th day of June 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents