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PEENING SHOT NOZZLE RECIPROCATING APPARATUS

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6 Claims. (Cl. 29—90)

This invention relates generally to shot peening equipment and more particularly concerns improvements in shot peening apparatus wherein peening nozzles are reciprocated, by which one actuator can be used to provide selective active reciprocation of peening nozzles at different locations relative to a shot peening zone in order to obtain thorough peening treatment of work inserted in said zone.

The invention is broadly directed to the problem of simplifying the arrangement of apparatus for reciprocating peening nozzles at different locations, for example above a peening zone and at one side thereof, so that only one actuator is needed for reciprocating the nozzles at these different locations. Such simplification of the equipment and reduction of the number of actuators needed to only one very clearly produces advantages in cost and simplification of fabrication and use of the peening equipment.

In accordance with the invention, there is provided nozzle means for jetting shot at work inserted into a peening zone within a housing, the nozzle means being selectively actively reciprocable at spaced locations relative to the peening zone. For example, the nozzle means is preferably reciprocable transversely above the peening zone and up and down at one side thereof for subjecting the work to thorough peening treatment. In addition, there are provided means for carrying and selectively actively reciprocating the nozzle means including an actuator, a pair of supports such as shafts carried by the housing, and linkage means reciprocable by the actuator on alternate of the supports or shafts for alternately transmitting reciprocation to the nozzle means at the spaced locations referred to. Preferably the linkage means include a pair of cranks angularly rotatable on the respective shafts, and connector means actively connectible with either of the cranks to transmit angular reciprocation therethrough.

In one form of the invention the single actuator is operatively connected with the cranks either of which may be blocked against rotation so that the other crank is angularly reciprocable by the actuator for transmitting reciprocation to the shaft carrying that crank and the nozzle means associated with that shaft. In another of its forms, the invention contemplates the provision of a third shaft angularly reciprocable by the actuator, a third crank on that third shaft, and a link connected with the third shaft and supporting the nozzle means for reciprocation, that link being selectively connectible with either of the pair of cranks associated with the two different nozzle locations.

These and other features and objects of the invention, as well as the details of an illustrative embodiment, will be more fully understood from the following detailed description of the drawings, in which:

Fig. 1 is a perspective view of a peening machine of the preferred type to be described;

Fig. 2 is a section taken on line 2—2 of Fig. 1;

Fig. 3 shows the linkage means and actuator seen in Fig. 1 with one crank of the linkage means blocked against rotation;

Fig. 4 is a section taken on line 4—4 of Fig. 3;

Fig. 5 is a view similar to Fig. 3 showing the other crank blocked against rotation;

Fig. 6 is a vertical section taken through the housing of a modified peening machine showing the arrangement of the nozzles and linkage means within the housing; and

Fig. 7 is a section taken on line 7—7 of Fig. 6.

In Fig. 1 the peening machine 10 is shown to include an upright housing 11 having a door or closure 12 hinge supported by one wall of the housing to enable insertion of work into a peening zone within the housing. When inserted into the peening zone the work indicated by the broken lines 14 in Fig. 6 is adapted to be supported by the rotary carrier 15 which is rotated by the motor driven equipment generally shown at 16 in Fig. 1.

While the work is being rotated in the peening zone it is subjected to shot peening treatment by upper and lower nozzles seen at 17 and 18 in Figs. 3 and 4, the nozzles jetting shot supplied through shot conduits 119 and 19, the shot being entrained in streams of compressed air supplied to the nozzles through conduits 20.

Shot particles falling off the work are tumbled downward within a tapering hopper 22 below the housing 11 and then are directed laterally by an enclosed conduit or chute 23 discharging into a reservoir 24 as shown in Fig. 2. The reservoir comprises the lowest portion of a vertically elongated housing 25 containing a continuous bucket elevator 26 operable to lift the shot collecting at 27 in the reservoir upwardly within the housing and thereafter discharge the shot to a hopper, not shown, for supply to the shot conduits 19, as desired. The chute 23 has a neck 127 fitting over and receiving the lowermost portion of the hopper 22, and it also has a flange 28 removably attached by wing nut 29 to the side of the reservoir 24 so as to deliver the shot in the chute through the entrance 30 to the reservoir. Removal of the wing nut fastener 29 from the screw 31 projecting laterally from the reservoir side enables ready detachment of the chute 23 from reservoir 24 and the hopper 22, whereby the entrance 30 to the reservoir is exposed facilitating or giving convenient access to hopper 22 and to the reservoir for cleaning out shot particles therein. This operation is desirable when changing shot in the machine.

Reference to Figs. 3 and 5 shows that the nozzles 17 are supported on rods 132 and 32 slidably adjustable in clamp mechanisms 133 and 33, the latter being angularly adjustable for angularly orienting the nozzles in space above and at one side of the peening zone, nozzle 17 being directed downwardly toward the peening zone and nozzle 18 being directed transversely toward the peening zone. The upper and lower clamp mechanisms 133 and 33 are in turn carried by the upper and lower vertically staggered shafts 134 and 34 which are carried by and project through the housing wall 13 and have parallel horizontal axes. Connected on the shafts 134 and 34 to rotate them are upper and lower vertically staggered cranks 35 and 36, these being outside the housing wall 13 whereas the nozzles are inside the housing. The cranks are preferably but not necessarily of equal length, and they are both connected with a single actuator 37, the lower crank 36 being pivotally connected at 38 with the actuator piston rod 39 and the upper crank 35 being pivotally connected at 40 with a connector link 41 supporting the actuator 37 at 42. The actuator will be understood as being reciprocable, as for example by hydraulic fluid passed thereto through lines 43.

In accordance with the invention, nozzles 17 and 18 are selectively actively reciprocable along arcs by the one actuator 37. This is accomplished by actively connecting one of the cranks 35 and 36 with the actuator,

as for example by blocking the other crank against angular reciprocation. Thus, as shown in Figs. 3 and 4 crank 35 is blocked against angular reciprocation by a lock pin 45 having a handle 46 for inserting the pin into a hole 47 in the crank 35 and into a bore 48 in a boss 49 carried by the housing wall 13. Accordingly, under these conditions the crank 35 cannot rotate whereas the crank 36 is angularly reciprocable by the actuator so as to transmit angular reciprocation to the nozzle 18 which pivots up and down at one side of the peening zone. Reference to Fig. 5 will show the similar manner in which the other crank 36 is blocked against angular rotation by the lock pin 45 carried by the handle 46, allowing the crank 35 to be reciprocated by the actuator and reciprocating the upper nozzle 17 in a transverse angular course above the peening zone and directed downwardly toward the part inserted therein. Thus, the linkage means including the cranks 35 and 36 and the link 41 is reciprocable by the actuator 37 on alternate of the shafts 34 for alternately reciprocating the nozzles 17 and 18 above and at one side of the peening zone.

In the modified form of the invention shown in Figs. 6 and 7 a housing wall 131 carries bearings rotatably supporting a pair of vertically staggered support shafts 50 and 51 having parallel horizontally extending axes, and also a third shaft 52 spaced directly above shaft 50 and horizontally from shaft 51. Connected with shafts 50 and 51 are a pair of floating auxiliary links or cranks 53 and 54 which are angularly rotatable with those shafts. Actively pivotally connected with the crank 53 is a nozzle carrier including a long link 56 and an arm 57 swiveled at joint 58 from the link enabling rapid bolt-on connection of the arm 57 with the crank 53. The arm 57 is alternately actively connectible with the crank 54 by removal of the bolts 55 from crank 53 and attachment of the arm 57 with crank 54 by means of those bolts. As shown by the full lines of Fig. 6, the link 56 supports a bank of parallel shot nozzles 59, the latter being connected with the link 56 through elongated rods 60 and clamp assemblies 61, as previously described in connection with Figs. 3 and 5. Shot conduits 191 deliver shot to the nozzles 59. When the link 56 is actively connected with the crank 53 the nozzles are reciprocable along arcs up and down at one side of the work 14, as will be described, whereas when link 56 is actively connected with the crank 54 the nozzles 59 may be swung, by adjustment of the clamps 61, to the broken line position shown at 62, in which the nozzles are transversely reciprocable along arcs above the rotating work for jetting shot over the entire upper surface thereof.

The link 56 supporting the nozzles is pivotally connected to a third link or actuating crank 63 which is connected to the third shaft 52, the pivotal connection joint between the link 56 and this third shaft being shown at 64. Thus, when the link 56 is swung between its full line vertical position to its broken line horizontal position as seen in Fig. 6, it pivots with respect to the third crank 63. That crank is angularly reciprocable by an actuator shown at 65 outside the housing and connected to the wall 13 thereof, an external crank 66 connecting the actuator piston rod 67 with the horizontal shaft 52 carried by the housing wall and extending therethrough.

Operation of the actuator 65 to reciprocate the piston rod 67 thereof will effect angular reciprocation of the crank 63 vertically to reciprocate the link 56 and the nozzles 59 when that link is actively connected with the crank 53. The link 56, crank 63 and interconnected crank 53 and arm 57 together with the wall 13 of the housing comprise or form in effect a four bar parallelogram linkage operable by the actuator 65 to reciprocate the nozzles 59 up and down while they remain angularly oriented in a fixed direction in space. The same is true with respect to the four bar parallelogram linkage formed when the link 56 is swung upwardly and connected with crank 54, the nozzles in their broken line position 62 at such times being reciprocated transversely while remaining angularly oriented with fixed direction in space. Shafts 50 and 51 are equally spaced from the axis of shaft 52.

From the foregoing it is apparent that the nozzles 59 are selectively actively reciprocable transversely above the peening zone generally indicated at 70 and up and down at one side of that zone by the single actuator 65, a pair of shafts 50 and 51, and the linkage reciprocable by the actuator while connected with alternate of the shafts 50 and 51, the linkage including the cranks 53 and 54, and the link 56 actively connectible with either of the cranks 53 and 54.

I claim:

1. In shot peening equipment, a housing forming a work peening zone, nozzle apparatus in said housing directed toward said zone for jetting shot at work in said zone, an elongated member mounting said nozzle apparatus in said housing, and means for supporting and bodily oscillating said member in either of two locations of oscillation near said zone so that the nozzle apparatus is directed toward said zone during oscillation, said last named means including an actuating link and two auxiliary links mounted to turn within the housing about spaced apart parallel axes, first means for pivotally interconnecting one end portion of said elongated member to either of said auxiliary links, and other means pivotally interconnecting the opposite end portion of said elongated member with said actuating link so that the elongated member may be swung between said first and second locations and therein pivotally connected by said first means to either one of said auxiliary links, and thereafter said elongated member may be bodily oscillated in response to back and forth turning of said actuating link.

2. The invention as defined in claim 1 including auxiliary shafts mounting said auxiliary links to float freely in turning about the auxiliary shaft axes.

3. The invention as defined in claim 2 in which said last named means includes an actuating shaft extending into the housing from the exterior thereof and connected to said actuating link, and an actuator outside the housing for oscillating said actuating shaft about its axis.

4. The invention as defined in claim 2 in which said first means includes an arm detachably connectible with either of said auxiliary links, and a joint carried by said one end portion of the elongated member and pivotally supporting said arm.

5. The invention as defined in claim 2 in which the auxiliary link axes are equally spaced in different directions from the actuating link axis, said other means includes a joint the axis of which is spaced a predetermined distance from the turning axis of said actuating link, and said first means includes another joint the axis of which is spaced the same predetermined distance from the axis of either auxiliary link when said first means pivotally connects the elongated member thereto.

6. In shot peening equipment, a housing forming a work peening zone, nozzle apparatus in said housing directed toward said zone for jetting shot at work in said zone, an elongated member mounting said nozzle apparatus in said housing, and means for supporting and bodily oscillating said member in either of two locations of oscillation near said zone so that the nozzle apparatus is directed toward said zone during said oscillation, said last named means including an actuating shaft and two auxiliary shafts mounted to turn within the housing about spaced apart parallel axes, first means for pivotally connecting one end portion of said elongated member to either of said auxiliary shafts, and other means including an actuating link for pivotally connecting the opposite end portion of said elongated member with said actuating shaft so that the elongated member

may be swung between said first and second locations and therein pivotally connected by said first means to either one of said auxiliary shafts, and thereafter said elongated member may be bodily oscillated in response to back and forth turning of said actuating link.

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FIG. 1.

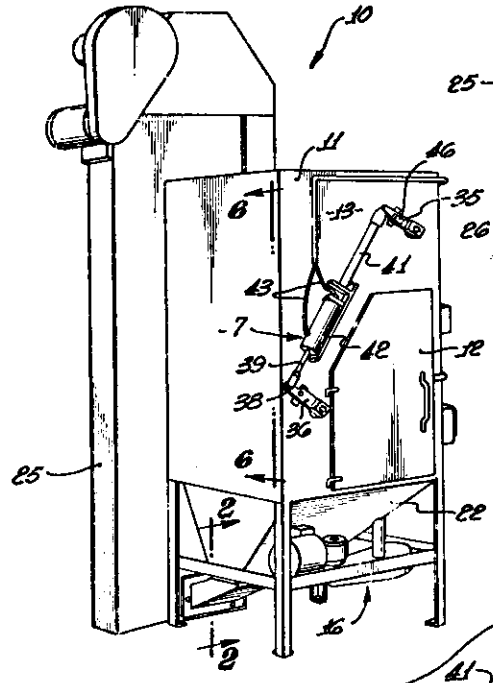

FIG. 2.

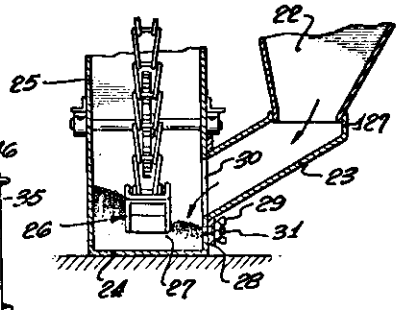

FIG. 3.

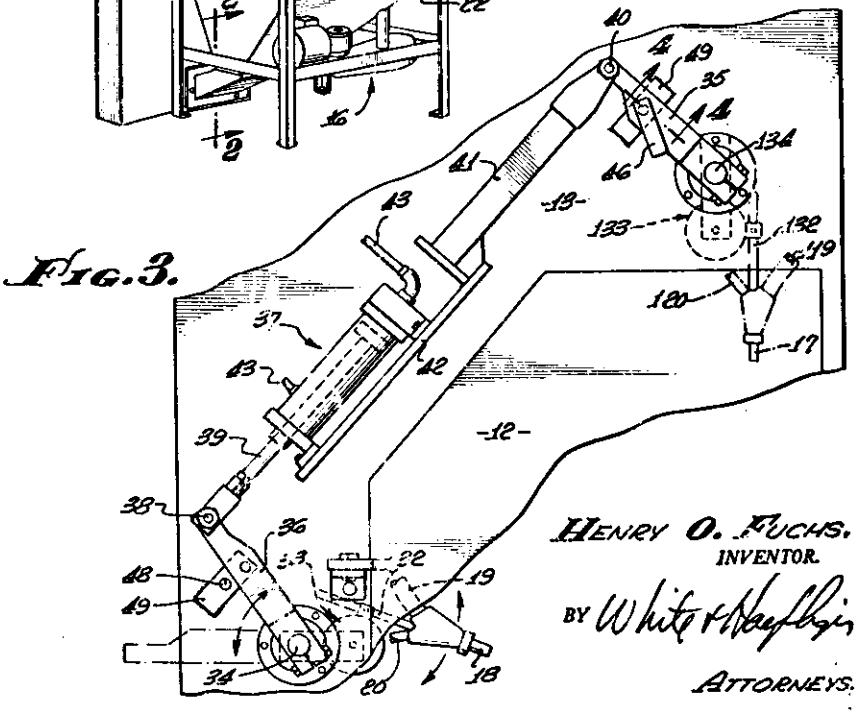

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FIG. 4.

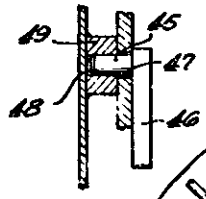


FIG. 5.

FIG. 6.

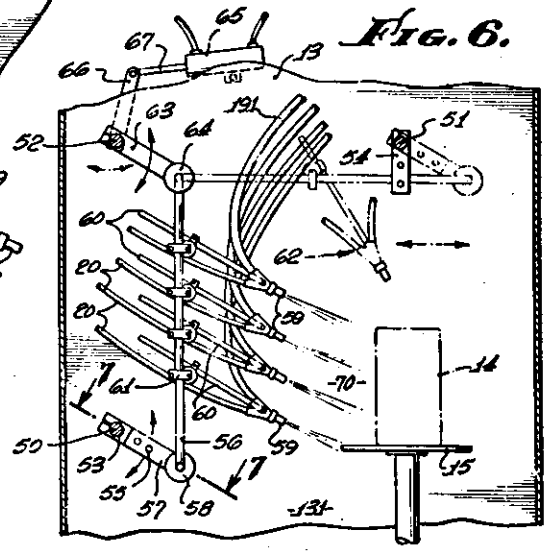
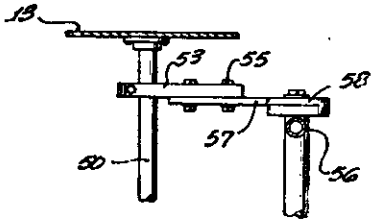


FIG. 7.



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