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SHOT PEENING

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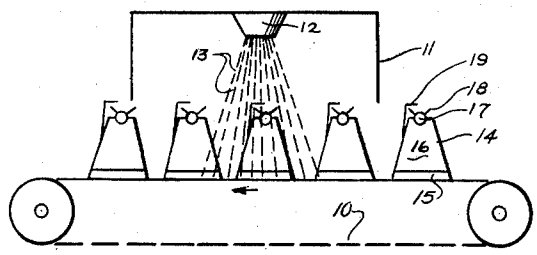


Fig. 1

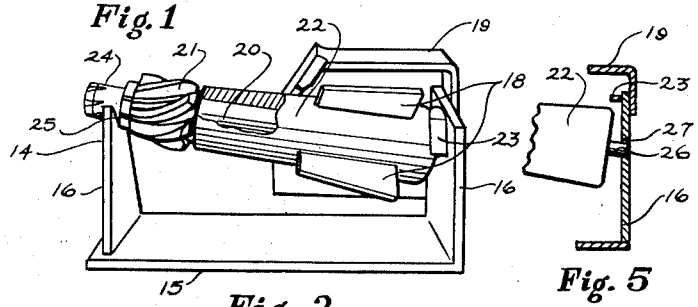


Fig. 2

Fig. 5

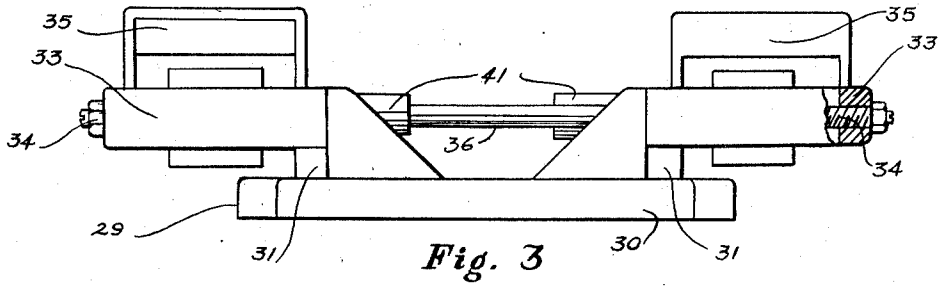


Fig. 3

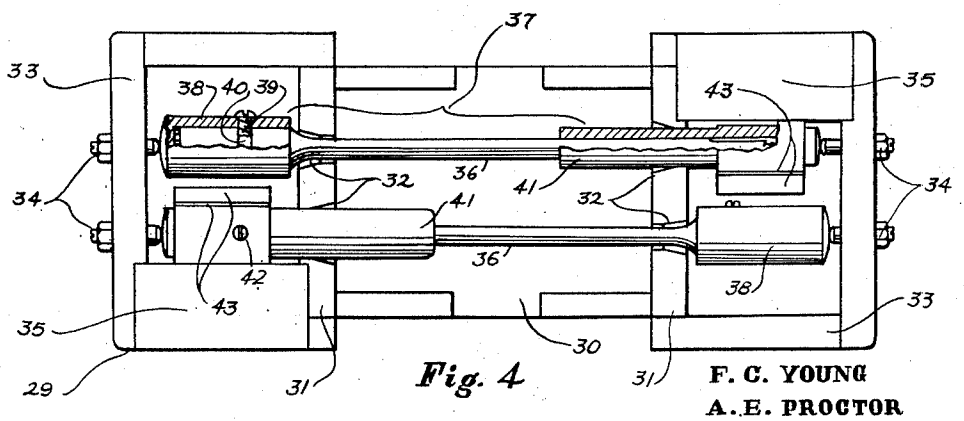


Fig. 4

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SHOT PEENING

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3 Claims. (Cl. 29—90)

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This invention relates to the surface treatment of metals; and, more particularly, to the shot peening of metallic articles which are more or less symmetrical about an axis of rotation.

The use of shot peening for improving the physical characteristics of metallic objects has been practiced for many years; and it is generally recognized that, for example, improved fatigue life is obtained in many parts which have been subjected to a blast of metallic shot. This has been particularly true in such items as springs, both leaf and coil, which are frequently subjected to this treatment and show marked improvement in their physical characteristics. Recently, the shot-peening process has been applied to a wide variety of metallic machine components with most satisfactory results. Thus, ring gears and pinions for automotive axles, quills, shafts, thrust washers, connecting rods and the like, have been treated similarly. It will be understood, of course, that the shot blasting does effect minor deformation of the metallic surface which is usually visible with an ordinary magnifying glass so that it cannot be applied to certain parts. However, this deformation is not sufficient to adversely effect the operating characteristics of the larger size gear teeth, for instance, and the increase in durability makes the treatment very desirable.

In former practice, when objects such as leaf springs were treated, it was usual to merely pass the spring on a conveyor under the shot source. In dealing with substantially flat surfaces, this gave sufficient uniformity of treatment on the major faces. However, when gears, shafts and other objects having a certain degree of symmetry about an axis of rotation are to be treated, it is very difficult to obtain the desired uniformity on all the surfaces. It will be quite apparent that it would be desirable to rotate such articles as they pass beneath the shot stream so that a more uniform manner of working would be obtained; but the very nature of the treatment prohibits the use of the more usual mechanisms for imparting such rotation. The advantage of the present invention is that in the mechanism devised, the rotation of the object under the undergoing treatment can be effected and by a means directly operated by the propelled particles themselves so that the rate of operation is automatically more or less dependent upon the distribution of the peening shot insuring uniform distribution of peening over the entire exposed surface of the object in one operation.

As the device is entirely self-contained and very rugged, it is not subjected to undue wear in the process, and the external driving connections used with other systems are no longer required. Another advantage of the invention is that it permits selective operation on various surfaces of the object to be treated, so that those surfaces which are not to be peened may readily be masked off and only those portions to be subjected to the treatment exposed. Still another advantage is that the device is readily loaded and unloaded and is particularly adaptable to repetitional use in connection with a moving conveyor by which successive objects to be treated are carried under the shot propelling means. As each device is entirely self-contained, flexibility of operation is increased and the basic fixture may be readily converted to accommodate widely different parts.

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With these and other objects in view, the invention consists in the arrangement, construction, and combination of the various parts of the improved device and in the steps of the method of operation, described in the specification, claimed in the claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a diagrammatic view of a shot-peening conveyor system.

Figure 2 is a perspective view of one form of shot-peening fixture for the treatment of an axle pinion.

Figure 3 is an elevation of a second form of peening fixture particularly developed for the treatment of a driving quill of which the greater part is to be protected from the peening action.

Figure 4 is a plan view of the device shown in Figure 3.

Figure 5 is a vertical section through the right-hand portion of Figure 2.

Referring first to Figure 1, 10 indicates diagrammatically a conveyor belt operating through a hood 11 in which is mounted a shot-projecting device 12 adapted to project streams of peening pellets as indicated by the dotted lines 13. A number of individual fixtures 14 each having a base 15 and the ends 16 are carried on the conveyor 10. Rotatably seated in each of these fixtures is an object 17 to be shot peened; and a paddle wheel 18, shielded on one side by the shield 19 and subjected on its other side, to the stream of pellets is fixed for rotation with the object. This arrangement causes rotation of the wheel 18 and consequent rotation of the object 17 with respect to the fixture 14 while undergoing the action of the peening particles. This rotation continues so long as the object is underneath the stream; and as the fixture emerges from the left-hand side of the hood 11, the object 17 can be removed and the fixture replaced with another object for treatment at the right-hand end of the conveyor.

A particular form of fixture 14, devised for the treating of an axle pinion and associated shaft

is shown in Figure 2. Each of the elements referred to above is shown on it. It will be noted that the shaft 20 of the spiral pinion 21 is not to be treated and it is slidably received within the tube 22 which carries the paddles 18. The tube has a trunnion bearing 26 loosely received in an aperture 27 in the right side 16 of the fixture which is protected beneath the bearing shield 23. The other end 24 of the pinion shaft 20 is rotatably seated in an open notch 25 in the left side 16. Relative rotation between the tube 22 and the shaft 20 may be prevented by a set screw or other appropriate means.

It will be observed that the axis of the shaft is placed at an angle to the base 15 so that the root surfaces of the pinion are substantially parallel with the base in the uppermost position when they receive the shot stream thus permitting the maximum effective treatment of the working surface of each tooth. As a preliminary to the peening operation, the shaft 20 is placed in the tube 22 and the assembled shaft and tubes are secured for common rotation and are then rotatably mounted in the fixture 14, by first sliding the trunnion bearing 26 into the aperture 27 in the right-hand side and seating the end 24 in the notch 25. The fixture is then placed on the conveyor 10. After its transit through the hood 11, the associated shaft and tube can be lifted from the fixture and the shaft removed from the tube for further processing.

Figures 3 and 4 show another form of fixture particularly devised for treating the exterior surfaces of shafts such as that of the quill 36. The fixture 29 comprises a base 30, having two cross walls 31, each of which has one or more notches 32. Extending outwardly from each of the walls 31 is a yoke 33 carrying the adjusting bolt 34. Sloping shields 35 are mounted on the yokes 33 as shown.

In the present fixture, only the central portion of the quill 36 is to be treated as indicated by the bracket 37. Accordingly, the ends are temporarily protected by masking sleeves, at least one of which carries actuating paddles, as in the example above. Thus, one end is protected by the short masking sleeve 38 slipped over and held in place by a set screw 39 engaging a channel 40 in the quill. The other end is protected by a somewhat longer masking sleeve 41, also secured in place by a set screw 42, and including a number of paddles 43. As best shown in Figure 4, the paddles on one side of the sleeve 41 are covered by the shield 35.

Again, the entire fixture can be placed loosely on the conveyor and carried beneath the stream of peening shot. The quills and their associated sleeves are free to rotate in the notches 32 under the impact of the shot on the paddles 43 and the exposed portions of the quill are successively exposed to the stream insuring a uniform surface treatment. The sleeves 38 and 41 are placed on the quill before the latter is placed in the notches 32 on the fixture and after transit through the hood, the assembly can be lifted out and the sleeves removed. The bolts 34 can be adjusted so that objects of different lengths may be accommodated and suitable sleeves can likewise be made for any particular object.

The advantage of the described fixtures, which have been particularly developed for use in the treating method proposed, lies in the utilization of the force of the treating particles to obtain a more uniform treatment of the object. Since they are entirely self-contained, they have no external driving connections subject to damage by the blast of treating particles. Moreover, the uniform treatment of the object is facilitated as the rate of treatment is more or less dependent upon the velocity and content of the stream of treating particles itself. However, under certain circumstances, it may be desirable to furnish an auxiliary air jet within the hood directed along the path traversed by the fixture and localized on the paddle wheel. This permits a further control and a wider latitude of rotational speeds for the object undergoing treatment as, depending upon the jet, the speed may be greater or less than that normally occasioned by the shot blast. The fixture itself, however, is the same for either application.

Some changes may be made in the arrangement, construction and combination of the various parts of the improved device and in the steps of the described method without departing from the spirit of the invention, and it is the intention to cover by the claims such changes as may be reasonably included within the scope thereof.

The invention claimed is:

1. In a shot-peening fixture, a support, means on said support to mount rotatably thereon an object to be treated by a stream of high velocity shot, a sleeve removably secured to said object and adapted to be fixed for rotation therewith, paddle wheel on said sleeve, and a shield on said support partially covering said sleeve so that said sleeve and the object to be treated will be rotated by the action of said shot stream on said paddle wheel.

2. In a shot-peening device, a source for a stream of high velocity shot, a moving conveyor passing through said stream, means on said conveyor to mount rotatably an object to be treated by said stream, a paddle means fixed for rotation with said object, and a shield partially covering said paddle means whereby said object will be rotated while passing through said stream by the action of said shot stream on said paddle means.

3. In a shot-peening device, a base plate, spaced supporting means secured to said base plate, opposed bearings in said supporting means adapted to receive rotatably an object to be treated by a stream of peening particles, means covering selected portions of said object which are not to be subject to said stream of peening particles, paddle means on said covering means fixed for rotation with said object, and a shield partially overlying said paddle means whereby the action of the shot stream will occasion rotation of said object in said bearings.

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