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METHOD AND APPARATUS FOR CLEANING BY ABRASIVE ACTION

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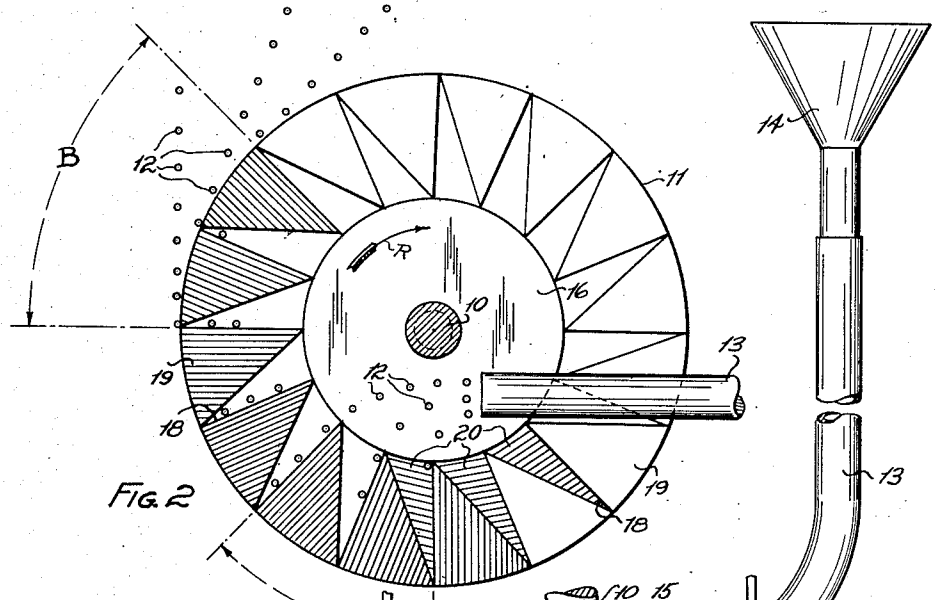


FIG. 2

FIG. 1

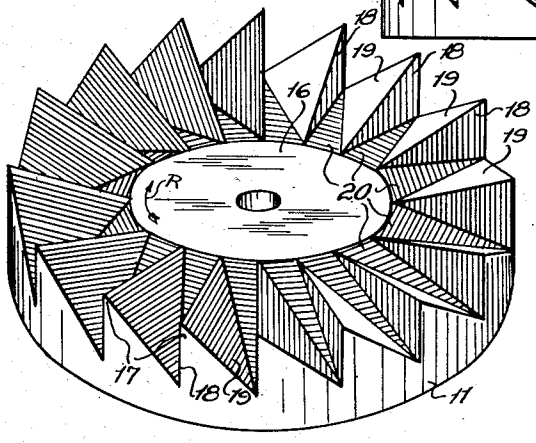


FIG. 3

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METHOD AND APPARATUS FOR CLEANING BY ABRASIVE ACTION

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8 Claims. (Cl. 51—9)

This invention relates to a method and apparatus for cleaning by abrasive action, and has reference particularly to the cleaning of castings and the like.

One of the objects of the invention is the provision of apparatus which may be employed in carrying out a method for cleaning by throwing abrasive bodies outward in an approximately horizontal direction from a rotating wheel.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawing, in which

Fig. 1 is a fragmental elevational view of apparatus constructed in accordance with the invention.

Fig. 2 is a plan view, partly in section on the line 2—2 of Fig. 1, showing the wheel by means of which the balls or other abrasive bodies are thrown, and showing diagrammatically the course of the balls when delivered onto the wheel at a predetermined distance from the center of rotation thereof and in a direction approximating the direction of rotation of the wheel; and

Fig. 3 is a perspective view of the wheel showing the preferred form of ribs.

In the drawing 10 represents a vertical shaft upon which is fixed by suitable means a wheel 11. The shaft is designed to be driven at a suitable speed, which however will vary with the diameter of the wheel, the character of work to be done, etc. Steel shot 12 or other small abrasive bodies are fed down onto the wheel through a pipe or other conductor 13 which leads to a hopper 14, the height of which may be adjusted by suitable means in order to regulate the force with which the abrasive bodies are delivered from the lower end of the conductor, and consequently their speed of travel. The direction of rotation of the wheel 11 is indicated by the arrow R in Figs. 2 and 3, and from this it will be noted that the abrasive bodies, which move in an approximately horizontal direction as they leave pipe 13, are then traveling in the same general direction as that part of the wheel which is revolving directly beneath them. The speed and direction of travel of the wheel and abrasive bodies being substantially the same at the point where they come together, obviously the impact of the bodies on the wheel will be light and the resulting wear small.

A guard plate 15 is fixedly mounted just above the wheel 11 for the purpose of deflecting downwardly any abrasive bodies which may tend to bounce upwardly after contacting with the wheel.

The wheel itself is adapted to receive the balls or other bodies, carrying them outwardly by centrifugal force, and throw them forcibly against the articles to be cleaned.

In order to assist in getting the abrasive bodies up to speed the wheel should have an upper surface which is roughened more or less, that is one which departs from a smooth or plane surface, and any hills and valleys that are provided should run in a generally radial direction so as not to impede the travel of the balls or other bodies toward the periphery of the wheel.

One form of wheel which is suitable for the purpose is illustrated in the drawing as an integral casting having a central depressed flat portion 16 surrounded by an annular portion formed with saw teeth ribs 17. Each of these ribs has a forward surface 18 which extends radially and is vertical or nearly so. This surface is preferably of the shape of an isosceles triangle with the point of the triangle at its inner end and the base of the triangle bisected by the plane of the inner flat portion 16 of the wheel. The other side 19 of each rib is also a plane surface of triangular shape which at its outer end meets the surface 18 of the next rib. Between adjacent ribs there is a groove having a triangular bottom surface 20 which begins at the flat portion 16 and extends downwardly and outwardly therefrom, becoming continually narrower toward its outer pointed end which meets the juncture of the vertical and inclined surfaces of the two adjacent ribs. It will be observed therefore that a ball may leave the flat surface 16 at any point in the periphery of the latter except where the ridges of the ribs intersect the periphery of the flat portion.

As soon as the balls contact with the surface of the flat portion 16 they are given a rotary impulse due to friction, and centrifugal force therefore acts at once to direct them outwardly as indicated in Fig. 2. Upon rolling over the periphery of the flat portion 16 the balls enter the grooves between ribs whereupon the front faces 18 of the ribs carry the balls around with a positive action. Gravity and centrifugal force together tend to move the balls downwardly and outwardly along the bottom of the groove. In case there should be any tendency for some of the balls to rise as they travel outwardly, the height of the vertical surfaces 18 of the ribs at the outer ends of the latter will prevent the balls from passing over the tops of the ribs.

With a given speed of rotation of the wheel and a given position of the delivery end of pipe 13,

the balls will enter the annular portion of the wheel all within a given angle. This angle may be increased in size by moving the delivery end of pipe 13 nearer to the center of the wheel and decreased by moving it further away from the center of the wheel, because it will take longer for the balls to leave the flat central portion of the wheel if they are delivered to that portion at the center thereof than if they are delivered near the periphery. This angle of deposit of the balls also affects the extent of the arc of the wheel from which the balls are thrown, because the balls delivered to a given sector of the wheel at any instant are thrown off from that same sector an instant later. This is indicated in Fig. 2 of the drawing where the sector A and the sector B are equal. The direction of travel of the balls after they leave the wheel may be approximately as shown in Fig. 2.

With respect to the space surrounding the wheel, the delivery of abrasive bodies may be caused to take place wherever desired by merely varying the position of the lower end of pipe 13 circumferentially of the wheel, it being understood that in every case the pipe will deposit the balls on the flat inner portion 16 of the wheel and will cause them at the time of deposit to be moving in the general direction of movement of the wheel.

Variations from the described structure may be employed. Accordingly I desire it to be understood that the scope of the invention is to be regarded as defined exclusively by the appended claims rather than by the foregoing description or the accompanying illustration.

Having thus described by invention, I claim:

1. A method of causing a substantially fan-shaped stream of abrasive bodies to impinge upon articles to be cleaned, and of regulating the angular size of the stream, which consists in delivering said bodies onto the upper surface of a revolving horizontal wheel at selected variable distances from the center of the wheel.

2. A method of causing a substantially fan-shaped stream of abrasive bodies to impinge upon articles to be cleaned with a minimum of wear in the apparatus, which consists in delivering said abrasive bodies onto the upper surface of a horizontal revolving wheel while the bodies are traveling in an approximately horizontal direction corresponding to the direction of rotation of the wheel at the point of delivery.

3. A method of causing a substantially fan-shaped stream of abrasive bodies to impinge upon articles to be cleaned with a minimum of wear in the apparatus, which consists in delivering said abrasive bodies onto the upper surface of a horizontal revolving wheel while the bodies are traveling in an approximately horizontal direction corresponding to the direction of rotation of the wheel, and at a speed approximating the speed of travel of the wheel at the radius corresponding to the point of delivery of the bodies onto the wheel.

4. In apparatus for causing a substantially fan-shaped stream of abrasive bodies to impinge upon articles to be cleaned, a wheel rotating about an upright axis, said wheel having a flat center and an annular ribbed throwing portion surrounding the flat center and means for feeding abrasive bodies onto the flat center at an eccentric point spaced inwardly from the annular portion, whereby the abrasive bodies are thrown from the wheel in a stream of predetermined angular extent.

5. In apparatus for discharging abrasive bodies in a given direction at a predetermined force for cleaning castings and the like, an imperforate wheel mounted for rotation on a vertical axis, the upper sunrface of the wheel having a central flat portion surrounded by an annular portion ribbed in an approximately radial direction, the ribs increasing in depth and height outwardly with respect to the plane of the central flat portion, and means for delivering abrasive bodies onto the said central flat portion.

6. In apparatus for discharging abrasive bodies in a given direction at a predetermined force for cleaning castings and the like, an imperforate wheel mounted for rotation on a vertical axis, the upper surface of the wheel having a central flat portion surrounded by an annular portion ribbed in an approximately radial direction, the ribs increasing in depth and height outwardly, and means for delivering abrasive bodies onto the said central flat portion in a direction and at a speed approximating that of the wheel at the point of delivery of abrasive bodies thereonto.

7. In apparatus for discharging abrasive bodies in a given direction at a predetermined force for cleaning castings and the like, an imperforate wheel mounted for rotation on a vertical axis, the wheel on its upper side having a central depressed portion surrounded by an upwardly flaring annular outer portion, said annular portion having approximately radial grooves therein extending at their outer ends to a depth below the level of the central portion and running up to the level of the central flat portion at their inner ends.

8. A method of causing a substantially fan-shaped stream of abrasive bodies to impinge upon articles to be cleaned, which consists in depositing said bodies at an eccentric point on the upper surface of a wheel rotating rapidly about an upright axis, and varying the position of deposit radially in order to control the angular extent of said stream.

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