Jan. 20, 1959 C. M. GOSSARD 2,869,289

REVERSIBLE CENTRIFUGAL BLASTING METHOD AND APPARATUS

Filed Jan. 24, 1957 3 Sheets-Sheet 1

Fig. 1.

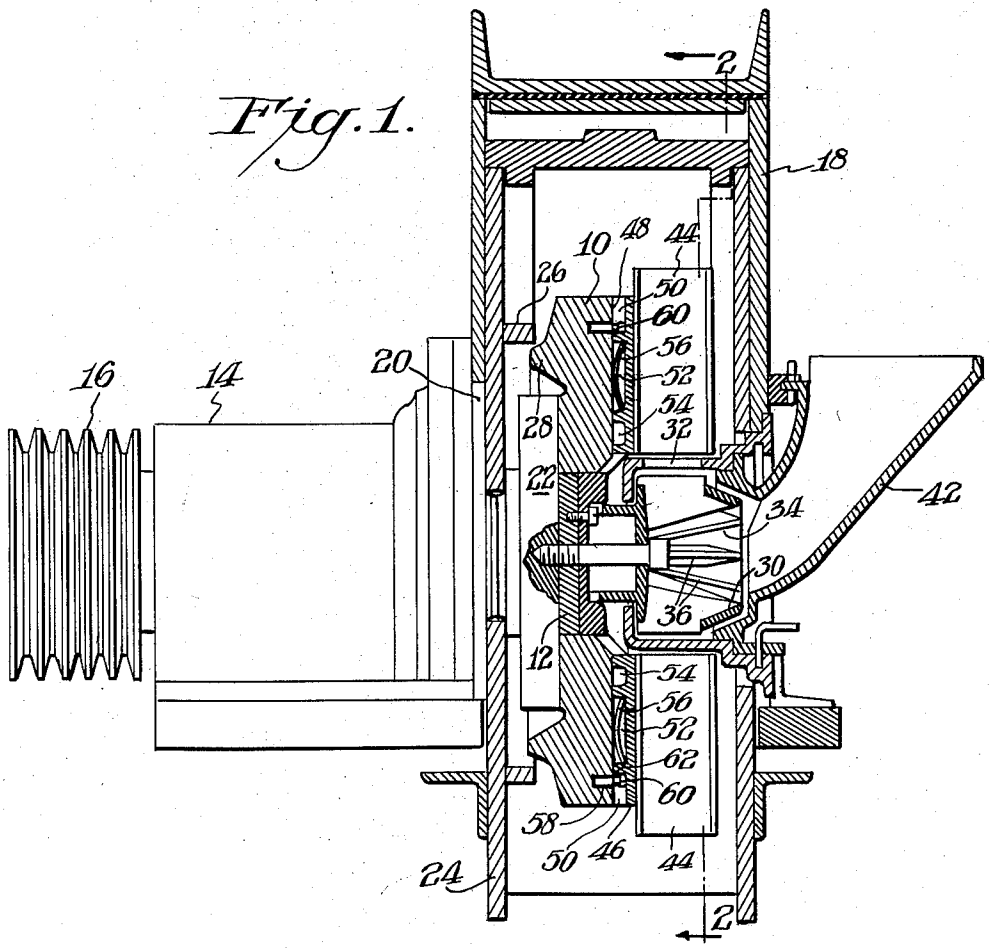
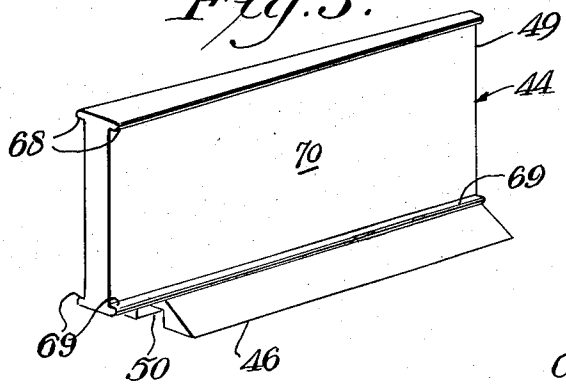


Fig. 3.



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Filed Jan. 24, 1957 3 Sheets-Sheet 2

Fig. 2.

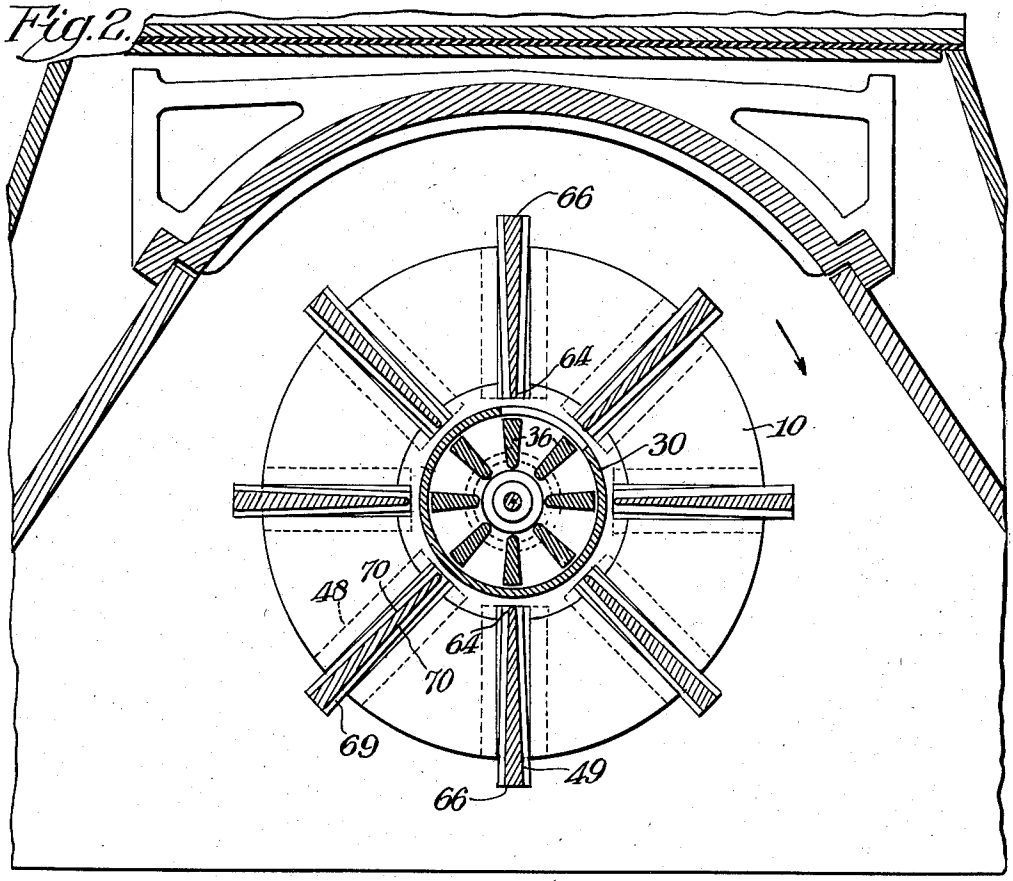


Fig. 4.

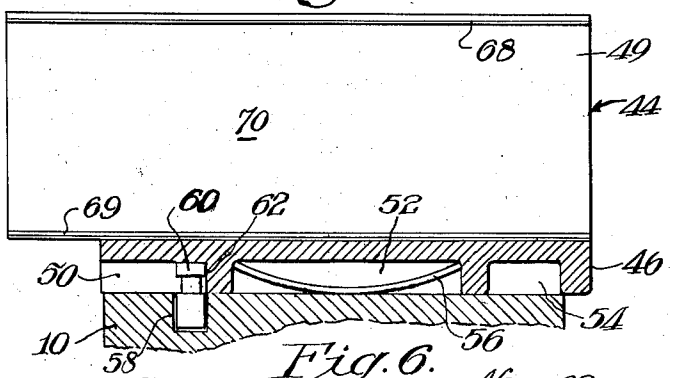


Fig. 5.

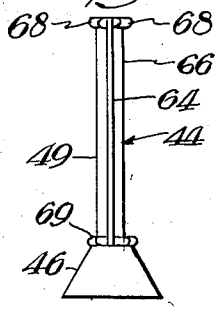
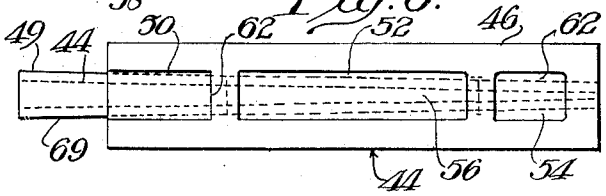


Fig. 6.



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Filed Jan. 24, 1957 3 Sheets-Sheet 3

Fig. 9

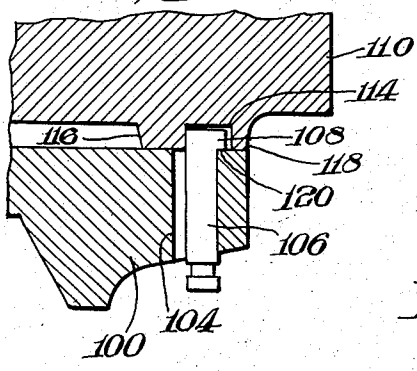


Fig. 8.

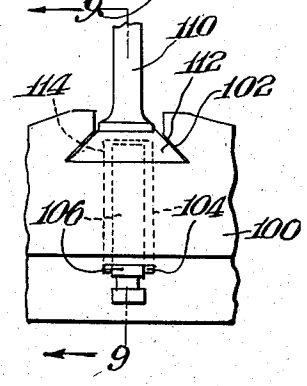
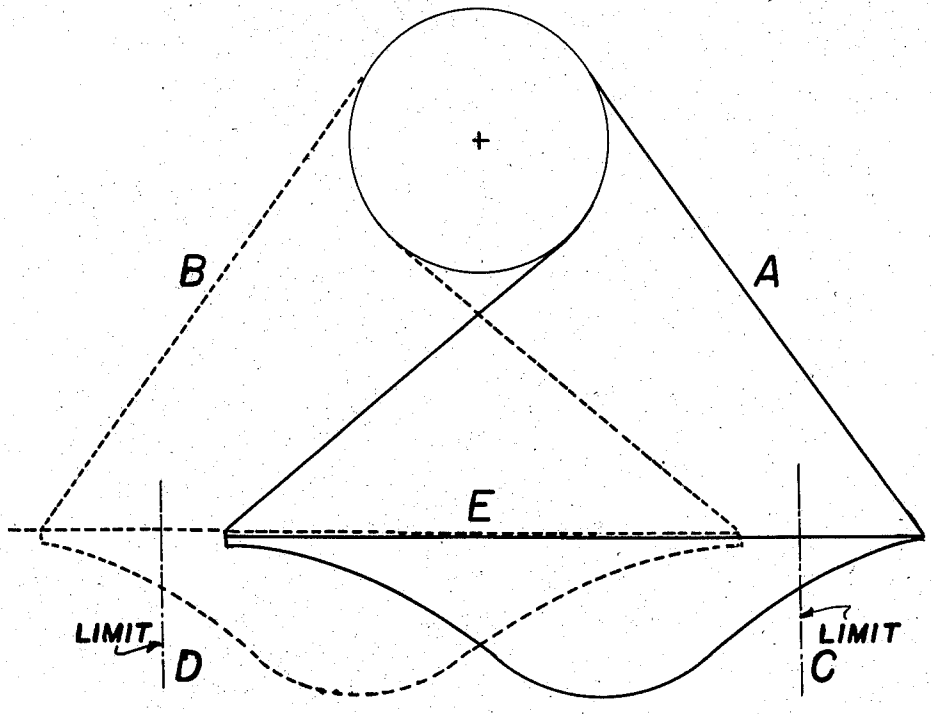


Fig. 7.



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2,869,289

REVERSIBLE CENTRIFUGAL BLASTING METHOD AND APPARATUS

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Application January 24, 1957, Serial No. 636,038

8 Claims. (Cl. 51—9)

This invention relates to an abrading apparatus; and it more particularly relates to an abrading apparatus wherein abrasive particles are gathered and thrown against the workpiece by centrifugal force.

Centrifugal abrading machines of this type have been in extensive use for many years. They generally comprise a wheel having a runner-head on which are positioned vanes extending radially from the axial center of the runner-head. These vanes are connected, at one longitudinal edge, to the face of the runner-head, and project away from the face.

Abrasive particles are fed into a fixed cage positioned axially of the runner-head and surrounded by the vanes, and, as the wheel rotates, the abrasive particles are propelled out of the cage, through an opening therein, into the path of the rotating vanes. As each vane moves by the opening, it picks up a charge of abrasive and, as the vane continues to rotate, it propels the abrasive charge tangentially away from the peripheral portion of the wheel and against the workload which is in a position spaced from the wheel.

These vanes are generally made separable from the wheel so that they may be individually removed and replaced when necessary. This is important since the action of the abrasive particles produces rapid wear on the parts.

The throwing vanes described above are generally provided with a contour on one surface thereof which aids the impelling of the abrasive particles during the rotation of the wheel. This contour is provided on that surface of the vanes corresponding to the direction of rotation of the wheel during use. Consequently, the wheel can be operatively rotated in only one direction, since, if it were rotated in the opposite direction, the vanes could not perform their function. It has, therefore, often been necessary, in order to get an adequate sweep of the abrasive stream, to provide at least two wheels, each being rotated counter to the other. This obviously tends to increase the cost of operation and maintenance. Furthermore, since no two wheels can be constructed exactly alike, there is always some variation in the abrasive effect, resulting in a lack of absolute uniformity of action over the entire workload.

On the other hand, if only one wheel is used, because of its unilateral direction of rotation, it is generally necessary to over-abrade one side of the workload in order to adequately abrade the other side. This is due to the fact that where only one wheel is used, the "hot spot" of the abrasive stream impinges against one portion of the workload while the "tail-end" of the stream impinges against the other end thereof. It is, therefore, necessary to blast the entire workload for a sufficiently long period to enable the "tail-end" side of the stream to effect a proper cleaning. By this time, that portion of the workload which has been receiving the forward edge of the stream has been over-abraded.

Another serious defect in the prior type of centrifugal-wheel machines is the fact that the vanes, during their rotation around the cage, tend to cut off a large portion of the charge of abrasive particles projected outwardly through the opening in the cage. As a result, the abrasive stream issuing from the wheel is substantially "thinner" than it should be. In other words, a large proportion of the abrasive particles which should take part in the blast stream is prevented from doing so. Consequently, the wheel must be run longer for each abrading operation in order to effect a sufficient cleaning action.

It is one object of the present invention to overcome the above as well as other disadvantages of the prior machines of this type by providing a centrifugal abrading machine which will evenly distrbute the abrasive stream over the entire surface of the workload.

Another object of the present invention is to provide a centrifugal abrading machine wherein the time necessary to effect an adequate cleaning is materially reduced.

Another object of the present invention is to provide a centrifugal abrading machine wherein a maximum proportion of the abrasive supply is effectively used.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same become better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a sectional view of a throwing wheel assembly embodying the present invention;

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

Fig. 3 is a top perspective view of one of the throwing vanes shown in Fig. 2;

Fig. 4 is a side view partly in section and partly in elevation, of the vane shown in Fig. 3, the vane being shown held on the runner-head;

Fig. 5 is an end elevational view of the vane shown in Fig. 3;

Fig. 6 is a bottom plan view of the vane shown in Fig. 3;

Fig. 7 is a diagrammatic view showing the directions of the abrasive stream during operation of the device;

Fig. 8 is a fragmentary elevational view of a modified form of the present invention; and

Fig. 9 is a sectional view taken on line 9—9 of Fig. 8.

Referring now in greater detail to the figures of the drawings wherein similar reference characters refer to similar parts, there is shown a runner-head 10 mounted for rotation on a shaft 12. This shaft 12 extends through a housing 14, and is provided at its other end, externally of the housing 14, with a driven sheave 16. A housing 18 encloses the runner-head 10 and is provided with a central opening 20 to permit entrance of the shaft 12 as well as the flange 22 supporting the runner-head. A wear plate assembly 24 is releasably held in place to close the opening 20 to an extent sufficient to permit clearance for the shaft 12. An annular flange 26 projects from the inner surface of the wear plate assembly and overlaps a rib 28 on the outer surface of the runner-head assembly.

The runner-head is provided with a central opening in which is positioned a discharge-directing feed cage 30 which is of generally cylindrical or cup-shaped form. A feed slot 32 is provided on the side of the cage and within the cage there is provided an impeller 34 that includes a plurality of vanes 36.

The impeller is supplied with abrasive particles by means of the spout 42, and is rotated along with the runner-head; during such rotation, the abrasive particles are propelled by the vanes 36 through the slot 32 into the path of the throwing vanes, to be hereinafter more fully described, as the vanes rotate with the runner-head.

The above-described structure is substantially similar to that disclosed in U. S. Patent No. 2,732,666, dated January 31, 1956, and is described in greater detail in that patent.

The aforementioned throwing vanes, herein designated **44**, are equally spaced around the runner-head and are releasably secured to the face of the runner-head as by a dovetail connection. This dovetail connection is effected by a base **46** on the inner edge of each of the throwing vanes, this base being slidable in a corresponding channel **48** on the face of the runner-head.

The base **46** is generally wedge-shaped as is also the complementary channel. The base, itself, extends only partly along the corresponding edge of the blade portion **49**, stopping short of the outer end of the blade portion, as best seen in Figs. 1, 3, 4 and 6. On its undersurface, the base is provided with a plurality of longitudinally-aligned slots **50**, **52** and **54**. The slot **50** opens out from that end of the base which stops short of the outer end of the blade portion.

When mounting or replacing a throwing vane **44** on the runner-head, the feed parts, at the center of the runner-head, are first removed. A leaf spring **56** is then placed under tension in the slot **52** of the base **46**, after which the vane is inserted into the corresponding channel **48** from the outer periphery of the runner-head. It is then pushed toward the center of the runner-head until the foreshortened base **46** clears a square hole **58** which intersects the floor of the channel. A lock pin **60** is then dropped into the hole **58**, and, since the lock pin is of greater length than the hole, it projects outwardly therefrom. The vane is then pulled radially back over the lock pin until the end wall **62** of the slot **50** abuts against the pin, thereby preventing any further radial movement of the vane. The feed parts are then assembled in place in the center of the runner-head. For removal, the procedure is reversed.

In operation, the spring **56** holds the vane in tension until, during the rotation of the runner-head, centrifugal force pushes the vane hard against the lock pin.

An important aspect of this invention is the construction of the blade portion **49** itself. This blade portion, it should be noted, extends from a relatively narrow radial inner edge **64** to a relatively wide outer edge **66**, as can best be seen in Fig. 2. At that edge of the blade portion which is opposite the base **46**, there are provided a pair of oppositely extending ribs or flanges **68**. Similar ribs or flanges **69** are provided adjacent the base. Each of these ribs **68** and **69** is coextensive in length with the corresponding impelling surface **70** of the blade portion, there being an impelling surface on each side of the blade portion, and is provided for the purpose of preventing the abrasive from escaping laterally from its corresponding impelling surface.

With the above-described construction, a single throwing wheel can be used to effectively and efficiently clean a workload. This is accomplished by rotating the wheel in one direction for one predetermined time interval and then reversing the direction of rotation for a second predetermined time interval. This reversal of movement may be continued for a number of passes, if desired. The compound action of the abrasive stream in both directions is illustrated in Fig. 7 where the fan-shaped stream A, shown in full line, is projected against the workload during clockwise operation of the wheel and the fan-shaped stream B, shown in dotted outline, is projected against the workload during the counterclockwise operation of the wheel. It can be seen that with a workload within the limits shown at C and D, practically the entire workload, within the area E, receives an equal abrasive action.

During the operation of this device, not only is the workload effectively cleaned, but the abrasive effect is more pronounced and the cleaning action is more rapid due to the tapering construction of the vanes. This tapered construction, which provides a relatively narrow, inner vane portion adjacent the cage, greatly decreases the blockage of the cage opening during rotation of the vanes and, thereby, permits the passage of a significantly greater proportion of abrasive particles.

In Figs. 8 and 9 there is illustrated a modified form of the present invention wherein the throwing vanes can be applied to and removed from the runner-head without the necessity of removing the feed parts.

The runner-head **100** in Figs. 8 and 9 is provided with a plurality of radial channels **102** similar to the aforementioned channels **48**. Each channel **102** is intersected, adjacent its outer end, by a bore **104** extending completely through the runner-head from rear to front.

Adapted to be inserted through said bore **104** is a locking pin **106** of substantially smaller cross-sectional width than the bore and having a flange **108** projecting laterally out from one end thereof. The cross-sectional width of this flanged end is slightly less than that of the bore to permit its insertion and extraction through the bore.

The throwing vane **110** used in this modified form is provided with a base **112** similar to base **46** except that, in place of the open slot **50**, it is provided with a closed slot **114** defined at its ends by flanges **116** and **118** and having a cross-sectional width corresponding to that of the bore **104**.

To position a throwing vane **110** on the runner-head **100**, it is not necessary to remove the feed parts as in the first described form of the invention. Instead, it is merely necessary to insert the base **112** of the vane into its corresponding channel **102** and to move it radially inward of the runner-head until the slot **114** fully mates with the end of bore **104**. In this position the vane will either still be slightly spaced from the feed cage or may even be in light contact therewith. The locking pin **106** is then inserted through the bore **104** until the flanged end **108** is seated within the slot **114**. The vane is then pulled back, removing the slot **114** from its mating position with bore **104** and pulling the flange **108** over the shoulder **120** defining the end of the bore. This is the locked position and is illustrated in Fig. 9. Centrifugal force holds the parts in this locked position during operation, just as in the first described form of the invention.

When it is desired to remove any one of the vanes **110**, the above procedure is reversed whereby the vane is pushed toward the center, the locking pin **106** is withdrawn, and the vane is then slid out of the corresponding channel radially outward of the runner head.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. An abrasive throwing vane comprising an elongated base adapted to be connected to a centrifugal throwing wheel, a blade connected to said base, said blade extending the entire length of said base and having an extension which extends beyond the corresponding end of said base, said blade being defined by two generally flat throwing surfaces, one on each side, said throwing surfaces being inwardly inclined toward each other from a relatively wide edge of said blade at the end of said extension to a relatively narrow edge at the opposite end of said blade, the longitudinal edge of said blade remote from said base being provided with a pair of oppositely-extending lateral flanges extending along the length of said blade, said flanges defining a flat longitudinal blade edge tapering from a relatively wide end coincident with the relatively wide edge of said blade at the end of said extension to a relatively narrow end coincident with the relatively narrow edge at the opposite end of said blade.

2. The throwing vane of claim 1 wherein said base is substantially wedge shaped in cross-section with the narrower portion thereof being connected to the corresponding longitudinal edge of said blade.

3. The throwing vane of claim 1 wherein said base

is provided with a longitudinal bottom wall remote from said blade, a first recess in said bottom wall for holding a leaf spring under tension, and a second recess in said bottom wall spaced from said first recess and having an open end coincident with the edge of the base adjacent the extension of said blade.

4. An abrasive throwing wheel comprising a runner-head, means for rotatably connecting said runner-head to a driving means, radially extending abrasive-impelling vanes on one face of said runner-head, said vanes each comprising a radially extending elongated base having a rear wall and a front wall, said rear wall being connected to said one face of said runner-head, and an elongated blade extending from the front wall of said base in a direction parallel to the axis of said runner-head, each of said blades being tapered inward from a relatively wide end at the radially outer edge thereof to a relatively narrow end at the radially inner edge thereof, and coacting securing means on said runner-head and on each base for releasably securing the base to the runner-head, said securing means being entirely positioned between said one face of said runner-head and the rear wall of the base within the plane defined by the opposite longitudinal edges of the base.

5. The throwing wheel of claim 4 wherein the longitudinal edge of each blade remote from the respective base is defined by a pair of oppositely extending lateral flanges extending the full length of said blade and tapering along therewith, said longitudinal edge of the blade being unconfined.

6. The throwing wheel of claim 4 wherein the base of each vane is slidably positioned in a radially extending channel on said one face of the runner-head.

7. The throwing wheel of claim 4 wherein said securing means includes an open-ended longitudinal slot on the rear wall of each base, said slot opening out of the radially outer end of the base, and a removable locking pin extending outwardly from said one face of the runner-head and into said slot.

8. The throwing wheel of claim 4 wherein said securing means comprises a longitudinal slot in the rear wall of each base, said slot opening out of the radially outer end of the base, a removable locking pin insertable through a bore in said runner-head, said bore extending parallel to the axis of said runner-head, said locking pin having a laterally flanged end thereon insertable within said slot, the length of the slot being substantially the same as the width of the bore, and the width of the locking pin being substantially smaller than the width of the bore.

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