May 20, 1969 M. GEISSELER 3,444,651

CENTRIFUGING WHEEL

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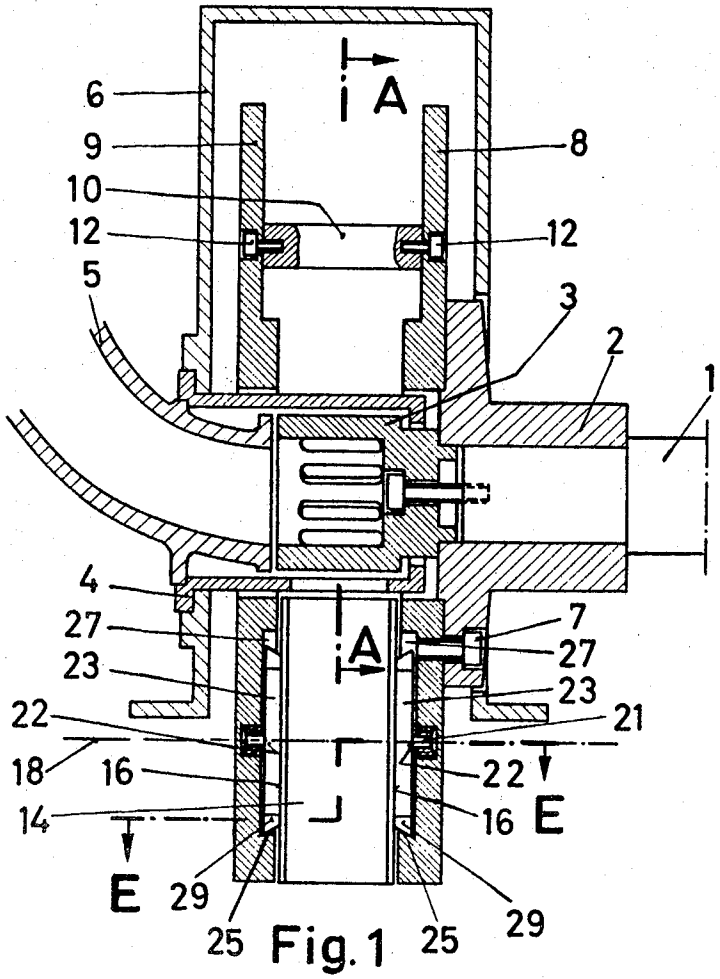


Fig. 1

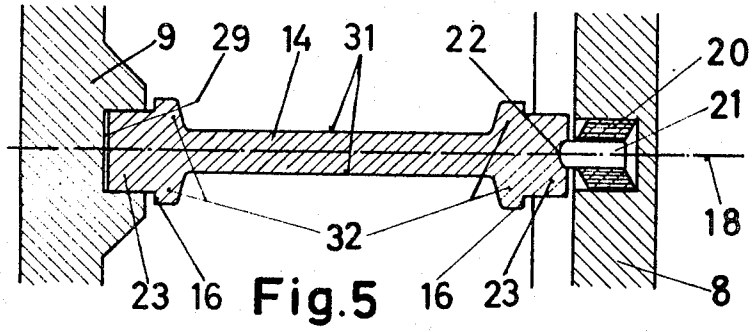


Fig. 5

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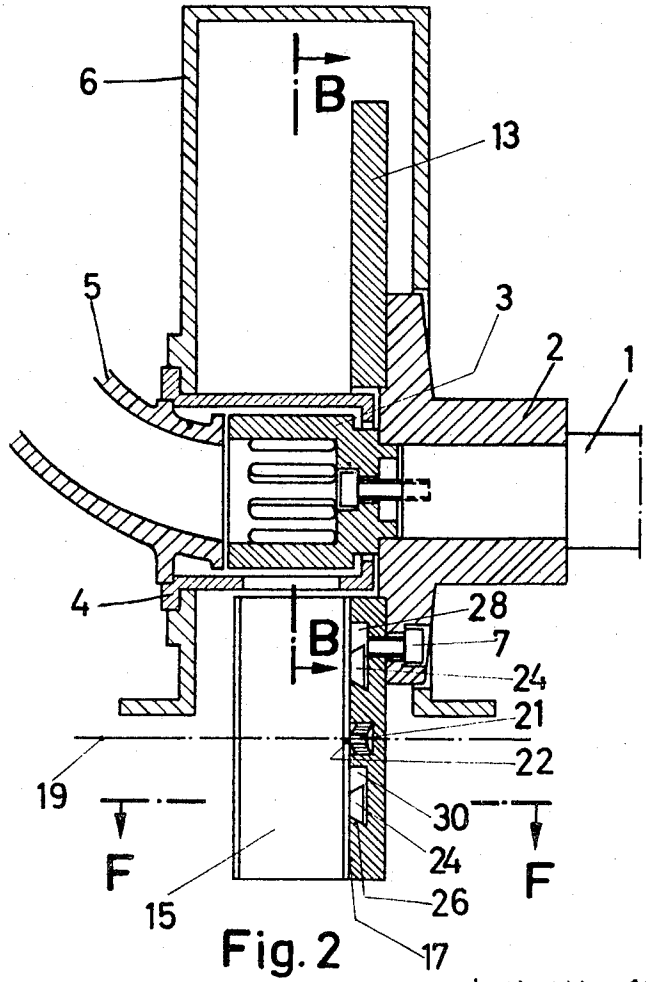


Fig. 2

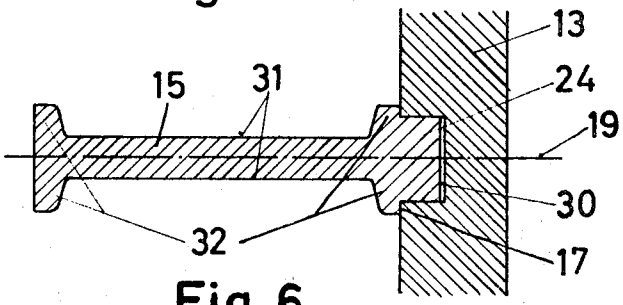


Fig. 6

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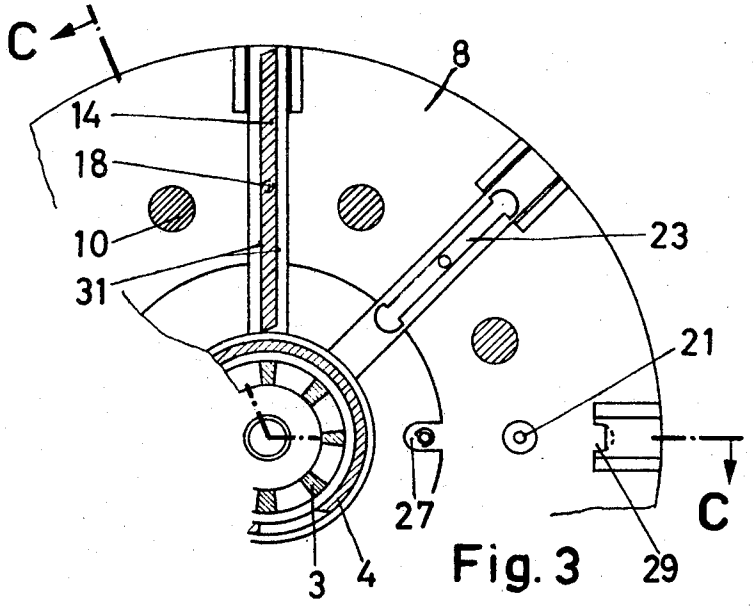


Fig. 3

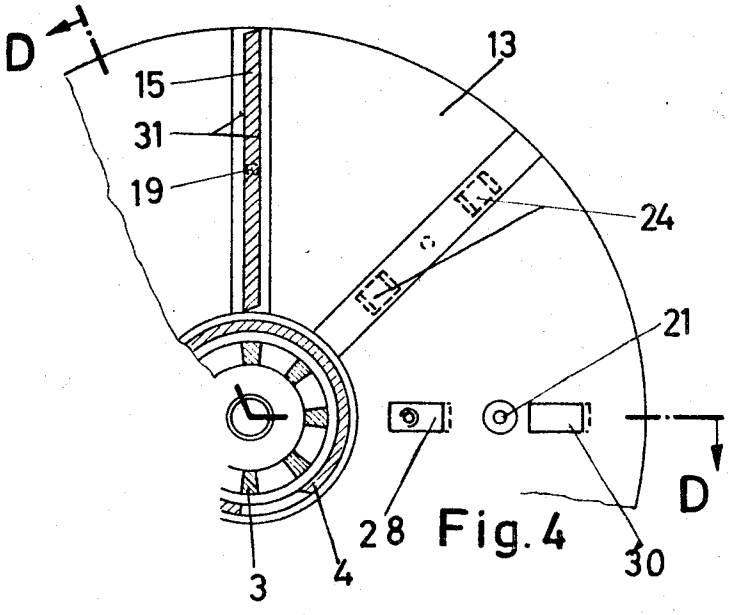


Fig. 4

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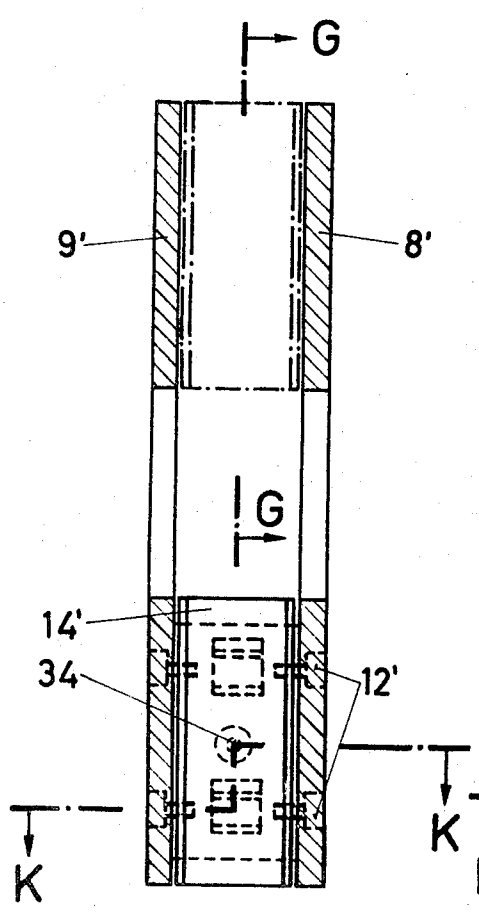


Fig.7

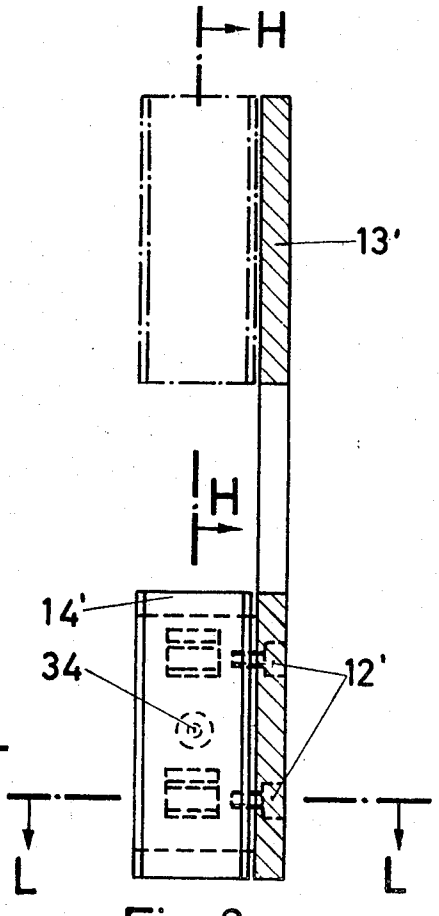


Fig.8

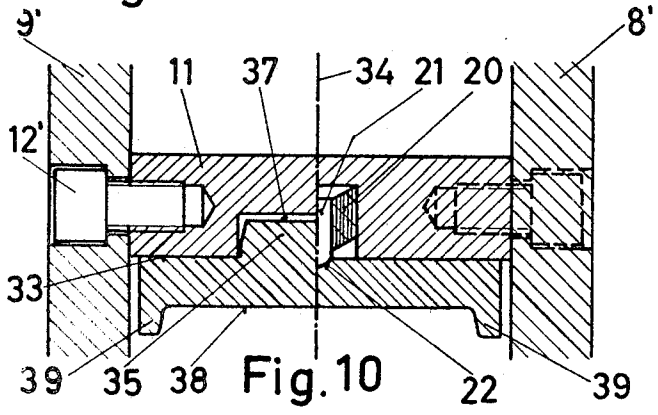


Fig.10

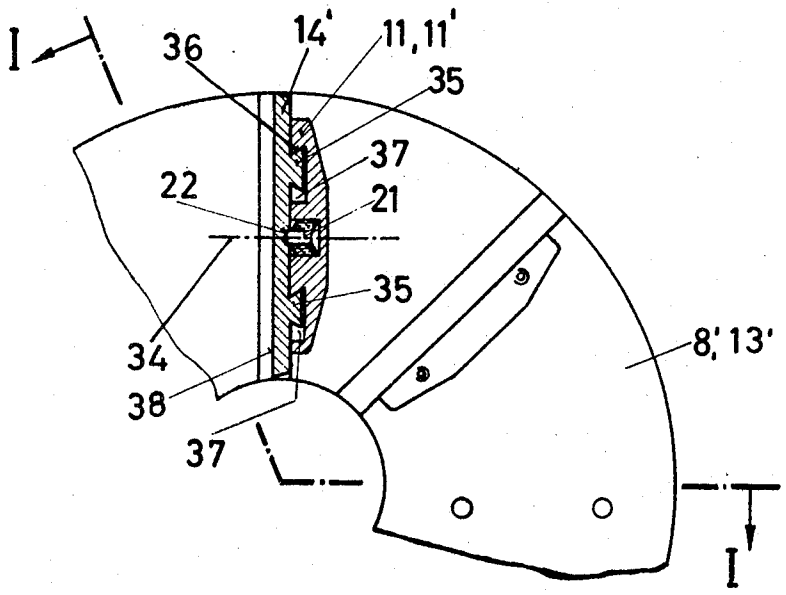


Fig.9

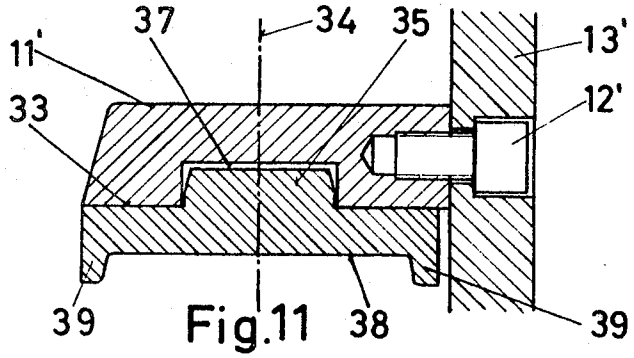


Fig.11

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3,444,651

CENTRIFUGING WHEEL

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Int. Cl. B24c 3/00, 3/02
U.S. Cl. 51—9 8 Claims

ABSTRACT OF THE DISCLOSURE

Centrifuging wheel comprising a preliminary accelerator, throwing blades which are symmetric with respect to a transverse axis about which they may be turned about a 180° angle and reinstalled to utilize a different surface of the blades, anchoring means having wedge shaped surfaces for retaining the blades while the wheel is rotating and applies centrifugal force and holding means which apply elastic pressure to the blades and retain them when the wheel is at rest and permit removal of the blades without releasing other fastening means.

The present invention concerns a centrifuging wheel having one or two wheel discs and interchangeable throwing blades for the acceleration of material to form jets, preferably of granular material, to a high speed for the purpose of the surface treatment of workpieces, which for example are to be cleaned or descaled. As is known the working principle of such a centrifuging wheel consists in that the jet medium is fed to a wheel rotating rapidly and provided with radial throwing blades, as far as possible to the centre thereof, is accelerated outward in the radial direction on the working surfaces of the throwing blades, and is then capable due to centrifugal force of being thrown at a high speed from the circumference of the wheel against the workpiece to be handled. Embodiments are known in which the jet medium is fed from the face of the wheel by means of a fall pipe directly onto the inner part of the throwing blades, and other embodiments in which a jet medium is fed into the centre of the wheel and is accelerated therefrom by means of compressed air or in a mechanical manner outwardly in a radial direction and then passed to the throwing blades for further acceleration. It is known from practical experience that the members feeding the jet medium and the throwing blades, more particularly with centrifuging wheels having a high throughput and speed of throwing and more particularly when using hard metallic or mineral jet media, are subjected to high wear and tear due to the grinding action of the same, and consequently have to be replaced from time to time.

The wear of the working surfaces of the throwing blades is in general considerably stronger towards the circumference of the wheel, usually due to increasing speed of the jet medium than it is on the inlet side for the jet medium. As observation shows, particularly with centrifuging wheels of high output, the wear appears in the form of local erosions or grooves sometimes deep and generally in the shape of saw-teeth, which have steep flanks directed against the flow of the jet medium. The wear comes about in that first of all individual small depressions form on the smooth working surfaces of the new throwing blades, which more and more take on the one-sided tooth shape. On the resulting steep flanks the jet medium builds up with increasing erosion which for its part results in a stronger digging out in front of the steep flanks. The aforesaid fissuring of the working surfaces not only means that smooth sliding thereon of the jet medium is impossible and thereby the centrifuged jet is torn apart in an undesirable manner, but also means that the throwing blades must be replaced when only a small part of their work material which is usually a high alloy and therefore expensive has fulfilled its purpose. By use of throwing blades, which become thicker towards the circumference of the wheel, attempts have been made to increase their life. This however did not prevent the tearing apart of centrifugal jet after a certain wear, and as such throwing blades could only be built-in in a given position, the part which was less worn on the inlet side for the jet means was lost when a change became necessary.

Various constructional shapes of centrifuging wheels are known, which as far as the fixing of the throwing blades is concerned differ only in that with one type a single wheel disc is present having throwing blades arranged on the face side, and in the other type two spaced wheel discs are provided with the throwing blades lying therebetween. In the first mentioned embodiment the throwing blades are either secured onto the shaft of the wheels by means of a screw, or held in radial grooves usually of dovetail shape on the front side of the wheel discs by means of securing elements. Amongst these there are also embodiments having symmetric throwing blades, which after a certain amount of wear can be turned through an angle of 180°.

In known centrifuging wheels having two wheel discs the throwing blades are inserted with their longitudinal narrow edges into radial grooves arranged in the surfaces facing one another of the two discs, and are secured against a longitudinal displacement radially outward, caused by the centrifugal force, either by means of adjustment screws, pivotable locking means, eccentrics, springs, or other moveable elements. With such centrifuging wheels the change of blades is consequently always characterised by a relative movement between surfaces sliding on one another and the loosening and reinstalling of a separate securing element. In addition to this with this type of fastening the throwing blades can only be built in a single position and the centrifuging wheels can only be built for use in a single position and the centrifuging wheels can only be used for a single direction of rotation. In addition with the known embodiments having positioning screws and eccentrics as the fixing elements it often happens that the hardened throwing blades are subjected to an excessive local pressure whereby they become cracked and break prematurely. It is further known from working with the conventional centrifuging wheels that freely circulating jet medium, which so far could not be entirely stopped, damaged the exposed parts of the securing elements by degrees, and the fine particles of the jet medium and the dust which is also present therein enters into all open cracks, and within a short time jams up either the throwing blades in their grooves, or the movable securing elements. Because of this, exchange of blades is often only possible with great effort and a corresponding exposure of time. Consequently the known centrifuging wheels have always had any one combination from at least four of the faults set out below.

(1) The throwing blades are secured by any type of securing elements having surfaces which slide on one another; or

(2) Are inserted with their narrow longitudinal edges in radial grooves of the wheel discs; or

(3) Are secured against radial displacement toward the outside by means of any type of securing elements having surfaces which slide upon one another; or

(4) Can only be built-in in a single position; or

(5) The centrifugal wheel can only be used in one direction of rotation.

The object of the invention is to eliminate at least the first four of the above summarised disadvantages and further aims at simplifying the construction and manufacture of both single and double disc centrifuging wheels, to raise the safety of operation by cutting out the heavy erosion and breakages of the throwing blades, to arrange for an easier and more rapid replacement of the same, to increase the life thereof by better utilisation of their material, and to maintain the desired shape of the centrifuging jet with one and the same throwing blade for a long period of time. The centrifuging wheel according to the invention is characterised in that the wheel disc or discs or blade carriers and the throwing blade have holding members mutually suitable anchors and anchorages receive the same, which are constructed symmetrically to at least one cross-axis of the throwing blade and in such a way that the throwing blades are held by the holding members in their working position, and on rotation of the centrifuging wheel retain themselves by the centrifugal force working on them in such a way that an undesirable displacement relative to the body of the wheel is prevented; can be exchanged when the centrifugal wheel is at rest without the releasing and re-fixing of separate securing elements, and are capable of being re-inserted when turned by an angle of 180 degrees about at least one of their cross axes.

The invention will be further apparent from the following description with reference to the several figures of the accompanying drawings, which show, by way of example only, a number of centrifuging wheels embodying the invention.

Of the drawings:

FIG. 1 shows a cross section through a centrifuging wheel having two wheel discs and anchorages arranged on the longitudinal narrow side of the throwing blade, along the line C—C of FIG. 3.

FIG. 2 shows a cross section through a centrifuging wheel having one wheel disc and anchorages arranged on the longitudinal narrow side on the throwing blade, along the line D—D of FIG. 4.

FIG. 3 shows a cross section through a part of the centrifuging wheel along the line A—A of FIG. 1, one throwing blade being in view and one omitted.

FIG. 4 shows a cross section through a part of a centrifuging wheel along the line B—B of FIG. 2, one throwing blade being in view and one omitted.

FIG. 5 shows a cross section of an enlarged scale through a part of a centrifuging wheel along the line E—E in FIG. 1.

FIG. 6 shows a cross section on an enlarged scale showing part of a centrifuging wheel along the line F—F of FIG. 2.

FIG. 7 shows a cross section through the body of a wheel having two wheel discs and anchorages, on the rear side of the throwing blade, along the line I—I of FIG. 9.

FIG. 8 shows a cross section through the body of a wheel, having one wheel disc and anchorages ranged on the rear side of the throwing blade, along the line I—I of FIG. 9.

FIG. 9 shows a cross section through a part of the body of the wheel along the line G—G of FIG. 7 and H—H of FIG. 8, one throwing blade being in view and one along with the blade carrier being omitted.

FIG. 10 shows a cross section on an enlarged scale through a part of body of the wheel along the line K—K of FIG. 7, and

FIG. 11 shows a cross section on an enlarged scale through a part of the body of the wheel along the line L—L of FIG. 8.

The wheel hub **2** and the preliminary accelerator **3** are secured in a manner known per se on the end of a shaft **1** which is driven at high speed by a power source which is not shown. The shell **4** for directing the jet along with the partly shown feed pipe **5** are pivotally arranged in a manner known per se in the sketched in centrifuging wheel housing **6**. The centrifuging wheel is secured on the wheel hub by means of a screw **7**. In FIGS. 1 and 7 the body of the wheel consists of the rear wheel discs **8** or **8'** and the front wheel discs **9** or **9'** which are held at a given distance apart by means of spacing means such as bolts **10** or the blade support or carrier **11**, and are rigidly connected together by means of the screws **12** or **12'**. In the centrifuging wheel shown in FIGS. 2 and 8 the body of the wheel consists of only the rear wheel disc **13** or **13'**, the blade support or carrier **11'** being secured to the latter wheel disc by means of the screw **12'**.

Two embodiments according to the invention are shown in FIGS. 1 to 6 wherein throwing blades **14** or **15** radially arranged at an even distance from one another and conveniently of an even number, and held on a longitudinal narrow side **16** or **17** and anchored in the wheel discs, are located between the two wheel discs **8** and **9** or on the outer end face of the wheel disc **13**. For this purpose the wheel discs are provied in the cross axis of the throwing blades **18** or **19** with support of holding members **21** which conveniently have no surfaces sliding on one another, are for example firmly seated in a resilient shell **20** and by extending into the depressions **22** of the narrow sides of the throwing blades apply pressure thereto. The throwing blades **14** and **15** have on their longitudinal narrow sides in addition to the transverse axes **18** or **19** symmetrically arranged anchors **23** or **24** preferably having wedge-shaped engagement surfaces **25** or **26**, which fit into the inner anchorages **27** or **28** in the outer anchorages **29** or **30** of the wheel discs. The working surfaces **31** of the throwing blades are provided on all four longitudinal sides with borders **32** for the radial direction of the jet medium. The shape of the throwing blade of the two disc centrifuging wheels is symmetrical both in regard to the radial longitudinal axis and also in regard to both transverse axes and with single disc centrifuging wheels in relation to the cross axis **19**.

Two embodiments according to the invention are shown in FIGS. 7 to 11 wherein radially arranged throwing blades **14'**, which are held and anchored on their sides **33** in the blade supports or carriers **11** or **11'** are located between the two wheel discs **8'** and **9'**, or on the outer face surface of the wheel disc **13'**. For this purpose the blade supports or carriers are fitted in the cross axes **34** of the throwing blades with holding members **21** which press into the depressions **22** in the rear sides of the throwing blades. The throwing blades **14'** have upon the rear side in addition to the cross axis **34** symmetrically arranged anchors **35** preferably having wedge-shaped engagement surfaces **36**, which fit into the anchorages **37** of the blade carrier, and for the radial guidance of the jet medium are provided on both longitudinal sides of their working surface **38** with borders **39**. The anchors and anchorages preferably do not extend over the whole width of the blade, and are adapted to one another in such a way that thereby at the same time a lateral guide in the actual direction of the centrifuging wheel is obtained. The shape of the throwing blades is both with two and single disc centrifugal wheels symmetric to the cross axis **34**.

As the following functional description will more clearly express, there is obtained with the centrifuging wheels according to the invention, with simultaneously secure anchoring of the throwing blades, a simplification of the mounting and dismounting which was not previously

known as a considerable improvement in their life and thereby a higher operational safety factor. In the embodiment shown by way of example in FIG. 1 the throwing blades are so inserted between the wheel discs for mounting in radial direction to the axis of the centrifuging wheel and in a slightly inclined position on the radial axis that the anchor of the throwing blade first of all comes to rest in the inner anchorage of the wheel disc. The throwing blades are then pivoted into their radial axes and drawn outwardly in the radial direction, so that the anchors of the throwing blades also engage into the outer anchorages. At the same time the resilient holding members snap into the related depressions on the narrow sides of the throwing blades and hold these in their working position. The dismounting of the throwing blades takes place in just as simple but however opposite manner. For this purpose by overcoming the holding power of the securing member they are pressed against the centre of the wheel out of the outermost anchorage, pivoted out on the circumference of wheel, and then drawn out from the inner anchorage in a radial direction on the axis of the centrifuging wheel. In the embodiment shown in FIG. 2 the mounting of the throwing blades takes place in that their anchors are inserted in the anchorages of the wheel disc in the axial direction of the centrifuging wheel, the throwing blades are then pressed against the holding member in the wheel disc and at the same time displaced towards the circumference of the wheel, until the holding members snap into the related depressions on the longitudinal small sides of the throwing blades, which they then hold in their working position. To dismount the throwing blades these, again by overcoming the tension of the holding member, are pressed towards the centre of the wheel and after release of the anchors are removed in the axial direction of the centrifuging wheel. The mounting and dismounting of the throwing blades in the embodiment shown in FIGS. 7 and 8 takes place basically in exactly the same manner as has just been described with the exception that the throwing blades have to be moved in the tangential direction to the axis of the centrifuging wheel.

As soon as the centrifuging wheels according to the invention are set into operation, they press themselves with great force against their support surfaces due to the high centrifugal force acting upon them and thanks to the wedge-shaped engagement surfaces of their anchors. In contrast to the known embodiments the centrifuging wheels according to the invention do not have any securing elements with surfaces which slide upon one another and also have no radial grooves for guiding the longitudinal sides of the throwing blades, so that jamming of these parts is quite out of the question. The embodiments according to the invention as shown in FIGS. 2, 7 and 8 also have a further advantage that both the holding member and also the anchor is completely covered by the throwing blades, and consequently cannot be attacked and damaged by the jet medium whirling around on all sides. The wheel discs of the embodiments shown in FIGS. 7 and 8 further have the advantage that they have completely smooth face sides, which are simple to manufacture and do not present any surfaces to be attacked by the whirling jet medium. If in centrifuging wheels in accordance with the invention, a used throwing blade is to be re-used in the embodiment shown in FIG. 1 it can at will either be built-in in such a way that the worn working surface rests on the rear side, or so the more-used part on the circumference of the wheel rests on the inlet side for the jet medium which is subjected to less stress. Whilst in the embodiment shown in FIG. 2 the worn working surface of the throwing blade, on turning is necessarily always located on the rear side, in the embodiment shown in FIGS. 7 and 8 the more-used part of the working surface on the circumference of the wheel is always turned against the inlet side for the jet medium. With the centrifuging wheels according to the invention it is consequently possible, either to locate a new working surface, or at least a less worn part of the working surfaces on the throw-off side for the jet medium which is subject to greater stresses, and in contrast to the known embodiments thereby approximately double the life of the throwing blade without increasing the expense of the material, and also to retain the centrifuging jet in the desired form with one and the same throwing blade for a much longer time.

The invention has been described with reference to the centrifuging wheels, in which the jet medium is fed to the centre of the wheel and is pre-accelerated by mechanical methods. Naturally the inventive thoughts can be just as well used on other types of centrifuging wheels. Furthermore in the embodiments given by way of example only the holding members and the anchorages are arranged on the body of the wheel and the anchors on the throwing blades. Embodiments are of course also conceivable where the retaining members and the anchorages are reversed without departing from the spirit of the invention. Furthermore in the embodiment shown by way of example only, centrifuging wheels are shown which have eight radially arranged throwing blades, whose working surfaces are even. According to the invention, embodiments are readily possible which have a smaller or larger number of throwing blades. Due to the lack of radial guide grooves on the longitudinal sides of the throwing blades the invention also makes possible simpler solutions of problems in the construction and manufacturing techniques of the centrifuging wheels, in which the throwing blades are inclined backwardly or forwardly as against the radial axes, or even have a curved working surface in the radial direction.

What I claim is:

1. A centrifuging wheel for accelerating material to high speed comprising a central preliminary accelerator and at least one wheel disk disposed circumferentially of said accelerator, a plurality of throwing blades disposed laterally of said at least one wheel disk, means including resilient support members and depressions retaining said blades on said at least one wheel disk and interengaging anchoring means presenting wedge shaped surfaces providing support for said throwing blades laterally of said at least one wheel disk in one operative position when centrifugal force acts on said blades, said throwing blades having a transverse axis and sides symmetrical to said transverse axis about which axis said blades may be turned 180° to another operative position, and said wedge shaped surfaces of said anchoring means being adapted to provide support for said throwing blades in said other operative position when centrifugal force acts on said blades.

2. A centrifuging wheel in accordance with claim **1** where said resilient support members are located in said at least one disk and said blades present longitudinal sides and an anchor on at least one said longitudinal side adapted to engage said at least one disk.

3. A centrifuging wheel in accordance with claim **2** comprising a pair of wheel disks, one on each side of said blades and anchoring means defined by resilient support members and depressions intermediate each wheel disk and the proximate sides of said blades.

4. A centrifuging wheel in accordance with claim **1** comprising a pair of wheel disks, said anchoring means including blade supports extending between said disks proximate said accelerator and said resilient support members being provided intermediate said blade supports and the radially inward ends of said blades.

5. A centrifuging wheel in accordance with claim **1** where the configuration of said blades proximate said anchoring means provides a protective cover for said anchoring means.

6. A centrifuging wheel according to claim **1** where

said anchoring means extend over part of the width of the throwing blades and are so adapted to one another that thereby a side guide in the axial direction of the centrifuging wheel is obtained.

7. A centrifuging wheel according to claim **1** where the throwing blades have a radial axis and two transverse axes and a symmetrical form both relative to their radial axis and relative to their transverse axes.

8. A centrifuging wheel according to claim **1** where the throwing blades have a symmetric shape in relation to their transverse axis.

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