Nov. 14, 1967 J. E. DE GROOT ETAL 3,352,064

LOCK SYSTEM FOR BLASTING-MACHINE BLADES

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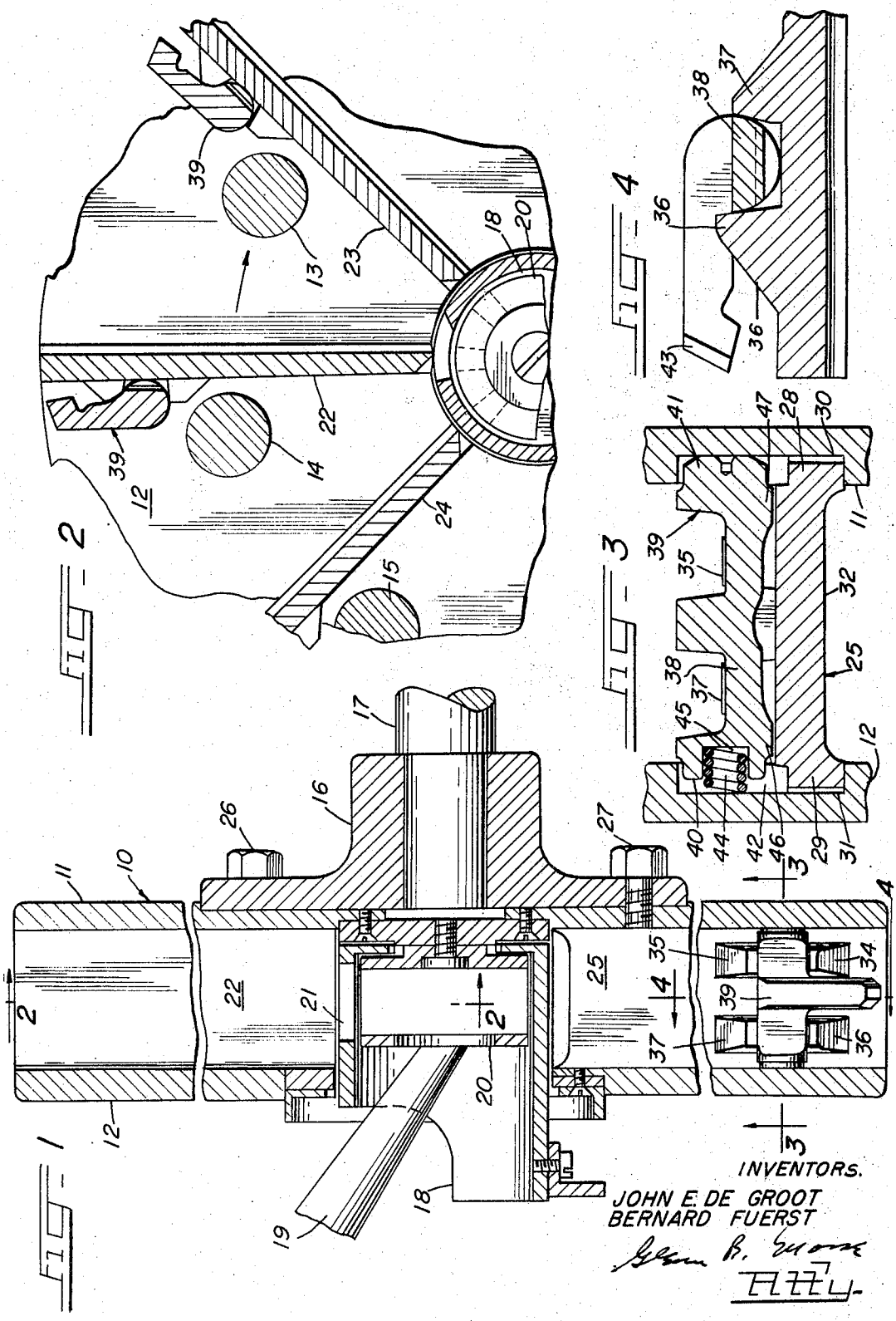

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FIG. 5

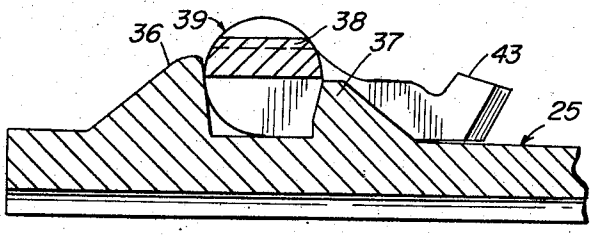


FIG. 6

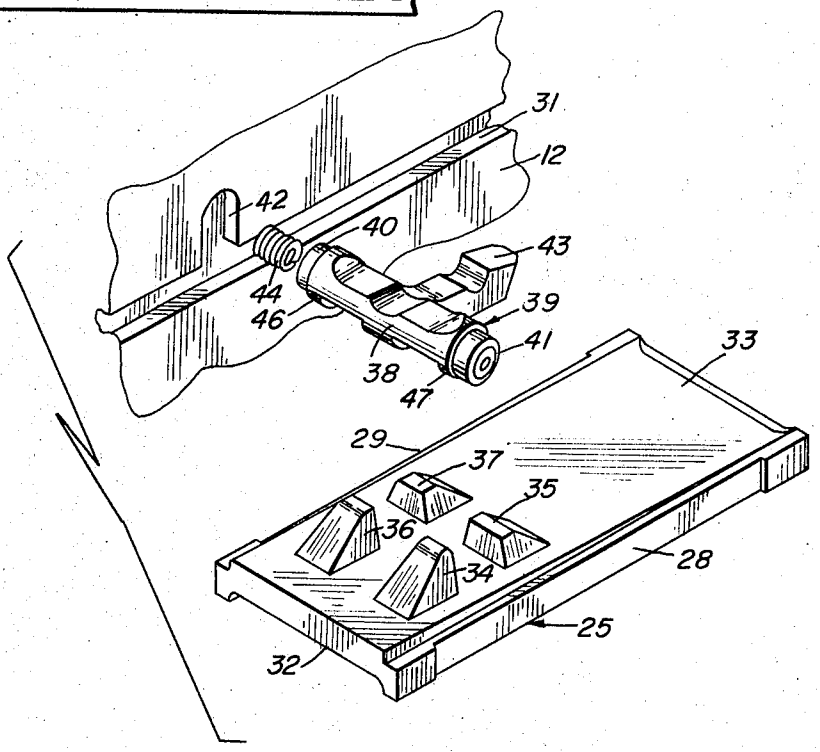
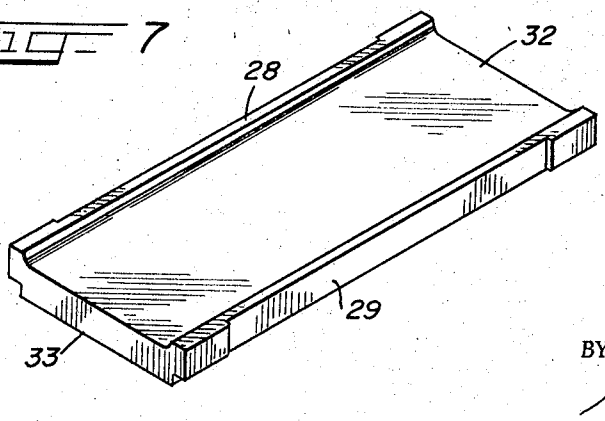


FIG. 7



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LOCK SYSTEM FOR BLASTING-MACHINE BLADES

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ABSTRACT OF THE DISCLOSURE

The invention is addressed to a centrifugal blasting wheel formed of a pair of axially spaced wheel members joined one to another with radial grooves extending in parallel relationship along the inner faces of the wheel members for receipt of radially extending blade members over which particulate material is displaced during rapid rotational movement of the wheel. The improvement resides in a means for releasably securing the blades in position of use in the wheel comprising radially spaced abutments the outermost of which is at a higher level than the innermost with a member mounted for rotational movement between the wheels having a central eccentric or cutout portion adapted to enable the innermost abutment to pass thereunder when in unlocking position and to block the innermost abutment from passage thereunder when in locking position to provide means for releasably securing the blade in position of use with the outermost abutment dimensioned to engage said locking device independent of its position to establish the inserted position for the blade. A further important feature resides in a radially extending arm integral with the locking member centrifugally to urge the locking member in locking position responsive to rotational movement of the wheel thereby to prevent inadvertent release of the blade during operation of the wheel.

This invention relates to the construction of blasting machines, in which a rotating wheel is used to accelerate abrasive particles to produce a high-velocity stream directable along a selected path. These machines are commonly used in foundries to clean scale from castings, and in many other industrial processes. The usual construction of a rotor includes a pair of disc-shaped side plates separated by spacers, and this assembly is usually fastened to a hub structure mounted on a driven shaft. At least one of the plates is open in the central area, and abrasive particles are supplied via this opening to the space between the side plates. Blades supported by the plates engage these particles and accelerate them as the wheel rotates. The result is a tangential stream of high velocity abrasive particles, and erosion of the blades resulting from this action necessitates frequent blade replacement.

The blades are commonly received along their edges in opposite grooves in the rotor side plates. These grooves are normally radial, and means must be provided for holding the blades against the effects of centrifugal force. In prior machines, this locking action has been provided by set screws in the side plates, or by a locking clip of the type shown in United States Patent No. 2,819,562. These prior locking arrangements have shown several undesirable characteristics, and the present invention has been developed to provide a blade lock that requires no tools, is not subject to variations in spring strength and dimensions, and is of such sturdy construction as to minimize the danger that stray particles of abrasive will wear enough of the locking device away to endanger the security of the locking action. These blades commonly weigh several pounds, and attain velocities of two hundred feet per second or more. It is obviously vital that the blades be prevented from escaping from the rotor.

The several features of the invention will be analyzed in detail through a discussion of the particular embodiment illustrated in the accompanying drawings. In the drawings:

FIGURE 1 is an axial section through a rotor equipped with the present invention for locking the blades in position. The rotor is of otherwise conventional construction.

FIGURE 2 is a fragmentary section on the plane 2—2 of FIGURE 1.

FIGURE 3 is a section on the plane 3—3 of FIGURE 1, on an enlarged scale.

FIGURE 4 is a section on the plane 4—4 of FIGURE 1, on a scale corresponding to that of FIGURE 3.

FIGURE 5 illustrates the release position of the locking device.

FIGURE 6 is a perspective "exploded view" showing the relationship of the side plate grooves, and the locking device.

FIGURE 7 is a perspective view of the front, or abrasive-receiving, side of the blade.

The rotor generally indicated at **10** includes the axially-spaced side plates **11** and **12** maintained in parallel spaced relationship by the spacer posts **13–15** shown in FIGURE 2. These are uniformly disposed around the rotor. This side plate assembly is secured to the hub structure **16** mounted on the driven shaft **17** in a suitable machine frame (not shown). The side plate **12** has a central opening substantially occupied by the "cage" assembly indicated generally at **18**. The chute **19** delivers a continuous supply of abrasive particles during the operation of the machine, and the functioning of the cage structure is to admit these particles at a selected sector so that the emerging tangential stream of high-velocity particles will be located as desired to follow a predetermined path. It should be noted that the cage structure **18** is fixed in position, and the distributing member **20** is secured to the rotor. The delivery of the particles through the chute **19** to the interior of the distributing member **20** will cause the particles to move around with the rotor until they emerge from the opening **21** in the cage **18** which is appropriately located to produce the desired tangential path of the abrasive particles emerging from the machine. When the particles move radially outward through the opening **21**, they being to encounter the blades shown at **22–25**, these blades (together with others) being uniformly spaced about the rotor, and arranged in radial planes containing the axis of rotation of the rotor. The structure thus far described is conventional.

The erosive effect of the stream of high velocity abrasive particles requires frequent replacement of the blades, and somewhat less frequent replacement of the side assembly. The securing of the side plate assembly to the hub structure **16** by the bolts shown at **26** and **27** in FIGURE 1 makes the replacement of the side-plate assembly a fairly simple matter. The replacement of the blades necessitates disengagement of a locking system which must be incorporated to prevent centrifugal force from moving the blades outwardly in the retaining slots commonly provided on the inner surfaces of the side plates **11** and **12**. Referring particularly to FIGURE 3, the edges **28** and **29** of the blades are received in opposite grooves as shown at **30** and **31** in the adjacent surfaces of the side plates **11** and **12**. The "front" face of the blade is indicated at **32**, which is the face primarily receiving the stream of abrasive particles. This face corresponds to the advance surface of the blade with respect to the direction of rotation.

Referring particularly to FIGURE 6, the back surface of the blade indicated at **33** is provided with axially-

spaced pairs of abutments **34–35** and **36–37**. The abutments constituting the pairs are radially spaced sufficiently to admit between them the central portion **38** of the locking member **39**. The ends **40** and **41** of the locking member **39** are engageable with opposite recesses as shown at **42** in FIGURE 6, and these recesses intersect the retaining grooves receiving the edges of the blades. The central portion **38** is eccentric with respect to the ends **40** and **41**, with the result that the locking member **39** is rotatable between a locking position shown in FIGURE 4 and a release position shown in FIGURE 5. In FIGURE 4, the presence of the central portion **38** between the abutments prevents either outward or inward movement of the blades, while the release position of FIGURE 5 will permit the blade to be withdrawn to the left so that the abutments **35** and **37** can move underneath the central portion **38** of the locking member. In the release position, it is very convenient to have the abutments **34** and **36** sufficiently high so that they will function as a stop limiting the inward movement of the blades on insertion from the outer periphery of the rotor.

It is significant that the arm **43** is secured to the locking member **39** in a position such that the effect of centrifugal force will normally maintain the locking member in the FIGURE 4 position. To release the blade, the arm **43** is swung from the radially outward position of FIGURE 4 to the inward position of FIGURE 5. The arm **43** is returned to the FIGURE 4 position after the new blade has been inserted.

To avoid the possibility that certain of the locking members might assume a position when the rotor is stopped in which the effect of gravity on the arms **43** might cause an unlocking of the blades, the compression springs **44** are installed in the axial holes **45** in the ends of one side of the locking members. The strength of these springs is selected to produce a frictional effect which will exceed the tendency of gravity to rotate the locking member at any position around its rotary path of movement.

The radially outer abutments **34** and **36** are not necessary to the functioning of the invention, as other structure may be relied upon to establish the stop to the inward movement of the blades on insertion. For example, the radially inner abutments might be disposed to contact the spacers **13–15**, or some auxiliary stop structure can be incorporated. It is also clear that it is not vital that a pair of inner abutments as shown at **35–37** be used. As far as the function is concerned, one of these would be adequate. It is preferable, however, that forces be balanced by the structure as shown. It is also preferable that the locking member be provided with cylindrical or cam-shaped bearing portions as shown at **46** and **47** which bear on the blade to control the degree of looseness of the blades in the grooves.

The conformation of the locking member is determined so that it may be inserted and removed (in the absence of the blade associated with it) without disassembly of the side plate structure of the machine. The extent of the recesses **42** to the side of the grooves **31** is related to the length of the locking member between its opposite ends such that placement of the locking member in a diagonal position (inclined with respect to a perpendicular to the side plates) will permit the withdrawal of the locking member, with the assistance of the clearance provided by the slots **31**. It will normally be necessary to shove the locking member **39** so as to compress the spring **44** in order to accomplish this insertion or removal, but this presents no problem. The replacement of the locking members is a very infrequent operation, and the compression of the spring **44** can be accomplished through the insertion of a screw driver under the opposite end of the locking member, normally applied through the space provided by the adjacent blade groove.

The particular embodiments of the present invention which have been illustrated and discussed herein are for

illustrative purposes only and are not to be considered as a limitation upon the scope of the appended claims. In these claims, it is our intent to claim the entire invention disclosed herein, except as we are limited by the prior art.

We claim:

1. In combination with a blasting machine including a rotor having spaced parallel side plates perpendicular to the axis of rotation of said rotor, said plates having opposite substantially radial grooves in the adjacent surfaces of said plates, respectively, said rotor also having blades with the edges thereof received in said grooves, a locking system for disengageably retaining the said blades in the said grooves, comprising:

means on said side plates forming opposite recesses in said adjacent surfaces;

an abutment mounted on said blade on the back surface thereof; and

a locking member having the ends thereof normally rotatably received in the said recesses, and having a central portion normally disposed radially outward from said abutment, said central portion being eccentric with respect to the ends of said locking member whereby said locking member is rotatable between a position wherein said abutment is free to pass underneath said central portion, and a locking position wherein said abutment is engageable with said central portion which includes a radially extending elongate arm integral with the locking member between the side plates automatically to urge the locking member to locking position by centrifugal force effected in response to rotation movement of the rotor and which operates the locking member for rotational movement toward and away from locking position.

2. A blasting machine as defined in claim **1**, wherein said locking member is provided with means establishing a resistance to rotation with respect to said rotor.

3. In combination with a blasting machine including a rotor having parallel side plates perpendicular to the axis of rotation of said rotor, said plates having opposite substantially radial grooves in the adjacent surfaces of said plates, respectively, said rotor also having blades with the edges thereof received in said grooves, a locking system for disengageably retaining the said blades in the said grooves, comprising:

means on said side plates forming opposite recesses in said adjacent surfaces, said recesses intersecting said grooves;

radially spaced inner and outer abutments mounted on said blade on the back surface thereof with the outer abutments dimensioned to extend beyond the level of the inner abutments; and

a locking member having the ends thereof normally rotatably received in the said recesses, and having a central portion normally disposed between said abutments, said central portion being eccentric with respect to the ends of said locking member whereby said locking member is rotatable between a position wherein the radially innermost of said abutments is free to pass underneath said central portion while the outer abutment is incapable of passage therebeneath, and a locking position wherein said innermost abutments is engageable with said central portion.

4. A blasting machine as defined in claim **3**, wherein said locking member has a laterally-extending arm disposed radially outward when said locking member is in locking position.

5. A blasting machine as defined in claim **3**, wherein said locking member is provided with means establishing resistance to rotation with respect to said rotor.

6. In combination with a blasting machine including a rotor having spaced parallel side plates perpendicular to the axis of rotation of said rotor, said plates having opposite substantially radial grooves in the adjacent surfaces

of said plates, respectively, said rotor also having blades with the edges thereof received in said grooves, a locking system for disengageably retaining the said blades in the said grooves, comprising:

means on said side plates forming opposite recesses in said adjacent surfaces, said recesses intersecting said grooves;

axially spaced innermost and outermost pairs of radially spaced abutments mounted on said blade on the back surface thereof with the outermost of said abutments dimensioned to extend beyond the innermost of said abutments; and

a locking member having the ends thereof normally rotatably received in the said recesses, and having a central portion normally disposed between said abutments, said central portion being eccentric with respect to the ends of said locking member whereby said locking member is rotatable between a position wherein the radially innermost of said abutments is free to pass underneath said central portion, and a locking position wherein said innermost abutments is engageable with said central portion, said radially outermost abutments being engageable with said central portion in both of said positions, said locking member also having a laterally extending arm disposed between the said axially-spaced pairs of abutments, and extending radially outward in the locking position of said locking member, said locking member also having a configuration adapted for insertion into engagement with said recesses exclusively in the absence of a blade in the grooves associated therewith.

7. A blasting machine as defined in claim 6, wherein said locking member has an axial hole in an end thereof, and a compression spring engaging said hole and bearing against the adjacent side plate to establish a resistance of said locking member to rotate with respect to said rotor.

8. A blasting machine as defined in claim 6, wherein said locking member has bearing portions disposed to engage the back of the blade associated therewith.

9. A blasting machine as defined in claim 8, wherein said bearing portions limit the freedom of movement of the said blades within the width of said grooves.

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LESTER M. SWINGLE, *Primary Examiner.*