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United States Patent

Leliaert

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[54] CENTRIFUGAL BLASTING WHEEL

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[52] **U.S. Cl.** **51/9**

[51] **Int. Cl.** **B24c 3/00**

[58] **Field of Search** 51/9

[56] **References Cited**

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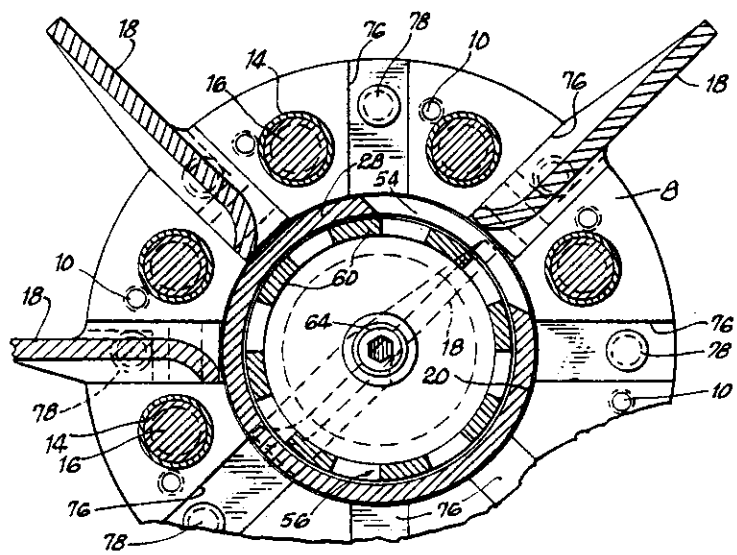
Attorney—McDougall, Hersh & Scott

[57] **ABSTRACT**

A centrifugal blasting wheel is disclosed which includes a rotating plate carrying spaced radially extending blades for propelling particulate treating material. The inner ends of the blades terminate short of the axis of rotation of the wheel to form a central opening. Impelling means rotating with the wheel receives particulate material from a source and imparts radial and tangential velocity components to it so that it is picked up by the faces of the blades and travels along those faces to be thrown from their ends. The blades are of such a size that when the impelling means is removed from the central opening a new blade may be inserted therein and moved radially outwardly to be mounted on the plate while a reverse action along the same path of movement may be used to remove old blades.

12 Claims, 7 Drawing Figures



CENTRIFUGAL BLASTING WHEEL

BACKGROUND OF THE INVENTION

This invention relates generally to apparatus for cleaning or treating surfaces of workpieces. More specifically, it relates to improvements in the construction of rotating wheels used to propel particulate material against the surface of a workpiece to clean or otherwise treat the same.

Centrifugal blasting wheels generally comprise a rotatable hub to which is mounted a plate or a pair of spaced plates which carry a plurality of equi-spaced radially extending blades. Means at the center of the wheel discharge particulate material onto the rotating surfaces of the blades which then propel it against the surface of a workpiece to be cleaned or treated in some fashion. Although the blades are made of materials which have hard surfaces, for instance, steel or steel alloys, they, nevertheless, are subject to wear as a result of the abrasion and impact of the particulate material thereon. Consequently, it is necessary that they be replaced at regular intervals in order to maintain the performance of wheel at the desired level.

It is obvious that while such blades are being replaced, the wheel is not in use so that production time and therefore production itself is lost. This, of course, is undesirable and in a certain sense such lost time and production must be considered as a cost of blade replacement. Therefore, it becomes desirable to replace the blades of such wheels in the shortest possible time.

In addition, the prior art blades with which the inventor is familiar very frequently require special tools for the removal of worn blades and the replacement of new ones. While this is not an overwhelming disadvantage, nevertheless, that to the extent it is possible in any industrial operation to perform maintenance functions without the need to obtain and store special tools, it becomes that much easier and economical.

Therefore, it is an object of this invention to provide a novel centrifugal blasting wheel and blades therefor which may be easily replaced when worn.

It is another object of this invention to provide a novel centrifugal blasting wheel and blades therefor wherein worn blades may be replaced in a relatively short period of time.

It is still another object of this invention to provide a novel centrifugal blasting wheel and blades therefor wherein the blades may be replaced without the use of special tooling.

It is still another object of this invention to provide a novel means for positive positioning and locking the blades utilizing centrifugal forces.

SUMMARY OF THE INVENTION

The foregoing and other objects are achieved by providing a centrifugal blasting wheel and blades therefor in which the wheel has a central opening accommodating elements for receiving particulate material from a source and propelling it onto the surface of the blades of the wheel. The blades are of such a size relative to the size of the central opening that when it is desired to replace a worn blade the propelling elements in the central opening may be removed and the old blade withdrawn and the new one inserted through the central opening.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is set forth in the claims appended hereto and forming a part of this specification while the structure and operation of an embodiment thereof may be understood by reference to the following detailed description read in connection with the drawings in which:

FIG. 1 is a front view partially in section of an embodiment of the invention;

FIG. 2 is a side view of the embodiment of FIG. 1;

FIG. 3 is a sectional front view of the embodiment of FIG. 1;

FIG. 4 is a sectional side view of the embodiment of FIG. 1;

FIG. 5 is a perspective illustration of a blade in accordance with the invention;

FIG. 6 is a partial side view of the blade of FIG. 5; and

FIG. 7 is an exploded view of an embodiment of the invention illustrating its mode of operation.

DETAILED DESCRIPTION

A centrifugal blasting wheel in accordance with the invention may take the form of the embodiment illustrated, but, as will be explained, various modifications can be made. Thus, such a wheel may comprise a hub **2** secured to driven shaft **4** for rotation therewith. A rear side-wall forming disc member **8** is secured to the hub **2** by bolt members **10** so that it too is rotatable with the shaft. A front side-wall forming disc member **12** is secured to rear disc member **8** in a spaced-apart relation by spacers **14** held by bolts **16** passing through the side walls.

The numeral **18** represents an improved blade embodying features of this invention, a plurality of which are mounted to extend crosswise between the front and rear side-wall forming disc members **8** and **12** generally in the radial direction with the outer edges of the blades extending beyond the periphery of the wheel in the embodiment illustrated while their inner sides terminate short of the axis about which the wheel rotates to define a central opening **20** therebetween. The wheel is enclosed in a housing, parts of which are shown at **22** and **24** which is open at one point, in this case the bottom, to permit particulate material propelled by the wheel to exit from the housing and impinge upon the surface of a piece being cleaned or otherwise treated.

Fitted into the opening **20** is a control cage in the form of a tubular member **28** having an annular flange **30** extending inwardly from the rearward end thereof while the forward end portion **32** extends beyond the front wall-forming disc member **12** for engagement with the housing. A flange **34** extends radially outward from the forward end portion **32** and is provided with a plurality of notches **36**, any one of which may be engaged by a finger **38** of a lug **40** which rests on the front plate **42** of the housing. An annular ring **44** has an annular shoulder **46** extending into an opening **48** in the front plate **42** and is provided with angularly spaced threaded holes **50** to receive bolts **52**. The bolts **52** passing through the lugs **40** function to hold the control cage in position by virtue of their engagement of their fingers **38** in a selected one of the notches **36** to force the flange **34** against the annular ring **44** when the bolts are tightened down.

The control cage is provided with a discharge opening **54** in the periphery thereof through which particulate material fed into the control cage is projected onto the blades. The location of the discharge opening is adapted to be adjusted by turning movement of the control cage relative to the housing thereby to provide directional control to the particulate material thrown from the wheel. This adjustment may be accomplished by loosening the bolts **52** holding the lugs **40** against the wall **42** and in the notches **36** of the flange **34**. The control cage may then be turned to the desired position and the bolts **52** tightened so as to hold the cage in that position by clamping it between the annular ring **44** and the lugs **40** with the fingers in selected notches **36**.

Mounted within the control cage is an impeller **56** preferably of the type described in the U.S. Pat. to Straub No. 2,708,814, issued May 24 1955. In the embodiment illustrated, the impeller is formed with a rear wall **58**, a plurality of vanes **60** extending forwardly from the rear wall to a conically-shaped lead-in section **62** which tapers outwardly from the feed end to the bladed section of the impeller. The impeller is secured by means of a bolt **64** to the end of the shaft **4** for rotational movement at high speed with the shaft.

A feed pipe **66** communicates the bottom end of a feed hopper (not shown) with the open end of the impeller for the delivery of particulate material from the feed hopper onto the conical surface portion of the impeller. In operation, particulate material deposited upon the conical lead-in portion of the vaned impeller has a rotational movement imparted thereto as the material advances rearwardly over the conical surface to the bladed section so that the material flows smoothly onto the bladed section where the blades operate to propel the material outwardly with considerable force through the discharge opening of the control cage and onto the inner ends of the blades or into the paths thereof.

The material thrown by the impeller onto the inner ends of the blades gains considerable momentum as it moves radially outwardly across the face of the blades to be thrown from the ends thereof with considerable force and velocity onto the surface to be treated. When the discharge opening in the control cage remains in the same position the material is thrown from the ends of the blades in a relatively uniform pattern which extends generally in the same direction. By adjusting the position of the discharge opening, as by rotational movement of the control cage, the direction of the abrasive pattern thrown from the wheel may be regulated and controlled, as pointed out above.

In accordance with this invention in the embodiment illustrated, the blades **18** are provided with side walls **68** and **70**, each side wall having a vertically extending stop member **72** and **74**. The side walls are engageable in guides **76** in the form of slots provided in the rear and front side wall-forming disc members **8** and **12**, respectively, when the blades are mounted in the wheel. Each blade has a longitudinal or radially extending dimension which is slightly less than the diameter of the central opening **20**.

By reference to FIGS. **4** and **5**, among others, it may be seen that the side walls **68** and **70** extend along the length of the blade **18** to a point intermediate that length in the embodiment illustrated. In FIG. **4**, the side walls extend to the periphery of the wheel as defined by the disc members **8** and **12**. Further, as seen in FIG. **5**, the stop members **72** and **74** are constituted by shoulders extending laterally or transverse to the side walls.

The slots **76** of the rear wall have provided therein stop means **78** in the form of lugs having a body portion **80** and a portion **82** extending into the guide panels. The lugs are held in position by engaging in openings **84** provided in the rear side wall and may be mounted by any suitable means such as press fitting the body portions **80** into the openings. If desired, similar lugs may be provided in the guide slots **76** in the front side wall **12**.

Referring to FIG. **7**, it may be seen how, in accordance with the construction described, worn blades may be replaced in the wheel. After removing the feed pipe **66** from the housing in order to provide working room, the bolts **52** are loosened so as to permit the lugs **40** to be withdrawn from the notches **36** in the flange **34**. This frees the control cage **28** so that it may be removed laterally outward from the wheel. The bolt **64** is then unscrewed from its threaded opening **89** in the shaft **4** so as to free the impeller **56** along with its centering plate **90** from the shaft. The entire assembly then consisting of the control cage, the impeller and its centering plate **90** and bolt **64** may then be moved laterally so as to be clear of the central opening **20** leaving that empty. The blade **18** may then be inserted laterally into the central opening and when its outer edge is aligned with the guide slots **76** moved radially outward until a lug **78** engages the stop **74** at which point the blade is in the desired position.

In the same manner, the worn blades are removed. It is to be noted that the lugs **78** prevent outward movement of the blades **18** beyond the desired point so that when the wheel is rotated and a centrifugal force is exerted on the blades they will be prevented from moving outward by virtue of the engagement of the lugs **78** with either stop **74** or stop **72**. During the operation of the wheel, a certain amount of particulate material will be forced into the clearance between the shoulders **68** and **70** of each blade to bind each blade in its guide slots **76**. The binding force provided by this material will be sufficient to prevent the blades from moving inwardly radially so that they will be locked in position for the operation of the wheel. The binding force of this material in the clearance between the shoulders and the guide slots is such that the blade is securely held in position so that when it is desired to remove a blade it will be necessary to apply a force to its free end as by tapping it with a hammer so that it can move inwardly to the central opening and there be withdrawn laterally.

While the wheel in the embodiment illustrated is shown with front and rear side walls, it is not necessary that such be provided for a wheel having only a rear side wall may be used. Such a wheel would be provided with channels or other blade guide means, as indicated, and the blade provided with a side wall or other element engaging the guide means so as to be movable outwardly until a stop member such as the lugs **78** is engaged to stop its outward movement. Other changes may be made in the particular design of the blade side engaging the side wall or walls of the wheel and the particular form of stop means provided to limit the outward movement of the blade.

It is to be noted that the wheel construction is such that the blades may be mounted in the wheel so as to have their throwing surfaces reversible, that is, that they may face in either direction. Thus, a wheel in accordance with the invention may operate in either direction of rotation, the direction being selected by the manner in which the blades are mounted therein.

Further, as long as the blade is of such a length that it may fit into the central opening **20**, blades of various lengths may be used so that wheels of different diameters may be provided depending upon the length of blade chosen.

As may be seen, the invention therefore provides a means whereby a blade may be retained in a centrifugal blasting wheel without the need of structural or other remaining elements apart from the stop means cooperating between a side wall and a portion of the blade. Likewise, the replacement of a blade can be effected in an expeditious manner without the need of special tools. The particular design of the guide means in the side walls of the wheel and the cooperating elements of the blade can be varied; for instance, the guide means rather than constituting channels **76** may be constituted by raised shoulders on the side wall.

It will be further understood that other changes may be made in the specific design details of the wheel, the blades and the stop means as well as in other details of construction and operation of the machine without departing from the spirit of the invention especially as defined in the following claims.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. In a centrifugal blasting wheel having: a pair of rotatable spaced circular side walls having a common axis of rotation; a plurality of angularly disposed spacing elements extending from one side wall to the other to hold them in spaced apart relationship; means at the center of said one of said side walls for mounting it on a rotatable shaft whereby the wheel may be rotated about said axis of rotation; said other of said side walls having an opening therein around said axis of rotation; a plurality of at least four angularly spaced radially extending blades mounted between said walls; each blade having an inner end and an outer end; the inner ends of said blades terminating short of said axis of rotation to define in conjunction with said opening in said other side wall a central circular opening of a given diameter; particulate propelling means removably mounted in said central circular opening; the improvement wherein each of said blades has a length in the radial direction slightly less than the diameter of said central circular opening whereby each of said blades may be removed from the wheel through said central circular opening.

2. The centrifugal blasting wheel of claim **1** including stop means on one of said side walls for limiting the movement of said blades radially outwardly.

3. The centrifugal blasting wheel of claim **2** including elements on said blades cooperating with said stop means.

4. The centrifgual blasting wheel of claim **1** including guide means on the interior surfaces of said side walls engageable with said blades to maintain them in angularly spaced positions.

5. The centrifugal blasting wheel of claim **4** including stop means in said guide means for limiting movement of said blades radially outwardly.

6. The centrifugal blasting wheel of claim **5** including elements on said blades cooperating with said stop means.

7. The centrifugal blasting wheel of claim **1** including guide channels on the interior surface of each side wall and shoulders on each side of said blades engageable in said guide channels whereby said blades are maintained in angularly spaced positions.

8. The centrifugal blasting wheel of claim **7** including stop lugs in said guide channels and shoulders on each blade engageable with said stop lugs whereby the movement of said blades radially outwardly is limited.

9. A blade for use with a centrifugal blasting wheel having an axis of rotation, said blade having: a throwing surface; a length extending from first and second ends; a side wall extending above said throwing surface on each side of said throwing surface extending from said first end thereof which is normally positioned toward the axis of rotation of the wheel when the blade is mounted in a wheel only to a point intermediate the length of the blade.

10. A blade as set forth in claim **9** including a stop member extending along at least one of said side walls transverse to said side wall.

11. A blade for use with a centrifugal throwing wheel having: a throwing surface; a length extending from first and second ends; a side wall on each side of said throwing surface extending from said first end which is normally positioned toward the center of a wheel when the blade is mounted in a wheel only to a point intermediate the length of the blade; and a stop member on at least one of said side walls engageable with a stop means on a wheel to limit radially outward movement of the blade when mounted in a wheel.

12. A blade as set forth in claim **11** wherein said stop member comprises a shoulder extending transverse to said one side wall.

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FIG. 1

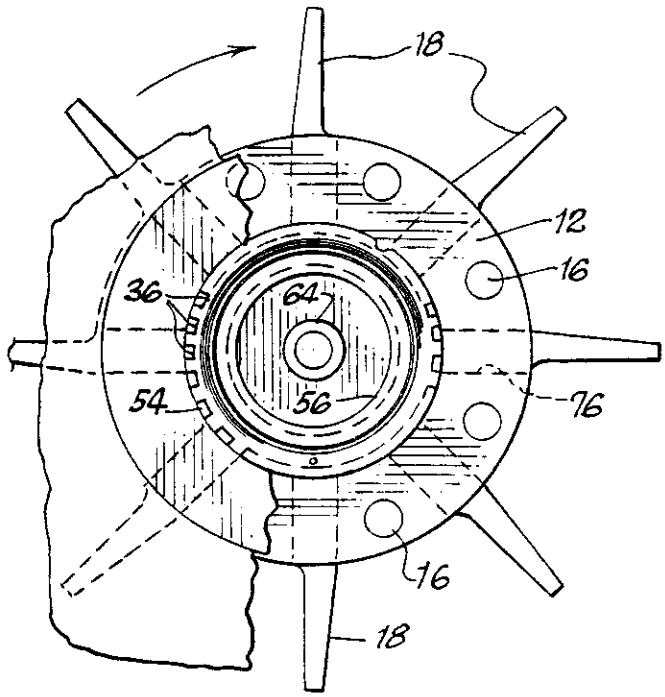

FIG. 2

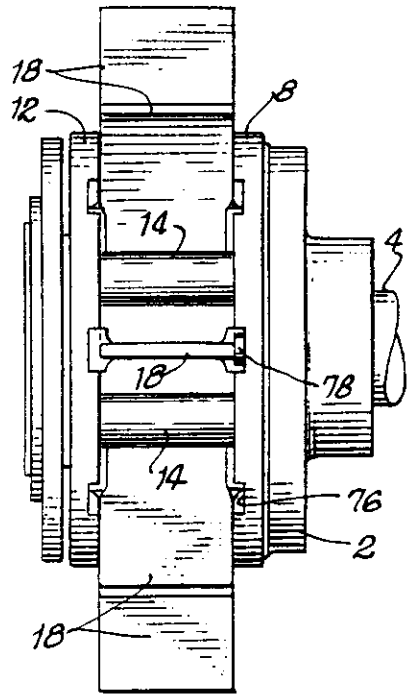

FIG. 3

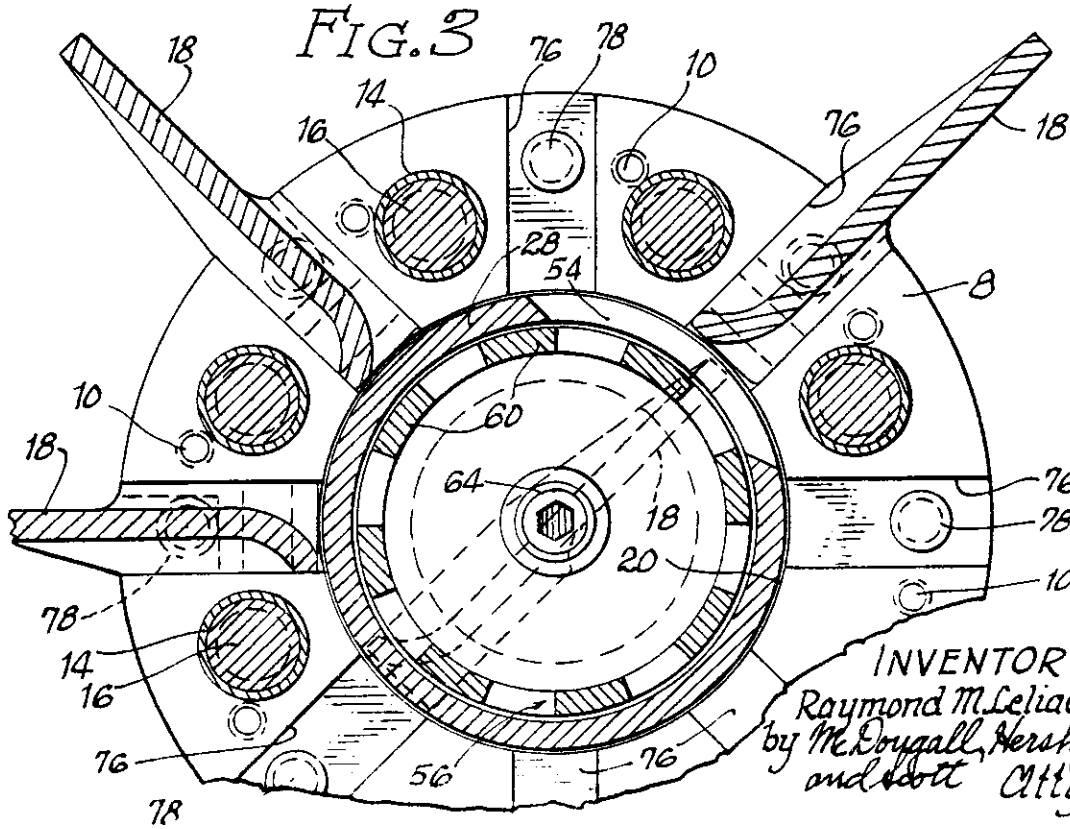

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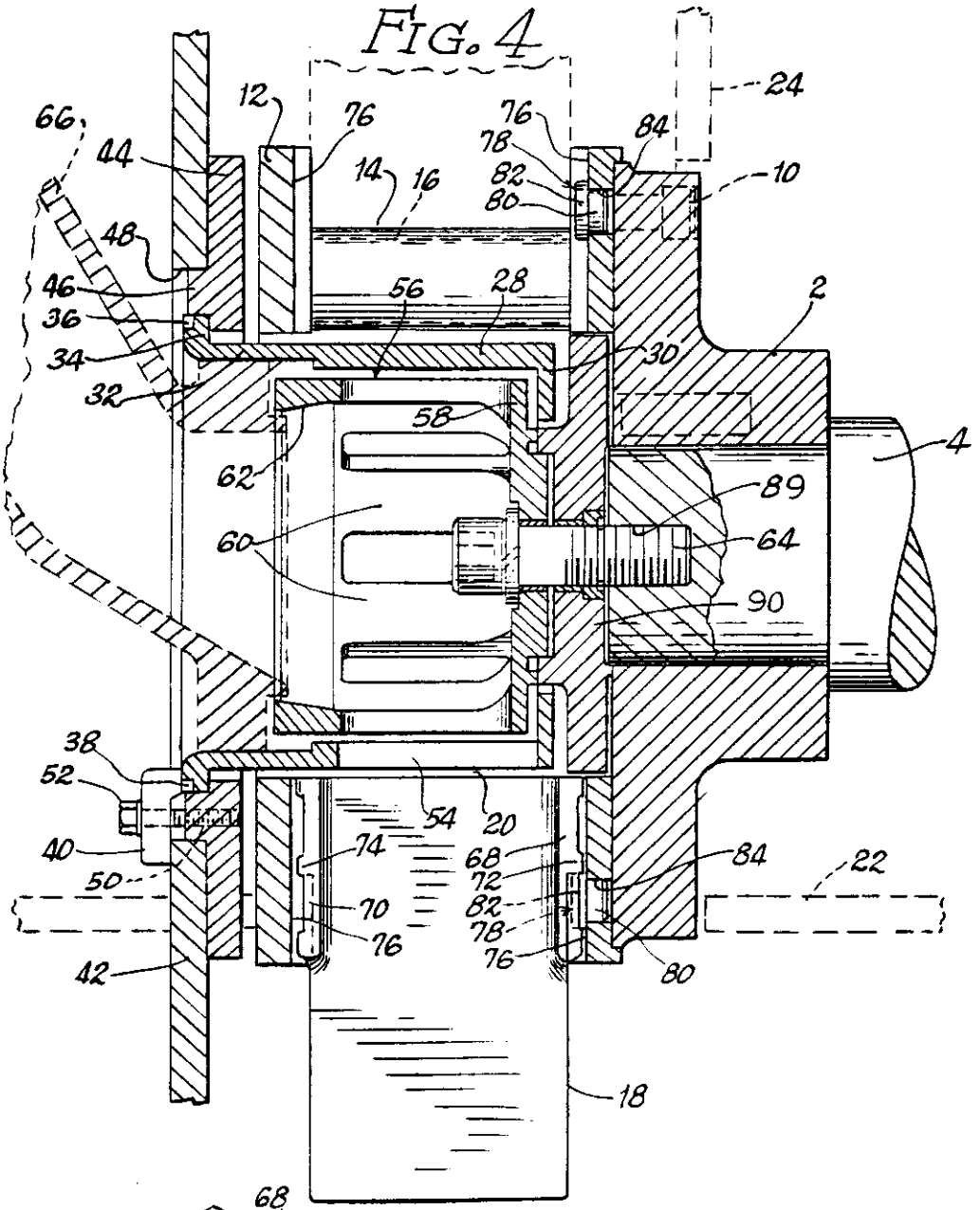
FIG. 4



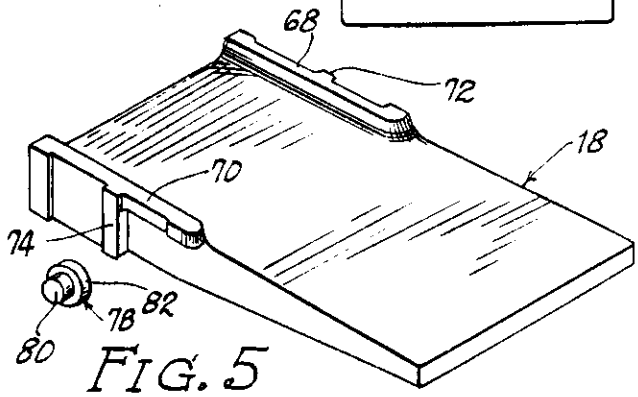


FIG. 5

FIG. 6

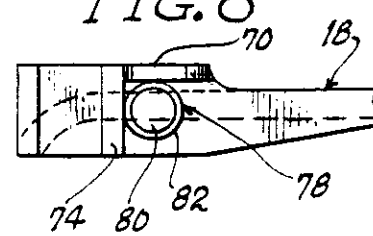
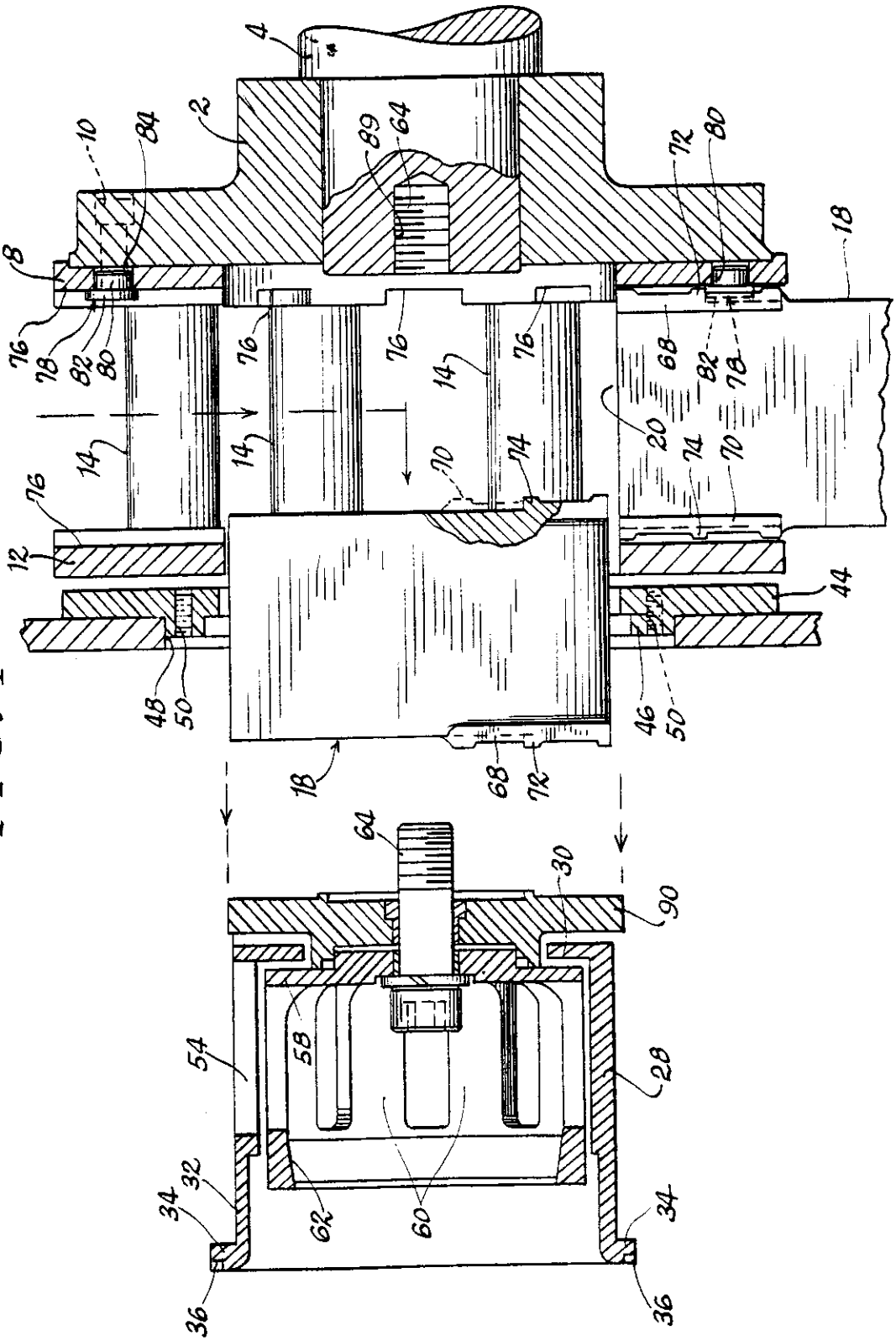


FIG. 7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