

[54] **CENTRIFUGAL DRYERS**

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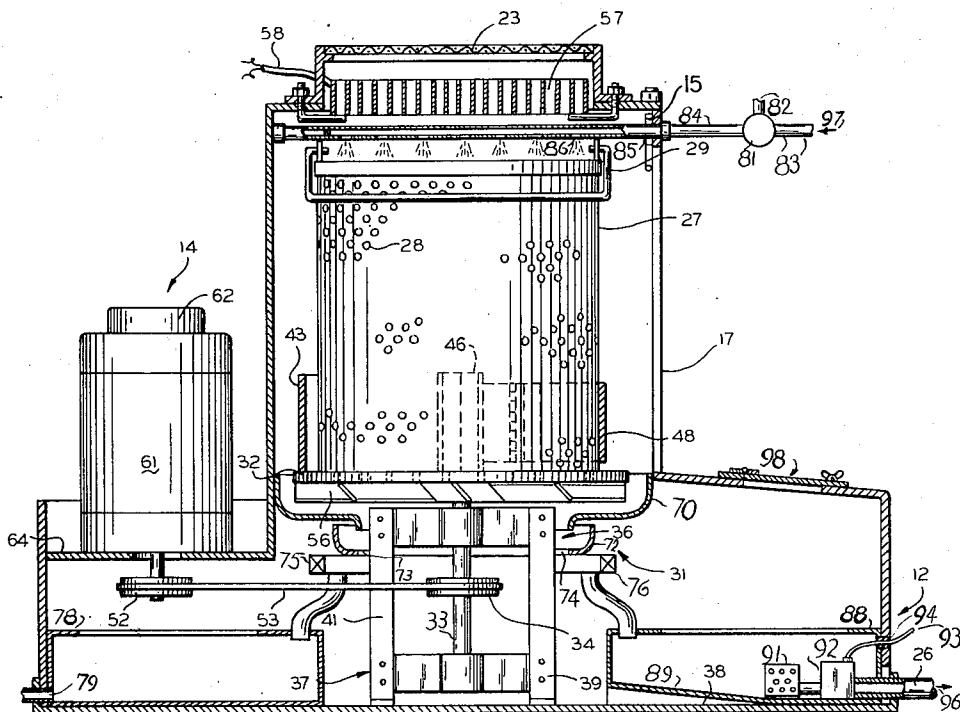
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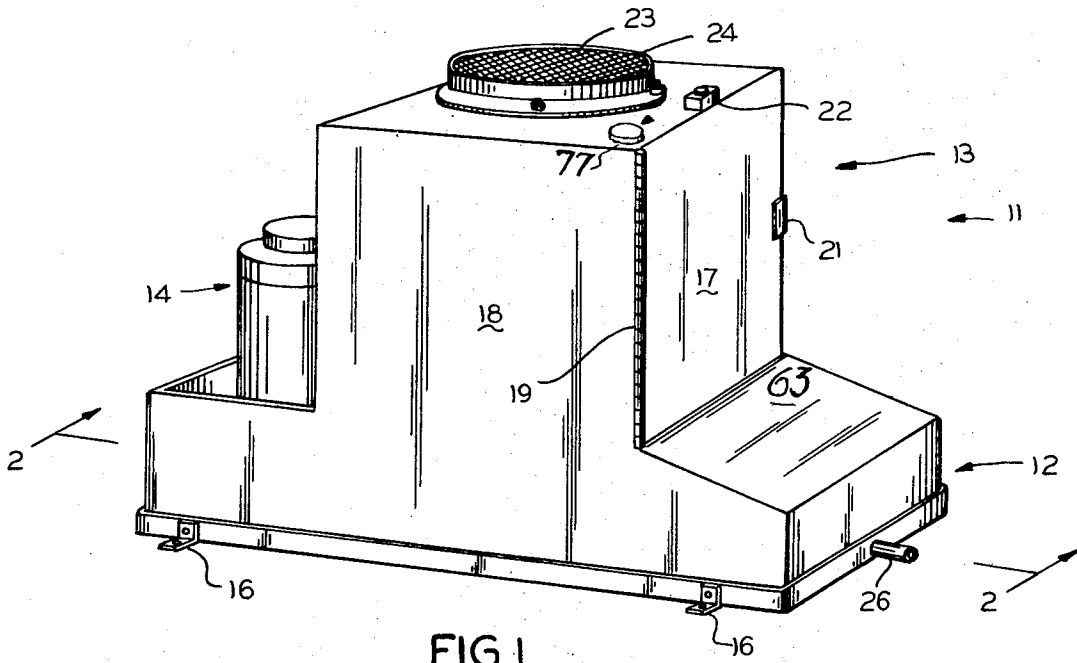
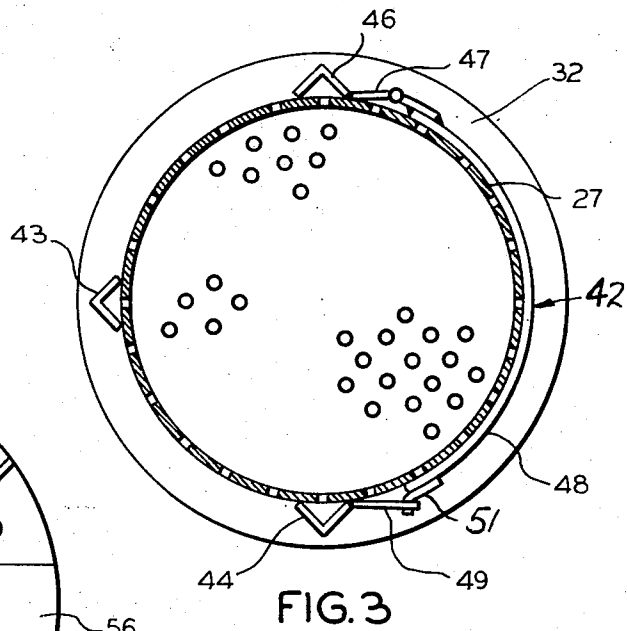
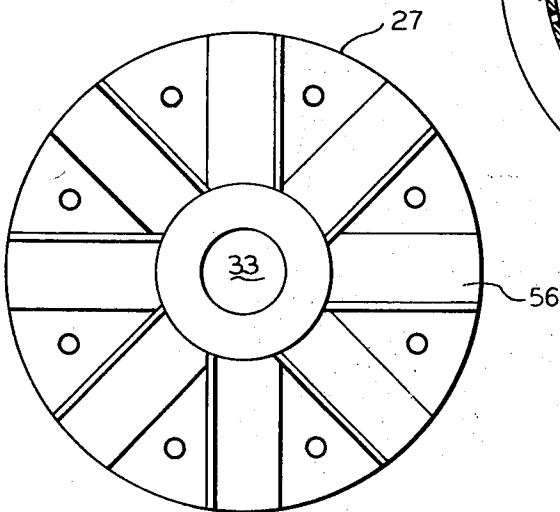
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ABSTRACT

A centrifugal dryer for drying small machine parts. The dryer features means such as an access door and a biased ramp leading thereto to facilitate the loading and unloading of a basket containing the parts into and out of the dryer. In addition, the drying process is expedited by utilization of heated air driven directly from a heater above the basket bearing the part through to the bottom of the work basket thereby minimizing duct work.

10 Claims, 4 Drawing Figures





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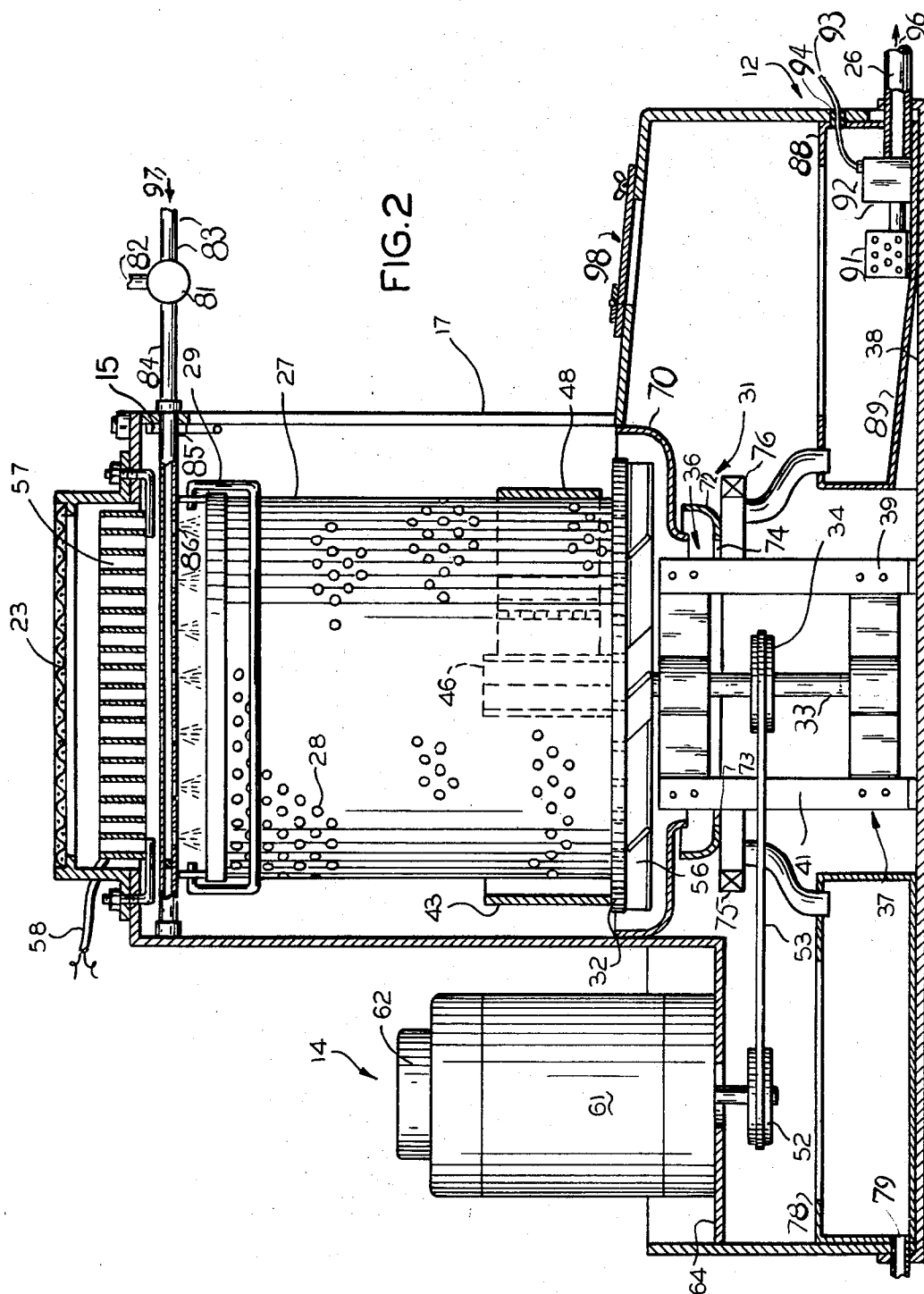


FIG. 2

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CENTRIFUGAL DRYERS

This invention relates to centrifugal dryers, and more particularly to such centrifugal dryers used for drying small machine parts after they are punched out on a press, or the like.

When such machine parts are received from the punch press, they are covered with fluids, such as cutting oil. Subsequent to being punched out, many times the parts are deburred. During the deburring process, the parts may be lubricated with water. Thus, whether deburred or not, the parts need to be dried, otherwise, they will be adversely affected by the liquid covering on the parts. For example, the liquid covering the parts speeds the deterioration of the parts through oxidation. It is common therefore to dry the small machine parts after the machining.

Centrifugal dryers are used for the drying process. Presently, the parts are placed into work baskets which are loaded into top loading centrifugal dryers by lifting the heavy baskets.

Heating units are mounted in the covers of the centrifugal dryers and fans create a hot air current going through the basket when it is centrifugally driven to facilitate the drying process. The hot air and the fans are many times directed through relatively complicated duct work.

Mechanical brakes are generally used to stop the basket when the drying operation is completed. Thus, in present operations, it is necessary for the operator of the drying machine to laboriously lift a heavy basket loaded with dripping machine parts to the top of the machine and to mechanically operate a lever controlled brake to jog the basket in the centrifugal dryer to properly distribute the weight.

Accordingly, an object of the present invention is to provide new and unique centrifugal dryers for small machine parts.

A related object of the invention is to provide a centrifugal dryer having an access door on the side thereof to facilitate the unloading of the work basket into and out of the dryer.

Another object of the invention is to provide a centrifugal dryer arrangement utilizing a minimum of duct work for forcing heated air through the basket during the centrifuge operation.

A further object of the invention is to provide for automatically braking the rotation of the work basket responsive to the operation of the stop button removing drive power from the motor.

In accordance with one aspect of this invention, a centrifugal dryer is provided having an access door in one side thereof. The access door is hinge mounted to swing horizontally and provide wide openings for receiving a work basket loaded with small machine parts for drying. A biased ramp or platform leads into the access opening and further facilitates loading and unloading the machine.

Clamp means are provided for clamping the work basket into place on a platform of a spinner assembly. The motor for driving the spinner assembly is provided with an electrical brake system that responds to the off switch for further automatically braking the motor to accelerate the stopping process.

The top of the centrifugal dryer is provided with a screened opening through which air is drawn by a fan placed at the bottom of the spinner assembly. A heating

unit is mounted beneath the screen top opening so that when the fan operates, hot air is pulled through the work basket thereby facilitating the drying of the work pieces within the basket. The location of the fan directly below the spinning assembly eliminates duct work.

A drain pan is provided at the bottom of the unit with a drain spigot attached thereto. Controls are conveniently mounted on an external portion of the centrifugal dryer. The door and clamping means are serially connected with the motor power so that the spinner cannot rotate unless the door is properly latched and the work basket is properly clamped in place.

The above and other objects and features of this invention together with the manner of obtaining them will become more apparent, and the invention itself will be best understood when making reference to the following description of a preferred embodiment of the invention taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a pictorial view of the inventive centrifugal dryer;

FIG. 2 is a sectional view taken on a plane coinciding with line 2—2 of FIG. 1, looking in the direction of the arrows;

FIG. 3 is a top view of the spinner assembly of the inventive centrifugal dryer; and

FIG. 4 is a bottom view of the spinner assembly showing the fan arrangement.

Turning now to the drawings, FIG. 1 shows an exemplary centrifugal dryer 11. Centrifugal dryer 11 includes a base section 12 supporting an upraised working cabinet 13 and a motor brake-assembly 14. Means such as anchor angles 14, 16 are provided for anchoring the centrifugal dryer 11 to the ground. The anchor angles are affixed to the frame of dryer 11 and bolted to the floor.

Means are provided for loading and unloading the centrifugal work section 13. More particularly, access door 17 is shown coupled to front wall 18 of the work cabinet section through means such as hinge 19. A latch 21 is provided for locking the door in a closed position. Interlocking switching means comprising a normally open microswitch is indicated at 15. The switch is closed by the door in the closed position and is provided to assure that the motor assembly can not operate unless door 17 is properly latched.

Control switch means 22 are located for easy access to the operator of the machine. The switch means normally has a start and stop switch. The switch means may also be provided with a clockwise rotating switch, a counterclockwise rotating switch and a heater switch along with a jog switch, for example.

Means are provided for making the interior of work section 13 accessible to exterior air. More particularly, as shown, an opening 23 is provided that is covered by the screen 24.

Means are provided for draining out excess fluid that may be derived from the stock parts being processed in the centrifugal dryer. More particularly, drain means 26 are provided at the bottom of base 12 reaching into the interior of the base for draining a pan or the like used for catching the excess moisture obtained from the processed stock material.

The remaining figures more clearly show the interior structure of the centrifugal dryer 11. Means, such as work basket 27, are provided for holding the stock material or small parts being processed. Basket 27 is either fabricated from screening or from perforated sheets. Perforations are shown as an example, such as perforated hole 28. The basket is further provided with handle means 29 to facilitate the transportation thereof.

To load the dryer, the basket is placed on the spinner assembly 31 through the doorway or access opening 17. The spinning assembly 31 comprises platform 32. A drive shaft 33 is fixedly coupled to platform 32 in any well known manner. A pulley wheel 34 is attached in any well known manner to the drive shaft 33.

The spinner assembly 31 further includes means for reducing friction during the rotation of platform 32. More particularly, bearing assemblies 36, 37 are provided. In one exemplary embodiment, the bearing assemblies were Timken bearing No. 362—A—368A and Timken bearing No. 214—14, 116, respectively. The bearing assembly 36 is shown as being supported above the bottom flooring 38 of base unit 12 through frame members 39 and 41, while bearing assembly 37 is juxtaposed to the flooring 38.

While the presently available centrifugal dryers included specially designed basket holder assemblies, the spinner retains the baskets in place during the centrifugal spinning operation using much simpler means. More particularly, basket clamp means 42 are provided. The clamp means is perhaps best shown in FIG. 3 where an exemplary mode of holding the basket is shown. As shown therein, the angle irons 43, 44 and 46 are peripherally located to conform to the outer contour of the basket. The clamp means 42 are attached between angle irons 44 and 46 to lock the basket in place.

In greater detail, clamp means 42 includes a hinge 47 having one end thereof fixedly attached in any well known manner to one end of angle iron 46. The other end of hinge 47 is fixedly attached to clamp member 48. Clamp member 48 may be fabricated from a rigid material to conform to the circumference of the barrel or it may be fabricated from a material such as flexible sheet metal, or the like. A locking member 49 of clamp 42 is fixedly attached, in any well known manner, to angle iron 44. A latch member 51 of clamp 42 is fixedly attached to member 48 and removably attached to locking member 49 for locking the barrel into place contiguous to the three angle irons.

Means are provided for coupling the pulley 34 to the motor brake assembly 14. More particularly, the shaft of the motor has a pulley 52 attached thereto. A belt 53 attaches motor pulley 52 to platform pulley 34, so that when the motor rotates, the platform is also caused to rotate at a desired number of revolutions per minute to provide a centrifugal action to be desired.

Means are provided for forcing air through the barrel as the barrel is rotated on the spinner to more effectively dry the piece parts in the centrifugal dryer. More particularly, fan means, such as fan blade 56 are attached to drive shaft 33 in any well known manner to rotate when the spinner assembly rotates. The blade configuration of the fan in an exemplary embodiment is best seen in FIG. 4. As the barrel rotates, the fan pulls

air through the screened opening 23 at the top of the work cabinet through the basket 27 and down past the fan and out through suitable openings in the base assembly 12. No duct work is required, because the actual walls of the work cabinet enclose the basket sufficiently to provide a forceful draft through the basket responsive to the rotation of the basket and the fan.

Means, such as heater unit 57 are provided for heating the air as it passes through opening 23. The heater unit 47 may be any well known type heater, such as commercially available Chromalox heaters KSEF 30. Means, such as leads 58 are provided for attaching the heater 47 to a source of power through suitable switching devices, not shown.

The motor brake assembly 14 includes a motor 61 and an electrical brake 62.

The assembly 14 is shown as mounted on a horizontal shoulder. On the opposite side of cabinet 13, adjacent to access opening 17 is a biased shoulder 63. The biasing facilitates the loading and unloading of the dryer.

In operation, the access door 17 is opened, and a work basket loaded with stock parts requiring drying is placed on the biased portion 63 of the base unit 12. From the biased portion 63, basket is slipped onto platform 32 and pushed against the angle irons 43, 44 and 46. Latching device 42 is locked to entrap basket on the platform in a stable position. The door is then latched, and the operator then jogs the centrifugal dryer so as to evenly distribute the stock parts against the basket. Depending upon the size and shape of the stock parts, the operator will perform the required number of jogging operations. The jogging operations are either performed by pressing a jog button or alternately pressing the start and stop buttons.

After the weight is evenly distributed, the operator then presses the start button and allows the centrifugal dryer to rotate for a sufficiently long time to dry the stock parts in the basket.

A drip tray 70 is positioned below the basket 27 and sealed at its periphery to the walls of housing 13. Therefore, any fluid or other material flung out of the basket, responsive to its centrifugal motion, is caught on the walls of the housing 13. As this material runs down the wall, it reaches the drip tray 70, which guides it into a second hollow semi-toroidal shaped, tray 72. This tray 72 collects fluids which may drip out through openings 70, 72.

There is an air passage opening in the center of the drip trays 70, 72 for admitting a draft of air forced through the basket by the fan 56. The drainage holes in the bottom of the basket 27 are arranged so that the fluids in the basket 27 do not drip into this air passage.

The inside lip of the drip tray 74 (which is concealed from view by bearing 36) preferably turns up so that fluids are trapped, to prevent their discharge at any place except through the drainage holes 73, 74.

Means are provided for controlling and directing the flow of fluids out of the drip tray 72. More particularly, each of the drainage holes 73, 74 has an associated valve 75, 76 which is electrically controlled by a suitable programming means, such as the programmed switch 77, commonly used on automatic washers and driers. Thus, when the basket 27 is first placed in the dryer, the parts are wet with an ambient fluid, which

may be either a cutting oil, as from a punch press operation, for example, or a washing fluid, as from a deburring tumbler operation. When the dryer first starts to spin, this ambient fluid is flung off and onto the walls of the cabinet 13. The valve 75 is then open and the valve 76 is closed. Drainage is from drip trays 70, 72 and into a catch pan 78 and out a hose 79.

Means are provided for covering the parts with a filtered fluid; such as for example, an oil solution to prevent oxidation of the parts. In greater detail, after the original ambient fluid has been flung off the parts, a suitable valve 81 is operated to either of one or several positions according to the users design and needs. As here shown, this valve has two intakes 82, 83 which allow a selective introduction of either of two fluids. Of course, any suitable number of such intakes could be associated with this valve.

The outlet port 84 of the valve 81 is connected to a suitable manifold 85 having a plurality of spray holes or outlets, such as 86. Thus, the fluid admitted through the valve showered down on top of the basket 27.

In operation, the valves may be programmed to provide for showering the parts with a sequence of fluids. At this time, the program switch closes the drainage valve 75 and opens the drainage valve 76. Thus, the fluid showering down, as at 86, is flung out of the basket 27, caught in drip trays 70, 72 and passed through valve 76 to a catch pan 88. The floor 89 of the pan 88 is shaped to provide a sump area containing a filter 91 and motor 92. The motor is driven by power supplied via an electrical cord 93 passing through a seal 94 in the wall of the dryer housing.

As the motor 92 runs, the fluid filtered at 91 passes out the tube 26 and into the inlet 83, as indicated by the arrows 96, 97. Thus, the filtered fluid is recycled any suitable number of times through the basket 27.

A suitable access door 98 is put into the housing to enable the operator to change the filter 91, as required. Symbolically, this door is here shown at 98; however, it should be understood that convenience will dictate the actual door position. For example, it is desirable to keep the ramp 63 clear of all projections so that it may serve as a guide for placing the basket in the housing 13. Thus, it is preferable to recess the door, provide guide rails raised above the door, or relocate the door to be in the side of the housing. In any event, door 98 may be opened periodically to service or replace the filter 91.

Upon reflection, it should be clear that the described arrangement enables a complete programming of a drying cycle. The basket is placed in the cabinet and all ambient fluids are drained off via valves 75 and drain 79. Thus, valves 75 is closed, 76 is opened, and 81 is rotated to admit a recycled fluid used during material processing. The sequence may be repeated in any suitable manner as different fluids are introduced via inlets 82 and 83 and flushed out the drain 79 followed by a recycling of filtered fluids, such as rust inhibitors, transmitted via valves 81, 72 and pipes 26, 83. In some cases, the pipes 26 and 84 may be interconnected to eliminate the valve 81.

The rotation of the spinner platform along with the fan pulls air through the screened opening where the air is heated and through the basket where the parts are centrifugally forced outwardly and thus severely

agitated and exposed to the hot air rushing past them. When the drying is complete, the operator of the machine presses the stop button, which automatically brakes the motor to stop the rotation in a relatively short period of time.

The operator of the machine then unlatches the door 17, uncouples the basket clamp and slides the basket down the biased shoulder 63 to either a waiting cart or transports it by carrying it by its handle 29 to the next station for operation, which may be a plating operation, for example. Thus, there is no necessity for the operator to physically lift the heavy buckets of stock parts, which may weigh upward to 75 pounds, and which may either be dripping wet or excessively hot after the operation of the centrifugal dryer.

It should be understood that while the fan is shown mounted directly below the basket, it may be removed further along the drive shaft. For example, it may be below bearing 36.

While the principles of the invention have been described above in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation on the scope of the invention.

I claim:

1. A centrifugal dryer for spinning machined parts at a high rotational velocity to dry the said machine parts, said dryer comprising a base section, said base section supporting a cabinet section rising from said base section, perforated basket means for holding said machine parts, spinner assembly means located within said cabinet for spinning said basket, motor means mounted on said base section for supplying power necessary to spin said spinner assembly, clamping means for clamping said basket to said spinner assembly, control means for selectively starting or stopping said motor means, coupling means for coupling said motor to said spinner assembly, and access opening means in the side wall of said cabinet section for loading and unloading said basket on said spinner assembly.
2. The centrifugal dryer of claim 1 wherein said base means includes a biased platform section, said biased platform section being adjacent to said access opening, whereby said basket can be slid up said biased platform section through said opening onto said spinner assembly means.
3. The centrifugal dryer of claim 2 wherein door means are provided for covering said access opening, vertical hinge means for coupling said door means to said side wall, latch means for selectively locking said door means, and means for preventing the operation of said spinning assembly when said door means is not latched.
4. The centrifugal dryer of claim 3 wherein said spinning assembly means comprises a spinning platform, post means on said platform for abutting said basket when said basket is properly placed on said platform, and

clamp means for locking said basket onto said platform.

5. The centrifugal dryer of claim 4 wherein said post means comprises three spaced apart angle irons vertically mounted to said platform and arranged to describe the outer contour of said basket.

6. The centrifugal dryer of claim 5 wherein said clamp comprises hinge means secured to one of said angle irons,

clamp body means conforming to the outer periphery of said basket attached to said clamp means, and

means for attaching the end of said clamp body means which is not connected to said hinge to an adjacent one of said angle irons to thereby lock said basket in place.

7. The centrifugal dryer of claim 3 wherein said motor means includes automatic brake means electrically operated to brake the rotation of said motor when said control means is operated to stop said motor.

8. The centrifugal dryer of claim 7 wherein said coupling means includes first wheel means attached to the shaft of said motor,

second wheel means attached to a drive shaft on said spinning platform,

belt means coupling said first wheel to said second wheel whereby the operation of said motor causes said drive shaft to be rotated to rotate said platform.

9. The centrifugal dryer of claim 8 wherein fan means are coupled to said drive shaft,

said cabinet having a screened opening at the top thereof, whereby the rotation of said fan draws air through said cabinet.

10. The centrifugal dryer of claim 9 wherein the top section of said cabinet is immobile, and

heater means mounted to the top section adjacent said screened opening whereby said fan draws heated air through said cabinet.

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