May 15, 1923.

1,455,187

G. BROWN

GRINDING FLUID CIRCULATING SYSTEM

Filed March 31, 1921

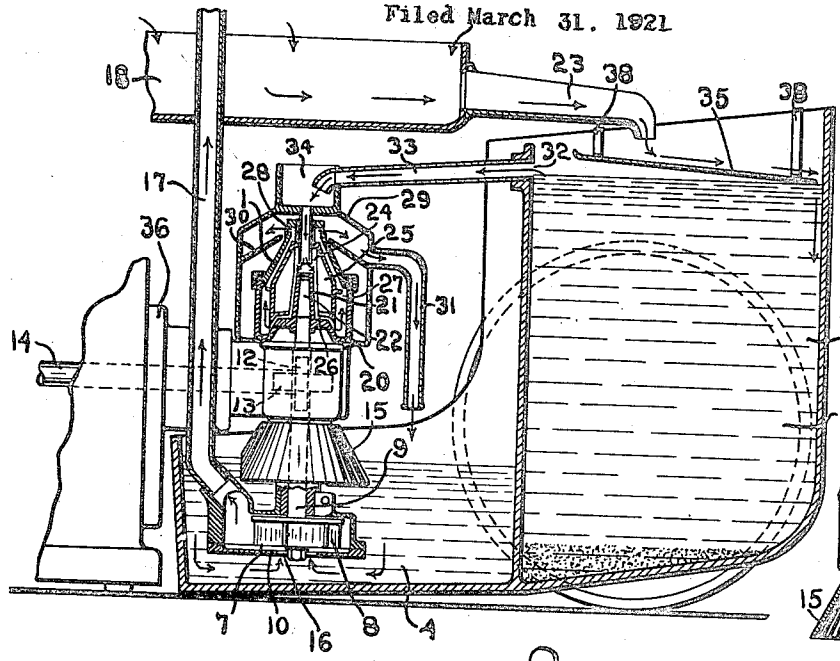


Fig. 2

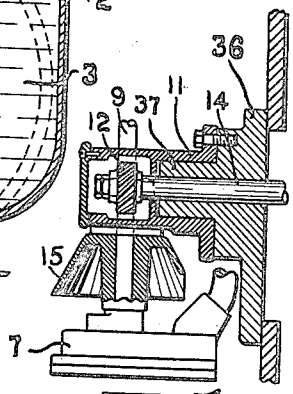


Fig. 3

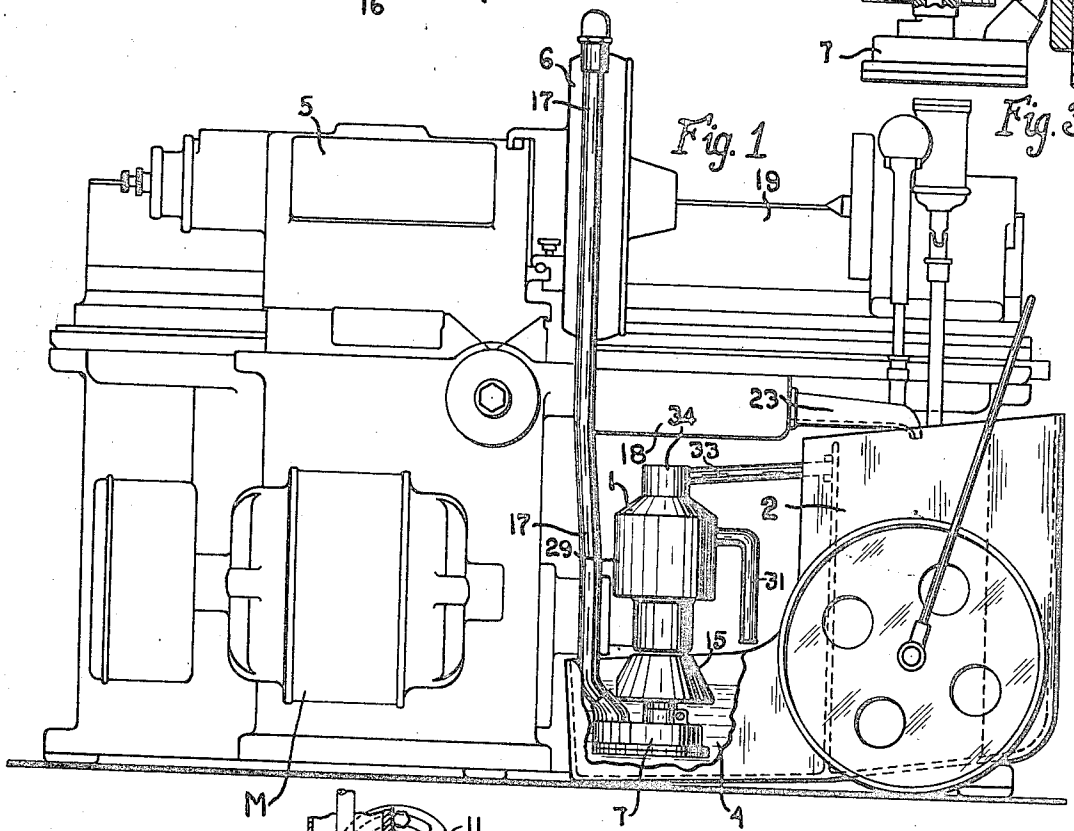


Fig. 1

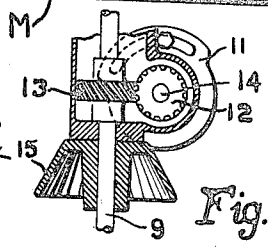


Fig. 4

Witnesses
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UNITED STATES PATENT OFFICE.

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GRINDING-FLUID-CIRCULATING SYSTEM.

Application filed March 31, 1921. Serial No. 457,554.

To all whom it may concern:

Be it known that I, GREGORY BROWN, a citizen of the United States of America, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new an useful Improvements in Grinding-Fluid-Circulating Systems, of which the following is a full, clear, and exact specification.

My invention relates to grinding machines and more particularly to the cooling or grinding fluid circulating system for such machines.

In the modern grinding machine it is the practice to constantly supply a copious stream of some grinding fluid, such as an emulsion of water and oil, to the area of contact of the wheel and work to cool these parts and also to carry away the metal chips and the abrasive material worn off from the wheel. The grinding fluid is usually pumped from a tank which may be integral with the base of the machine or removable therefrom for cleaning purposes, through conduits and a spout to the wheel. After it leaves the wheel and work it is laden with chips and particles of abrasive and is drained back to the tank in which the coarser particles settle out and the fluid is again pumped to the wheel. In most cases the tank is divided into two chambers, a settling chamber and a pump chamber, the fluid overflowing from the former into the latter. Most of the solid material is left in the settling chamber but some of the finer particles will be carried over into the pump chamber and returned to the wheel and work. This abrasive grit, in passing over the work, may become wedged in between the rotating wheel and the metal surface and so produce scratches on the work and prevent the production of the fine finish which is, in some cases, highly desirable.

It is therefore the principal object of my invention to overcome these difficulties by providing means on the machine for readily and economically separating from the grinding fluid substantially all of the solid particles which may affect the grinding action detrimentally and to provide a compact unitary mechanism which will accomplish this result automatically and with the minimum of attention on the part of the operator.

With this and other objects in view, my invention also consists in certain devices, arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

In the drawings which form a part of this specification and in which like reference characters refer to like parts:

Figure 1 is a rear view of a grinding machine showing my invention applied thereto;

Fig. 2 is a sectional view on a larger scale through the main parts of the fluid circulating and separating system;

Fig. 3 is a detail sectional view showing the manner in which the pump is suspended and driven; and

Fig. 4 is a similar view taken at right angles to the section shown in Fig. 3.

In accordance with my invention, I have discovered that centrifugal action may be employed to separate the grit and other solid particles from the grinding compound and produce a substantially clear fluid which will not affect the grinding action detrimentally. I therefore propose to provide a centrifugal separating mechanism in the fluid circulating system of a grinding machine and preferably to combine therewith means, such as a settling tank, which will serve to remove the coarser particles and permit the centrifugal device to act only upon the fine suspended matter. In order to circulate the fluid, I utilize a construction which will both clean the compound and lift it to the grinding wheel and in the form illustrated this function is served by two separate mechanisms, a pump and a centrifugal bowl.

In the specific embodiment of my invention shown, the fluid circulating system comprises a centrifugal apparatus 1 mounted to cooperate with a settling tank 2 for removing the grit from the fluid. This tank may have a settling chamber 3 and a pump chamber 4, the fluid being lifted to the grinding wheel (not shown), which in the type of machine illustrated is mounted on a cross slide 5 and is partially enclosed at the rear by the hood 6, by means of the centrifugal pump 7. This pump 7, which may be of any desired construction, is here shown as comprising rotary blades 8 mount-

ed on the lower end of the vertical shaft 9. This shaft and the pump casing 10 are suspended from a housing 11 on the horizontal stud 37 projecting from a plate 36 secured over an opening in the base of the machine. A horizontal shaft 14 passes through the center of this stud and is driven from the motor M at the rear of the machine. Power is transmitted from the shaft 14 to the pump shaft 9 by spiral gears 12 and 13 on the respective shafts. The housing 11 can be swung on the stud 12 to permit removal of the tank 2. A hood 15 may be provided above the pump casing to stop the upward surge of the fluid in the vicinity of the pump shaft. Liquid entering the pump through opening 16 in the pump casing is forced upwardly through conduit 17 to the grinding wheel and work. Some of the fluid is thrown directly into the trough 18 and that which falls onto the work table 19, which in the type of machine illustrated reciprocates past the wheel, flows through collecting channels to the trough. From the trough it passes by a spout 23 to the settling tank.

The separator 1 may be of any construction suitable for the purpose and is shown as comprising a bowl 20 provided with a substantially conical recess 21 fitting over a mating extension 22 formed on the pump shaft 9. The pump shaft and bowl may be splined together to prevent relative rotation. The bowl is shown as being of a multiple chamber construction, the fluid to be clarified first passing into an inner chamber 24 having radial partitions 25 forming sediment pockets into which the heavier and more easily separated particles are thrown, the partly clarified fluid then passing through the channel 26 in the bottom of the bowl into the outer chamber 27 where, by reason of the greater diameter, the maximum centrifugal force clarifies it of the finer and more difficultly removed particles. The clarified fluid is then forced upwardly to the discharge outlet 28 where it is caught and collected by an outer casing 29 having an outwardly and downwardly sloping diaphragm 30 and led to the pump chamber through a spout 31 as indicated by the arrows in Fig. 2. The casing 29 may be supported by the top of the housing 11.

Near its upper end the settling chamber 3 is formed with an outlet opening 32 through which the overflow fluid is conducted into a conduit 33 and from there into a receiving tank 34 formed on the top of the casing 29, this tank 34 having an outlet opening in the bottom provided with a spout 35 extending downwardly into the interior of the inner chamber 24 of the separator bowl. The conduit 33 is made flexible to allow the pump and separator to be swung about the axis of the shaft 14 when it is desired to remove the tank 2 for the purpose of emptying it. Obviously the separator bowl 20 and casing 29 may be lifted off the end of the pump shaft before swinging the pump out of the pump chamber, if desired.

I have shown the settling chamber of the wheel tank or truck provided with a drainage member 35 sloping away from the discharge orifice and adapted to receive the fluid returned through the spout 23 and conduct it to the side of the chamber away from said orifice in order to provide a better circulation of the fluid in the chamber. The drainage member is supported from the side of the tank by suitable hangers 38.

While I have shown my centrifugal separating means used in connection with a settling tank, it is understood that the settling tank may, under certain conditions of operation, be dispensed with and the separator relied on to remove also the coarser particles ordinarily removed by the settling tank. Under some conditions of operation the pump may even be dispensed with, the centrifugal action of the separator being sufficient to return the fluid to the grinding wheel, or a machine combining the functions of the separator and the pump may be substituted for the separate pump and separator shown.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a grinding machine having a grinding wheel, a circulating system for continuously supplying grinding fluid to the wheel, comprising conduits and means for forcing the fluid through the conduits and centrifugally separating solid particles from the used fluid.

2. A grinding machine having a grinding wheel and a work table, comprising a fluid circulating system including a conduit for supplying grinding fluid to the wheel, conduits for collecting the fluid from the wheel and table, centrifugal means for separating solid particles from the grinding fluid, and a pump for circulating the cleaned fluid through the conduit leading to the wheel.

3. In a grinding machine having a grinding wheel, a fluid circulating system comprising a settling tank, a conduit to conduct used fluid from the wheel to the tank, a pump to return the fluid to the wheel and means interposed between the settling tank and the pump to remove any solid particles remaining in the fluid after it leaves the tank and thereby provide clean fluid for the wheel.

4. A grinding machine having a grinding wheel and a work table, comprising a settling tank for receiving grinding fluid, means including conduits for circulating the grinding fluid from said tank to the grinding wheel and back to the tank, and a cen-

trifugally acting separator interposed in said conduits for removing solid particles from the grinding fluid.

5. A grinding machine having a grinding wheel and a work table, comprising a settling tank for coarse particles, conduits from the table to conduct grinding fluid thereto, a centrifugal separator having a rotary device to remove solid fine particles from the fluid, an overflow conduit from the settling tank to said device, means to rotate said device and further clean said fluid, and means including a pump and a conduit to supply said cleaned fluid to the wheel.

Signed at Worcester, Massachusetts, this 30th day of March, 1921.

GREGORY BROWN.