

# UNITED STATES PATENT OFFICE

2,605,971

## COMBINATION PULVERIZING AND CLASSIFYING MACHINE

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Application August 3, 1949, Serial No. 108,266

8 Claims. (Cl. 241—39)

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This invention relates in general to a device for classifying a product of pulverization and more particularly to a type thereof in which a partially comminuted material may be further reduced in size while being classified and selectively carried off to a collector system.

The combination pulverizing and classifying machine to which this invention relates, hereinafter referred to as the classifier, is an improvement upon the device disclosed in the Andrews and Willoughby Patent No. 1,953,058. The separator portion of said device has been found in practice to operate unsatisfactorily under certain conditions. For example, since it is usually desirable to collect only uniformly small particles, called fines, the gas within the separator must circulate at a very high speed in order to provide a centrifuge of sufficient strength to prevent the large particles from being entrained with said small particles or fines as they leave said separator. However, said high speed rotation of said gas not only causes the large, or oversize, particles to be centrifuged out of the rotation gas against the cylindrical wall of the separator but also causes a substantial quantity of the fines to do likewise. As the large particles are pulled down said wall by gravity, said centrifuged fines, which would otherwise be carried off to the collector, may also be carried downwardly with said large particles. This mixture of large and small particles drops into the bed of partially comminuted material and the bottom of the separator.

This situation becomes more clear when it is remembered that after the usual grinding operation, particularly of the impact type, the particles of shattered material are not all uniformly large and uniformly small, but rather are of a wide gradation of sizes. In present equipment, the separation of extreme heavies and extreme fines is accomplished satisfactorily, but there are large quantities of materials of borderline sizes which cause trouble. Usually, to insure against oversize particles getting into the product, it is necessary to run the classifier in such a manner that many suitable fines are actually returned to the grinding zones with the heavies returned for regrinding. Thus, an undesirable recirculation of satisfactorily ground fines becomes necessary.

Furthermore, said centrifuged fines, instead of distributing themselves uniformly upon said bed as they return thereto, may tend to load up near certain nozzles and, due to their poor flowability, reduce the effectiveness of these certain nozzles.

It has also been found that fines, as well as medium size particles, often tend to adhere to each

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other in said separator because of the inherent cohesiveness of certain materials or, perhaps, because of a static electrical charge thereon effected by the rapid circulation of the particles. The resulting groups of small and medium size particles are drawn downwardly by gravity, along with the said large particles, into the said bed. Thus, additional energy must then be expended in separating such particles from each other.

Accordingly, a primary object of this invention is the provision of a combined pulverizing and classifying machine preserving the advantages of certain earlier machines, especially that disclosed in said Patent No. 1,953,058, while overcoming the disadvantages found in such machines, such as the difficulty encountered in handling medium size particles and agglomerates of small and medium size particles.

A further object of this invention is the provision of a pulverizing and classifying machine, as aforesaid, in which the uniformity of output may be increased without increasing the input energy requirements.

A further object of this invention is the provision of a pulverizing and classifying machine, as aforesaid, in which large particles are separated from a mass of partially comminuted material, pulverized to the required size and expelled from said machine into a suitable collector with a minimum expenditure of energy.

A further object of this invention is the provision of a pulverizing and classifying machine, as aforesaid, in which small particles about to be removed to a collector are prevented from improperly returning to the bed of the machine more effectively than has hitherto been possible.

A further object of this invention is the provision of a pulverizing and classifying machine, as aforesaid, in which small and/or medium particles, which have been raised through a substantial portion of the machine and have then formed an agglomerated mass of particles, due to mutual adherence, are separated from each other and discharged as fines before they can return to the bed of the machine.

Other objects and purposes of this invention will become apparent to persons familiar with this type of equipment upon referring to the accompanying drawings and upon reading the following specification.

In meeting those objects and purposes heretofore mentioned, as well as others incidental thereto and associated therewith, I have provided a combined pulverizing and classifying machine comprising a vertically disposed, cylindrical