Jan. 4, 1927. 1,613,048

P. S. MITTS

CUTTING MACHINE

Filed March 19, 1923 2 Sheets-Sheet 1

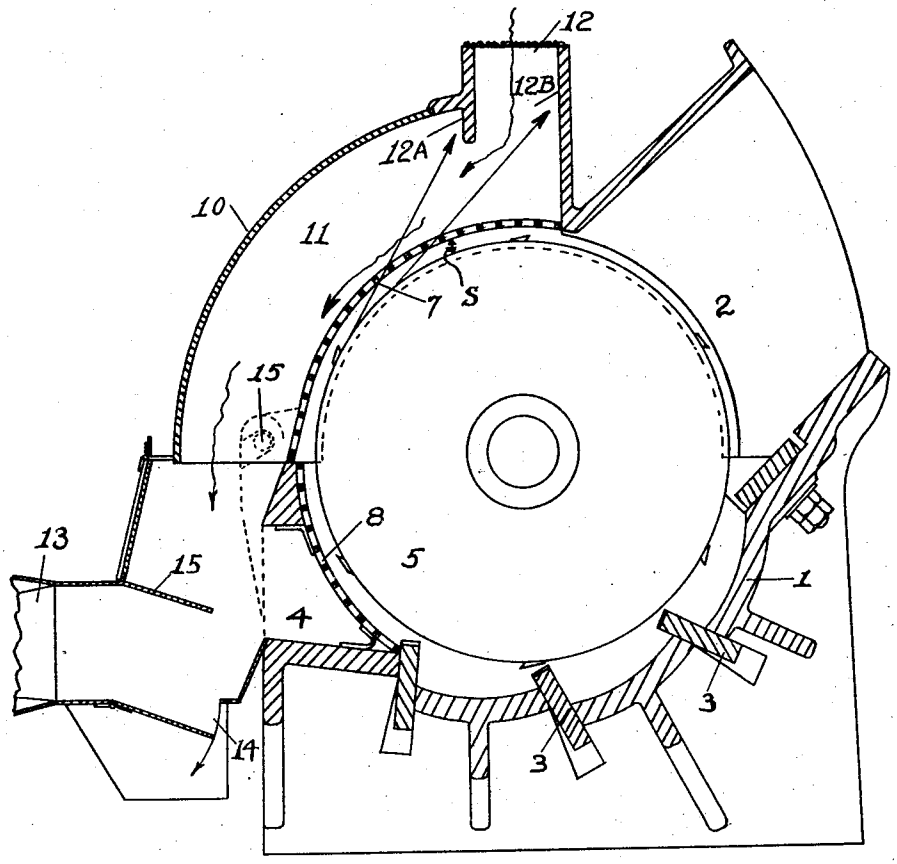



Fig. 1

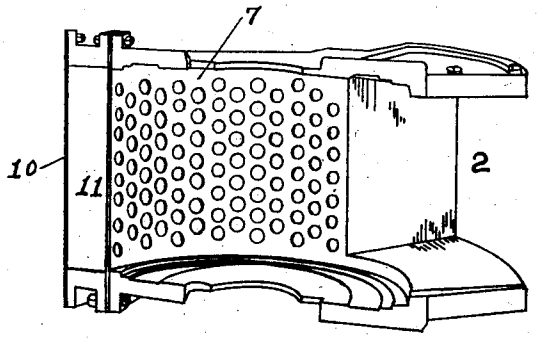



Fig. 2

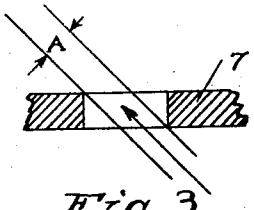



Fig. 3

Philip S. Mitts INVENTOR

BY

Geo. B. Willey ATTORNEY

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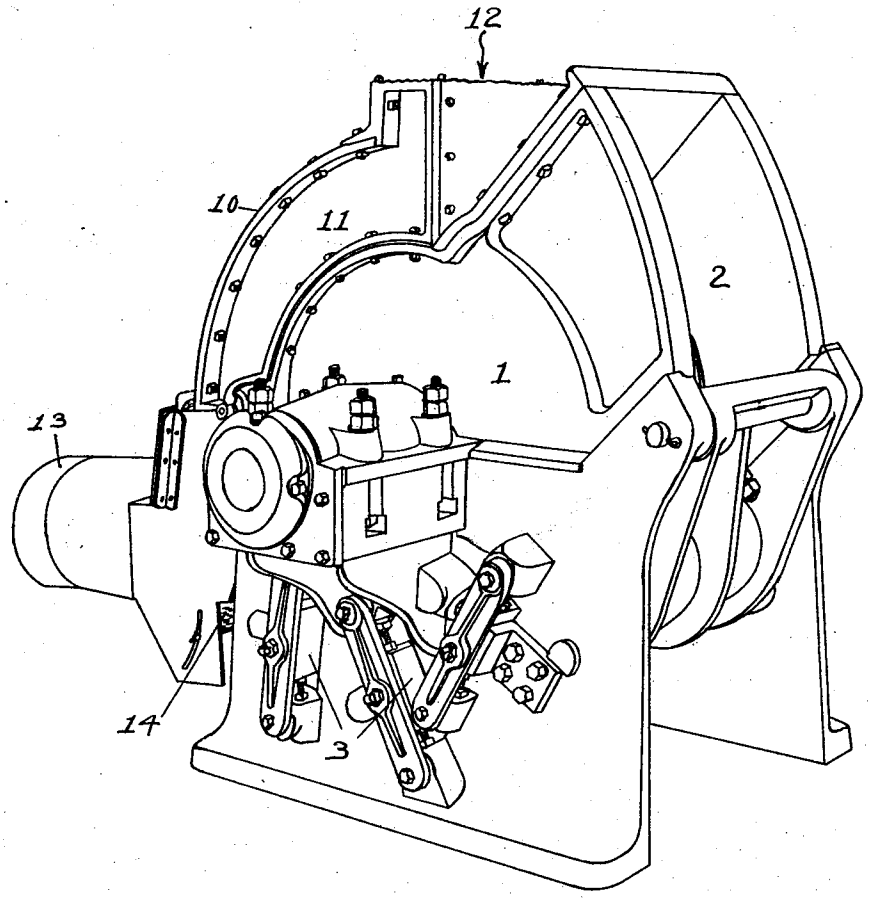



Fig. 4

INVENTOR
Philip S. Mitts

BY
Geo. B. Willey

ATTORNEY

Patented Jan. 4, 1927. 1,613,048

# UNITED STATES PATENT OFFICE.

PHILIP S. MITTS, OF SAGINAW, MICHIGAN, ASSIGNOR TO MITTS & MERRILL, OF SAGINAW, MICHIGAN, A CORPORATION OF MICHIGAN.

## CUTTING MACHINE.

Application filed March 19, 1923. Serial No. 626,144.

This invention relates to cutting machines of the kind commonly known as hogs and employed for disintegrating many kinds of materials.

A hog of the kind to which my improvement is especially well adapted consists in a cylindrical knife-carrying drum revolvably mounted in a cylindrical casing having an inlet for crude material in one side and an outlet for the disintegrated product on the opposite side, and stationary cutter bars around the lower part of the inner periphery of the casing between the inlet and outlet openings.

The drum nearly fills the chamber of the casing and the knives project only slightly outside the drum rim. Such a hog is illustrated and described in Patent No. 1423867 issued July 25, 1922.

The objects of my invention are, to enable chunks of wood, sheets of veneer and other materials to be cut into small pieces, to take out the material as fast as it is reduced to a predetermined maximum size or smaller, to automatically recut all material that was not sufficiently reduced in its first passage through the machine, and to repeat the cutting operation until all the material fed to the machine emerges therefrom in a state of fineness in which no over-size particles are present. No subsequent screening is, therefore, required to remove large pieces from the product.

A further object is to secure the greatest possible rate of output of properly cut and sized product per unit time.

A still further object is to so design and arrange the discharge pipe connections that the direction of movement of the cut material will be changed immediately after leaving the cutter chamber, thereby checking its velocity and dropping out nails, pieces of iron and other heavy particles that have passed through the machine, while the good material is carried along by the air current into the exhaust fan or such other disposal apparatus as may be provided.

With the foregoing and certain other objects in view which will appear later in the specification, my invention comprises the devices described and claimed and the equivalents thereof.

In the drawings, Fig. 1 is a part sectional side view of a hog embodying my improvement.

Fig. 2 is a perspective view of the recutting screen and the air-flow chamber as seen from inside the machine.

Fig. 3 is a diagrammatic detail of a section of the screen.

Fig. 4 is a perspective view of the machine assembled.

As is clearly shown in the drawings, 1 is the usual casing of the hog, 2 the feed opening, 3, 3 is a plurality of stationary cutting bars located around the lower part of the periphery of the casing and 4 is the discharge opening. The cylindrical drum 5, which nearly fills the casing, has knives 6 that project slightly beyond the cylindrical surface of the drum. The drum is revolvably mounted within the casing.

In the customary operation of such a hog, material is fed into opening 2, passes between the rapidly moving knives 6 and the successive stationary cutting bars 3 and is discharged through the opening 4. The discharged material usually consists of a mixture of finely cut and coarsely cut particles.

My present improvement embodies improved means to screen the material, to automatically recut those pieces which may not have been sufficiently reduced in size by the previous passage through the machine and it automatically repeats the recutting and rescreening operations as many times as may be necessary to reduce the material to the required size.

Material is not permitted to escape from my present machine until it has been reduced to the desired degree of fineness. When that degree of fineness has been attained the material is automatically discharged and cleared away from the machine.

I employ a recutting and sizing screen 7 around that part of the drum which is not occupied by the inlet opening 2 and the stationary cutting knives 3. This part usually comprises about one third of the circumference of the casing.

A similar screen 8 is located across the discharge opening 4.

The operation of screens 7 and 8 is as follows:

Some of the material which entered feed opening 2 and passed the knives and stationary cutting bars 3, 3 is projected tangentially by centrifugal force from the drum knives through the screen openings. Other material, not so well cut, and consequently

of larger size, can not pass through and is swept around the inside surface of screens 7 and 8 like a rapidly moving stream along the thin annular space S that surrounds the periphery of drum 5. This coarser material is delivered into the inlet hopper 2 where it is joined by a new supply of material. The material again encounters the cutting knives and stationary bars 3, 3 and the action is repeated, the fine re-cut material being projected at high speed diagonally through the openings of screens 8 and 7.

The screen is preferably made of heavy material such as steel plate, rigid enough to retain its original shape under conditions of hard service. It is formed with large perforations as shown in Figs. 2 and 3. These perforations may be circular as shown, or rectangular, or the screen may be built up of bars.

Cut material is thrown from the knives tangentially and only such material can pass through the large perforations as is fine enough to go through the diagonally projected area of the opening as indicated at A, Fig. 3.

The screen, therefore, serves as a cylindrical wall to guide the coarser material rejected by the screen around the drum through the thin channel S and back to the cutter bars 3 for recutting. It also serves as a sizing screen for particles of finely cut material that are driven against it tangentially and with great velocity.

I increase the output of the machine per unit time by eliminating air blast action within the working chamber, as follows:

The fan or blast-producing action of my knives and drum is slight because the interior of the drum chamber is practically air bound, as distinguished from machines in which the revolving knife-carrying cylinder also acts as an air blast-producing element.

Air-fanning by the knives is further minimized by so arranging the parts that the thin annular channel or working space S between the outer periphery of the drum and the inner periphery of the casing is occupied as fully as possible by the cut and partly sized material instead of being occupied, as heretofore, by a mixture of material and air.

Since there is in practice only a negligible amount of fan action in the casing there is no great amount of air driven through the perforations of my screen by the revolving drum.

In the absence of such an air-blast action through the screen, cut particles are, therefore, projected through the perforations by the momentum imparted by the rim velocity of the drum instead of being carried through the screen by floating in an air blast that has been created by the fanning mill action of the cutters, as in machines of the kind above referred to.

By making the channel S thin as above described the cut material is confined in a thin layer between the drum or knife-carrying member and the screen. By being confined to a thin layer which travels at high velocity, the material does not clog the screen openings, as would be the case if the layer S were thick. The thin layer insures that each separate particle of the cut material shall more quickly have an opportunity to fly out through the holes. If the layer were too thick those particles nearest the drum would not have so good an opportunity to escape. Consequently by placing the screen close to the drum rim and driving the material around the screen surface in a thin layer the hourly output of the machine is greatly increased.

The thickness S, that is, the radial distance from the drum rim to the screen, is determined in practice by the required size of finished particles, the speed of the cutting knives and the nature of the material, but in any case my arrangement by which the material is passed over the screen always in a thin layer enables me to adapt the machine to any required conditions, since the drum rim forms one confining wall for the thin layer of material and the screen is the other wall, the distance between them being gauged to suit the particular conditions of operation.

In practice the projected or free-flow area A of the screen perforations of my machine when working at full capacity are filled by almost solid streams of cut material, instead of by a mixture of material and air. Obviously the capacity of a hog of given size and speed as measured in terms of cubic feet of cut material passing through a square foot of screen surface per unit of time is thereby enormously increased.

Cut material projected through the screen from the air-bound drum is preferably picked up by an independent current of air that flows around the outside periphery of the screen, but not through it. To carry this air current I provide an outer casing 10 forming an air flow passageway or jacket 11 having an inlet 12, its lower end communicating with discharge pipe 13.

Air inlet 12 has proper volumetric capacity to supply the air flow needed for sweeping the fine material away from screen 7. To prevent particles that have been discharged at high velocity through the uppermost perforations of screen 7 from flying upward out through inlet 12 I provide baffles $12^A$ and $12^B$ to take the impact of the projected particles. The material strikes these baffles and drops back into the passageway 11 and is taken by the flow of air as above described.

The casing 10 with screen 7 and inlet spout 2 may be hinged as at 15 to the frame of body 1 to afford ready access to the drum knives.

A hog not originally equipped with a recutting and sizing screen 7 may be fitted with such a screen merely by removing the original plain casing section and substituting the screen and casing as shown in the drawings. A suitable air current may preferably be produced in pipe 13 by action of a fan (not shown). Material projected through screen 8 is discharged into suction pipe 13 where it encounters the air current from passageway 11 and is thereby propelled through the discharge pipe 13.

To better regulate the supply of air to the discharge pipe 13 I provide a valve-controlled air inlet 14 at a point close to the discharge outlet 4.

This inlet 14 also permits pieces of iron and other heavy material to be dropped out near the point where the direction of flow from passageway 11 is changed into discharge pipe 13. A baffle wall or separating plate 15 is also provided, against which particles from screen 8 impinge, lose their velocity and drop by gravity into the exhaust pipe 13 where they meet the air current entering at 14, and are carried away. If any pieces of iron and the like are in the cut material they will drop through the air inlet 14 as soon as their velocity is checked by striking baffle 15.

By the means above described I have produced a recutting and re-screening device that automatically carries partly cut material through the knives repeatedly, as many times as may be necessary to reduce it to the required size and when that size has been attained the material is projected out of the machine and into an air current generated independently of the cutting drum. It is projected by its own momentum due to the velocity imparted to it by the knives in the thin channel S. Its path of flight is tangential to the drum rim and diagonally through the openings in the screen. This air current sweeps over the outside surface of the screen, but not through it and automatically separates iron and heavy materials and takes the sized product away from the machine and keeps the screens clear, while greatly increasing the rate of output of the machine.

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

1. In a cutting machine including a cylindrical shell, and a substantially cylindrical knife-carrying member revolvable therein, a cylindrical screen forming a wall of said shell, said screen concentric with said knife-carrying member and in close proximity thereto, to form a thin annular channel in advance of each knife, said screen formed with large perforations adapted to permit the free passage diagonally therethrough of cut pieces when thrown by centrifugal force tangentially from the rim of said knife-carrying drum.

2. A drum-type cutting machine having a part of its casing formed of a screen located concentric with the drum, said screen formed with large perforations adapted to permit the passage of small particles only when diagonally projected therethrough, an outer casing enclosing said screen, said outer casing having an air inlet at one end and a suction outlet at the other end, and adapted to direct an air current around the outer surface of said screen but not through its perforations.

3. A regrinding and sizing device for cutting machines including a casing having stationary cutting bars, a knife-carrying drum in said casing, a part of the wall of said casing formed of a non-yielding sizing screen having openings therein adapted to pass material diagonally therethrough, said screen arranged in close proximity to the path of travel of said knives to form a thin channel therebetween, a wall outside said screen and spaced therefrom, the space between said screen and wall comprising an air passageway having a current of air sweeping circumferentially around the outside surface only of said screen.

4. A cutting hog comprising a casing having a feed opening and a plurality of stationary cutting bars located beneath said opening and around the lower periphery of said casing, a knife-carrying drum revolvable within said casing and concentric with the working edges of said cutting bars, a discharge pipe, a discharge opening in said casing beyond said cutting bars and communicating with said discharge pipe, an air inlet in said discharge pipe near the discharge opening, an air inlet in the upper side of said discharge pipe, a screen forming a wall for the upper part of said casing, and an air passageway outside of said screen surrounding said screen and communicating with the opening of said discharge pipe.

5. In a machine of the class described, a casing have a feed opening and a discharge opening, a screen across said discharge opening, a revolvable cylindrical drum having knives projecting from the periphery thereof, stationary cutting bars fixed to the lower inner periphery of the casing between said openings, a sizing screen arranged close to the periphery of said drum to form, together with the drum, a thin annular channel through which material being worked is constrained to travel in a thin stream, for the purposes set forth.

In testimony whereof, I affix my signature.

PHILIP S. MITTS.