Jan. 6, 1953

M. F. WARD

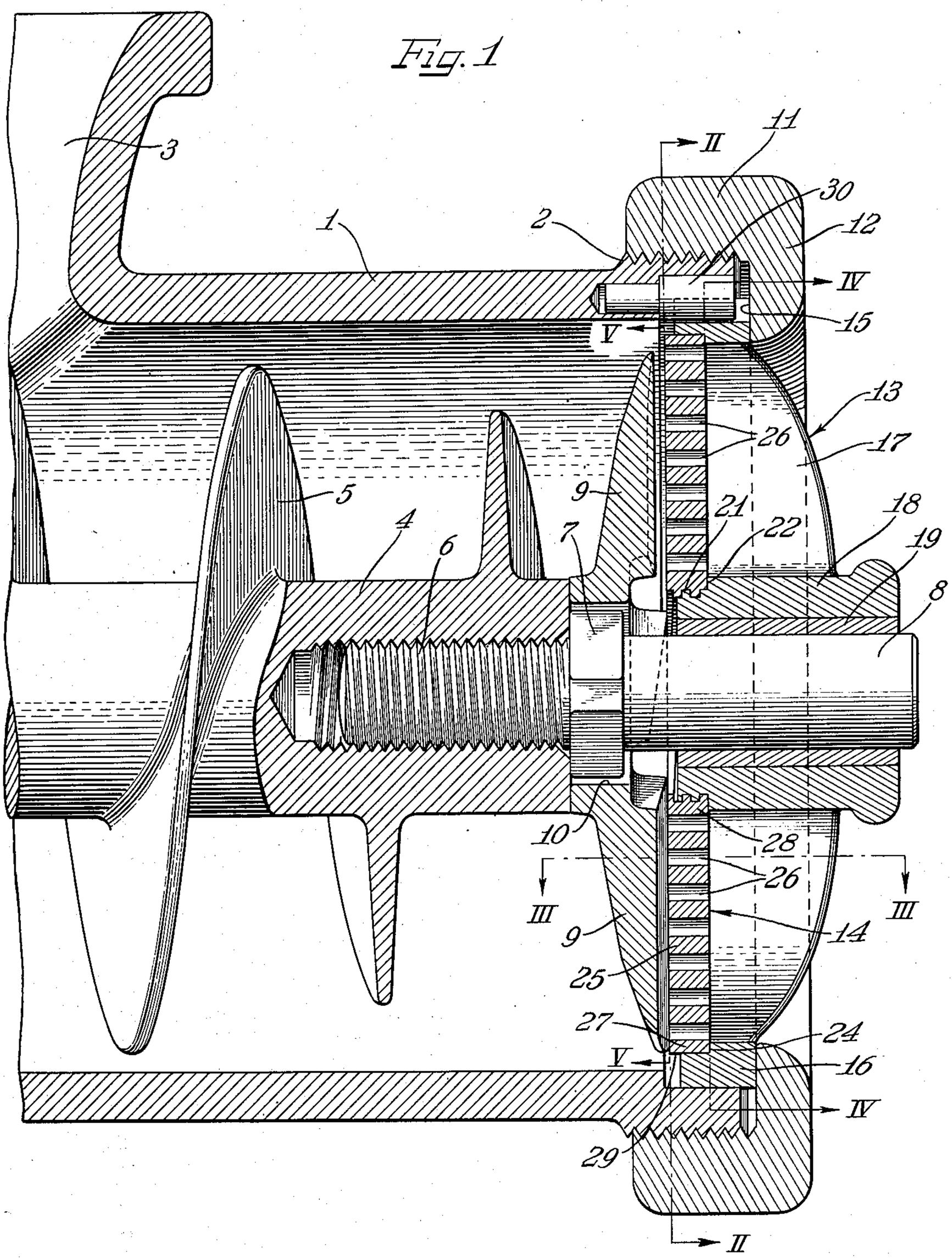
RETAINING SPIDER AND PLATE FOR MATERIAL GRINDING MACHINES

2,624,384

Filed May 24, 1949

3 Sheets-Sheet 1

Fig. 1



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3 Sheets-Sheet 2

Fig. 2

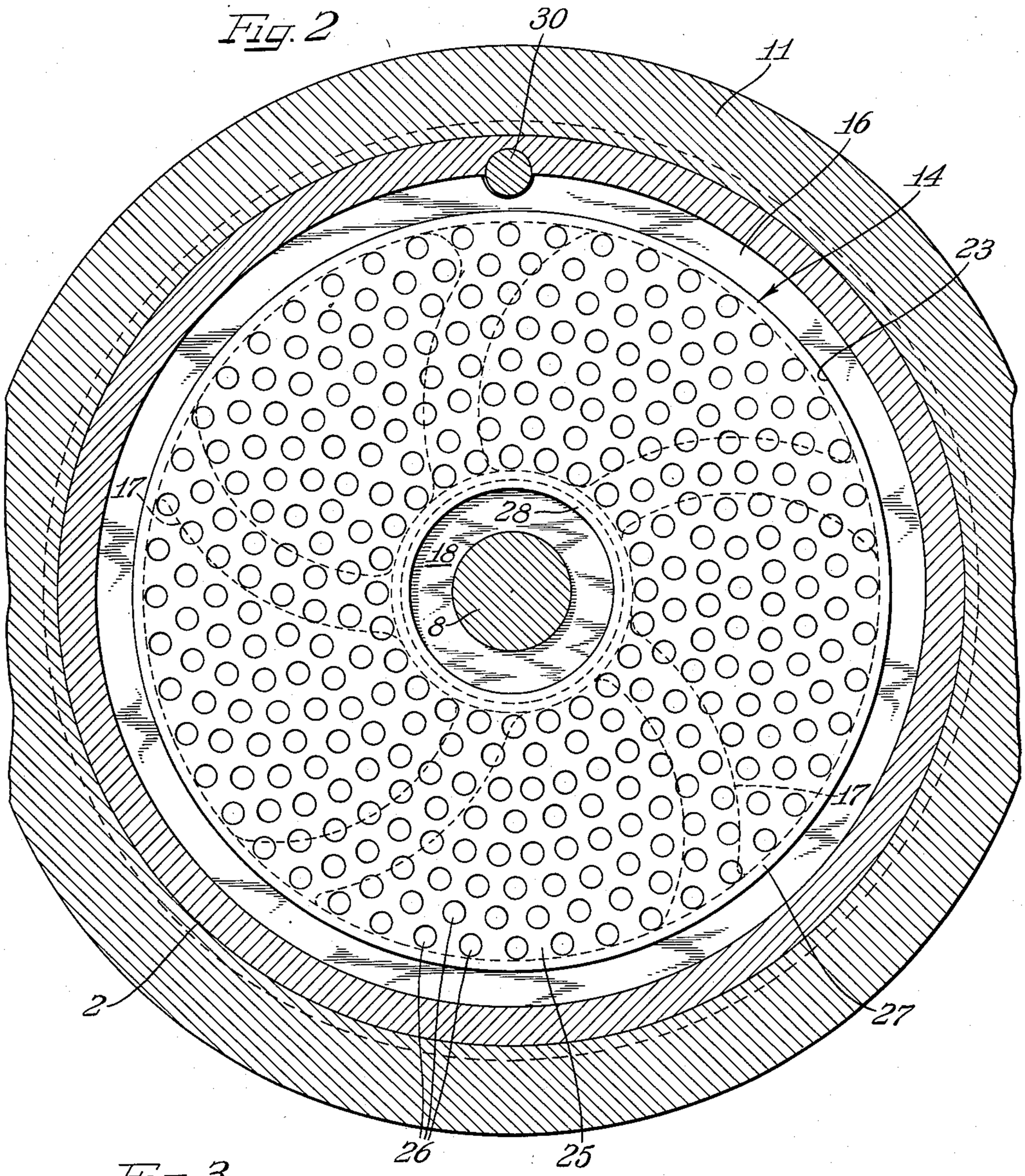

Fig. 3

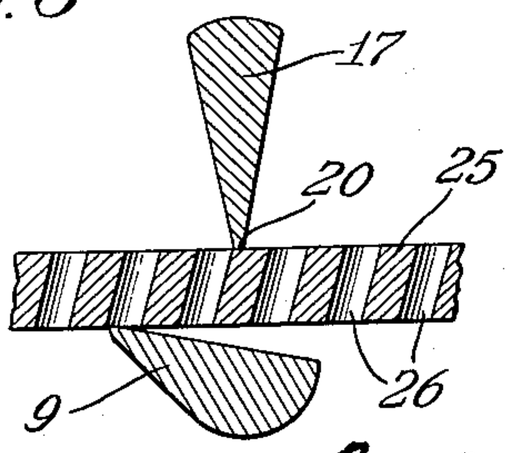

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Fig. 4

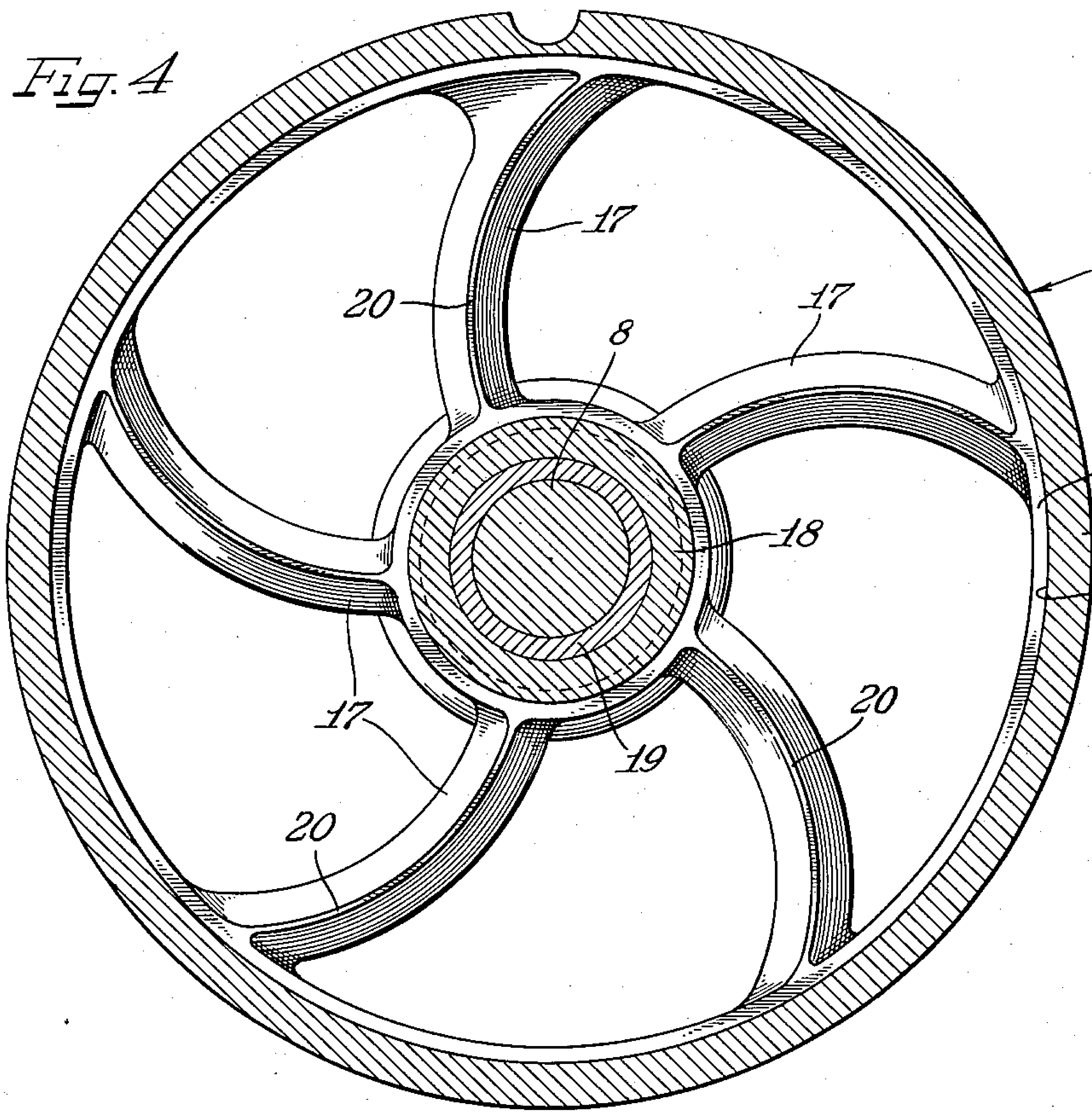
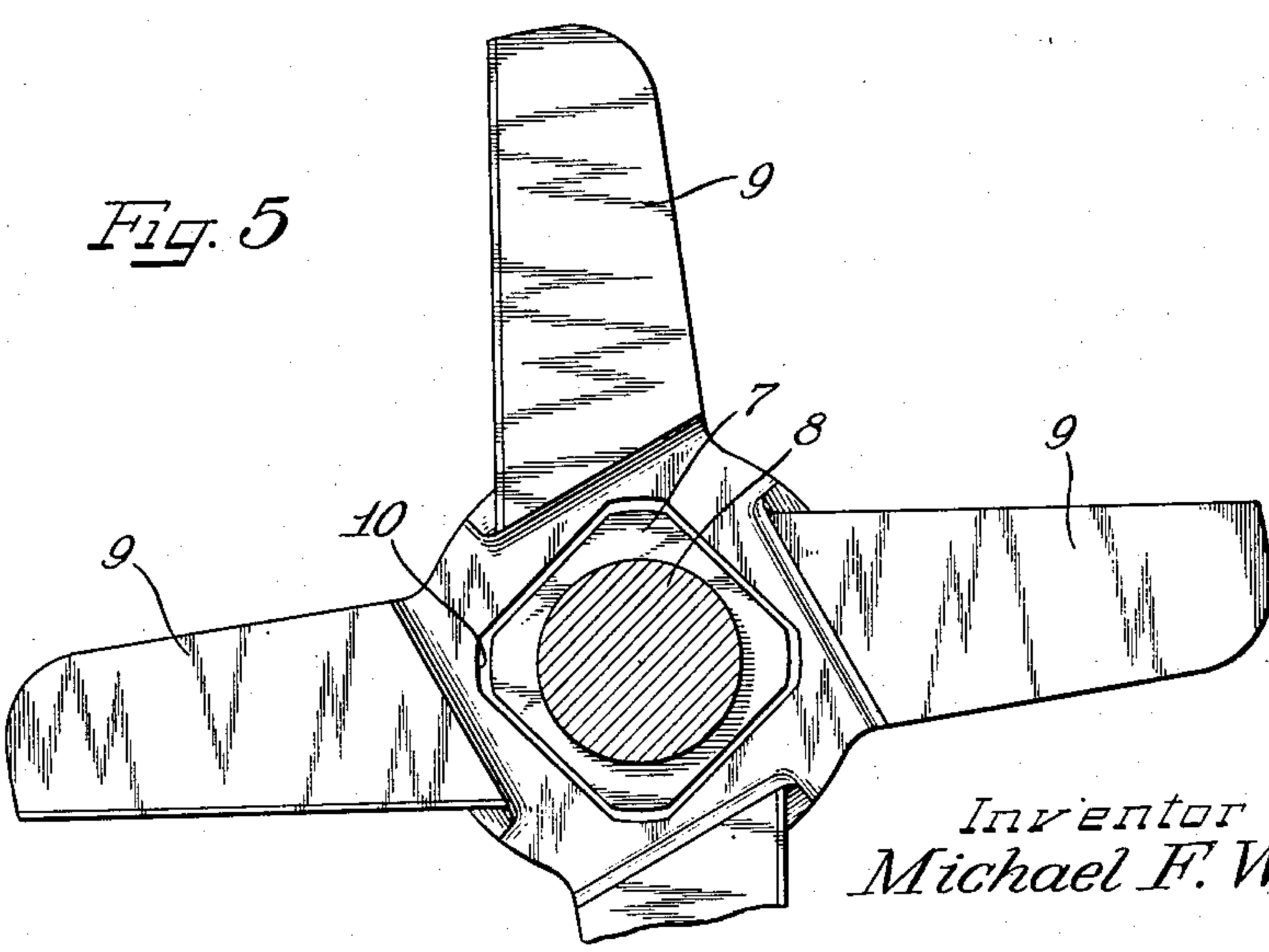


Fig. 5



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UNITED STATES PATENT OFFICE

2,624,384

RETAINING SPIDER AND PLATE FOR MATERIAL GRINDING MACHINES

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Application May 24, 1949, Serial No. 94,976

6 Claims. (Cl. 146—189)

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This invention relates to improvements in a retaining spider and plate for material grinding machines, and more particularly to a retaining spider and plate assembly for grinding machines of the character highly desirable for use in meat packing plants and the like to grind meat in the form for use as sausage, hamburgers, and the like, although the invention is equally adaptable for grinding nuts, other food items, washing powder, soap chips, and materials of various types, as will be apparent to one skilled in the art.

Machines of the type of this invention customarily include a cylinder, a screw type conveyor therein, a rotary knife, and a plate having numerous apertures therein in operative association with the knife, the ground material exiting from the device through the apertures in that plate. Frequently, especially in packing plants, machines of this type are of relatively great capacity insofar as the quantity of material ground per hour is concerned, and equally as frequently these machines are operated with motors of approximately 60 horsepower. The plate, therefore, is subject to severe strain and heretofore that plate was exceedingly expensive owing to the necessary thickness to prevent the plate shattering under the load. Such plates, because of the numerous apertures therein, are exceedingly expensive, and the expense increases materially as the size of the apertures decreases. Usually a series of plates having differently sized apertures are utilized with each machine, and the weight of metal alone is a considerable item, when it is recalled that heretofore these plates also in most cases carried a bushing in the central portion thereof to support bearing means for the shaft of the conveyor. Of course, owing to the thickness of the plates, the capacity of the machine was limited to some extent by the added friction of the material passing through the holes or apertures in the plate, and frequently it was necessary to clean the plates in a most laborious manner by hand to eliminate the material tightly choking the apertures.

It is also an object of this invention to provide a plate for a grinding machine with a retaining spider lending support to that plate, and the structure being such that the plate is of substantially uniform thickness throughout and the weight of the conveyor and its shaft is entirely removed from the plate.

Still a further object of the invention is the provision of a plate for a grinding machine of the character set forth herein, which plate actually increases the capacity of the machine by virtue of the thinness of the plate and the consequent

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shortness of the apertures through that plate, thereby lessening friction upon the material passing through those apertures over plates of the same character heretofore known.

Still a further feature of the invention resides in the provision of a retaining spider for a plate in a grinding machine of the character set forth herein, which spider is so constructed as to adequately support the plate against the rotary knife of the machine and against the extreme pressure developed in the machine, whereby the plate may be much thinner than plates of this type heretofore known, and no load except that of the material passing through the plate need be carried by the plate.

It is also a feature of this invention to provide a plate and spider assembly for a grinding machine of the character set forth herein, wherein the spider is constructed to support the plate by means of spokes over the surface adjacent the spider, and also lend proper support to the circumferential margin of the plate.

It is still a further feature of this invention to provide a plate and retaining spider assembly for a grinding machine, wherein the plate is extremely economical to manufacture because of its relative thinness, its uniform thickness, and its reversible character, while the spider is substantially a permanent part of the machine.

Still a further feature of the invention resides in the provision of a plate for a material grinding machine of the character set forth herein, which plate may be extremely economically manufactured, is very highly durable and long lasting, and yet may be replaced if desired at a comparatively low cost.

While some of the more salient features, characteristics and advantages of the instant invention have been above pointed out, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawings, in which—

Figure 1 is a fragmentary central vertical sectional view through a grinding machine, parts being shown in elevation, equipped with a plate and retaining spider assembly embodying principles of the instant invention;

Figure 2 is an enlarged fragmentary transverse vertical sectional view taken substantially as indicated by the line II—II of Fig. 1, looking in the direction of the arrows;

Figure 3 is a fragmentary plan sectional view taken substantially as indicated by the line III—III of Fig. 1, but rotated at an angle of 90° for purposes of clarity;

Figure 4 is also a transverse vertical sectional view taken substantially as indicated by the line IV—IV of Fig. 1, to illustrate the inside faces of the spokes of the retaining spider; and

Figure 5 is a transverse vertical sectional view taken substantially as indicated by the line V—V of Fig. 1 to illustrate the mounting of the knife.

As shown on the drawings:

The illustrated embodiment of this invention is shown operatively associated with a material grinding machine of the high capacity type utilized in meat packing and other manufacturing plants. All parts of the machine including those involved in the instant invention are preferably made of stainless steel for sanitary purposes, although other materials plated or finished as desired may also be used.

The grinding or cutting machine includes a cylinder or container 1 having an open forward end around which is an externally threaded marginal portion 2. The cylinder is also provided with an intake hopper 3 through which material to be ground may be placed inside the cylinder 1.

In order to carry the material forward into position for cutting, there is a screw conveyor assembly embodying a shaft 4 around which is disposed a helical blade 5 gradually decreasing in diameter toward the front end of the cylinder. This screw conveyor is driven by any suitable means connected to the rear end thereof, and not shown in the drawings. The screw conveyor assembly also includes a stud projecting forwardly of the shaft 4 and having a portion 6 threadedly engaged with that shaft 4. The stud also includes an outstanding polygonal flange 7 and forward of that flange, the stud is shaped to provide a journal 8 for the conveyor assembly.

Around the polygonal flange 7 a multi-bladed knife 9 having a center opening 10 complemental to the flange 7 is loosely disposed, and the knife obviously rotates with the screw conveyor assembly.

At the forward or open end of the cylinder 1, a retaining ring 11 is threadedly engaged on the part 2 of the cylinder, this ring having an inwardly extending flange 12 to hold a retaining and supporting spider, generally indicated by numeral 13, as well as a plate, generally indicated by numeral 14, in position with the inside surface of the plate in contact with the cutting edges of the blades on the rotary knife 9. It will be noted from the showing in Fig. 1 that the retaining ring 11 is provided with a recess 15 inside the flange 12 of sufficient depth to insure contact of the plate 14 with the knife blades, such contact limiting the threaded engagement of the retaining ring with the externally threaded portion 2 of the cylinder 1.

The retaining spider, best seen in Figs. 1 and 4, comprises a rim portion 16 connected by a plurality of spokes 17 to a hub in the form of a bushing 18 in which is a hardened bearing 19 for the aforesaid journal 8 of the screw conveyor assembly. Since this retaining spider is substantially a permanent part of the machine and is designed to carry the full load on the plate 14, by effectively supporting that plate, the spokes 17 are preferably substantially wedge shape in cross-section as seen best in Fig. 3. These spokes taper inwardly so as to provide a relatively narrow or fine edge 20 for contact with the outer face of the plate 14. As seen in Fig. 1, the spokes are also of outward arcuate configuration axially of the machine; that is, the spokes are thickest adjacent the hub bushing 18 and thinner where they connect with the rim 16 of the spider. With reference to Figs. 2 and 4, it will also be seen that the spokes are also of arcuate configuration in a radial direction in the preferable construction. Thus, the spokes lend support to the outer face of the plate 14 and at the same time approach line contact with that plate so as not to obscure or block the apertures through the plate beyond a minimum extent.

Additional support is given the plate 14 by the spider, both centrally and at the circumferential margin. The central support is provided by a reduced threaded interior end 21 on the bushing 18 terminating in an abrupt shoulder 22, as best seen in Fig. 1. The circumferential marginal support is provided by an enlarged bore 23 in the rim portion 16 of the spider terminating in a flat face or shoulder 24 against which the circumferential marginal portion of the plate may firmly seat.

The plate 14 is preferably in the form of a metallic disk 25 provided with numerous apertures 26 therethrough. These apertures or cutting holes may be parallel to the axis of the disk or at an angle to that axis as seen clearly in Fig. 3. The apertures or cutting holes may also be of any desired size, depending upon the material to be cut or ground by the machine. For example, holes ¼ inch to ⅛ inch in diameter may be utilized for certain types of meat, holes of lesser size may be used for meat for sausage, holes even smaller such as 1/64 inch may be used for washing powder and like products.

It will be especially noted that the disk 25 is relatively thin. In fact, this disk need only be up to 40% of the thickness of disks of this character heretofore used because this disk does not carry any of the weight of the screw conveyor assembly, nor is the disk provided with a hub or bushing.

The disk or plate is preferably left with a smooth outer marginal portion 27 that seats against the bottom or shoulder 24 of the enlarged bore in the rim of the spider. Centrally thereof the disk is provided with a relatively large opening internally threaded for engagement with the threads on the bushing 18, and a smooth inner marginal portion 28 of the disk seats against the aforesaid shoulder 22 on the bushing. Accordingly, the disk is firmly supported at the center, at the outer margin, and across the face by means of the aforesaid spokes 17 on the spider.

It should also be noted that the disk is reversible. That is, it may be connected to the bushing 18 by way of the threads illustrated, or in any other equivalent manner, with either flat face of the disk adjacent the rotary knife 9. It should also be noted that the depth of the enlarged bore 23 in the spider is less than the thickness of the disk so that the disk extends inwardly beyond the termination of the spider rim as indicated at 29 in Fig. 1. In addition, the fine edges 20 of the spokes 17 all terminate substantially in the same plane as the bottom 24 of the enlarged bore so that the disk may seat flatly against the narrow edges of these spokes. Thus, the disk is firmly held in contact with the rotary knife 9, and there is no danger of that knife ever contacting the spider. It might be added that the disk is preferably of hardened stainless steel plate, which can be hardened and operate satisfactorily in the present instance at 68–70 Rockwell scale.

The spider and plate are kept from rotating by a suitable pin 30 engaged in complemental sockets in the spider rim and cylinder 1.

In operation the instant invention is extremely simple and highly efficient. It must be assumed, of course, that a set of cutting plates are provided for each machine, each plate having apertures therethrough of a different size than the other plates. It is a simple expedient to interchange plates by removing the retaining ring 11, pulling out the spider with the disk attached thereto, unscrewing the disk from the bushing of the spider, and attaching a new disk, and reassembling the spider and retaining ring on the machine. By the assembly operation and the construction of the relative parts, the disk is always brought into positive contact with the blades of the rotary knife. From the showing in Fig. 1, it will be noted that the disk is of such diameter relatively to the blades of the knife that the blades cover the entire exposed face of the disk during their rotation, and so the knife will not tend to groove the disk. The disk is therefore of extremely long life, and even though one face thereof may become worn to an objectionable extent, the other face of the disk may then be used by reversing the disk.

The use of the particular disk, so supported by the spider, permits the disk to be made extremely thin and light, thereby greatly reducing the cost of manufacture of the disk as well as its weight. It should also be especially noted that the disk actually results in an increase in capacity of the machine by virtue of its thinness, in that the holes or apertures through the disk provide less friction to the passage of the material being cut or ground. That material therefore will move with greater rapidity through the disk, and plugging of the apertures in the disk by material is greatly eliminated. Whenever it is necessary to replace a disk, that may be done extremely economically, because the cost of the disk or plate and the spider should be no more than the cost of a disk or plate of the character heretofore used, and yet the spider is substantially a permanent part of the machine and will outlast even the plates.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. A plate and spider assembly for a material grinding machine, including a relatively thin disk of uniform thickness having numerous apertures therethrough and a relatively large central opening internally threaded, a spider comprising a rim, spokes, and a hub bushing, said bushing having a threaded inner end to receive thereon said disk from either side, the rim of the spider having an enlarged bore to receive the disk when the same is attached to said bushing.

2. A plate and spider assembly for a material grinding machine, including a relatively thin disk of uniform thickness having numerous apertures therethrough and a relatively large central opening internally threaded, a spider comprising a rim, spokes, a hub bushing, said bushing having a threaded inner end to receive thereon said disk from either side, the rim of the spider having an enlarged bore to receive the disk when the same is attached to said bushing, said enlarged bore being of less depth than the thickness of said disk, and said spokes terminating inwardly in the plane of the bottom of said enlarged bore to lend support to the body of said disk.

3. A plate and spider assembly for a material grinding machine, including a relatively thin disk of uniform thickness having numerous apertures therethrough and a relatively large central opening internally threaded, a spider comprising a rim, spokes, and a hub bushing, said bushing having a threaded inner end to receive thereon said disk from either side, the rim of the spider having an enlarged bore to receive the disk when the same is attached to said bushing, said spokes being tapered in cross-section with their narrower edges terminating substantially in the plane of the bottom of said enlarged bore to lend support to said disk and block said apertures to a minimum extent.

4. In combination in a material grinding machine, a cylinder, a conveyor assembly in said cylinder, a multi-bladed rotary knife on the shaft of said conveyor assembly, a retaining ring on the end of said cylinder, a spider held by said retaining ring, said spider including a hub part to provide a bearing for the conveyor assembly shaft, and a disk-like plate of uniform thickness and having numerous apertures therethrough and a central opening for engagement with said hub disposed adjacent said knife, said plate being of such size that the inner face thereof may be completely contacted by the knife blade cutting edges.

5. In a plate and spider assembly for a material grinding machine having a protruding conveyor shaft portion, a spider comprising a rim, spokes, and a hub, a disk of uniform thickness having numerous apertures therethrough removably mounted on the inner end of said hub, said hub having a radial shoulder to bear against the outer face of said disk, and bearing means in said hub extending through the part carrying said disk to journal the conveyor shaft portion, the rim of said spider having an enlarged bore of less depth than the thickness of said disk to receive the outer margin of the disk, leaving the entire inner face of the disk free for contact by a knife.

6. In combination in a material grinding machine, a cylinder, a conveyor assembly including a shaft in said cylinder, a multi-bladed rotary knife on said shaft, a retaining ring on the end of said cylinder, a spider held by said retaining ring, said spider including a hub part to provide a bearing for said shaft, said spider having an annular plate receiving recess in its inner face, an apertured plate in said recess of greater thickness than the depth of said recess whereby the entire inner face of the plate is exposed adjacent said knife, and said plate and knife being of the same diameter.

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