Sept. 4, 1956 J. F. THOLL ET AL 2,761,564

CENTRIFUGAL CHIP EXTRACTOR MACHINE

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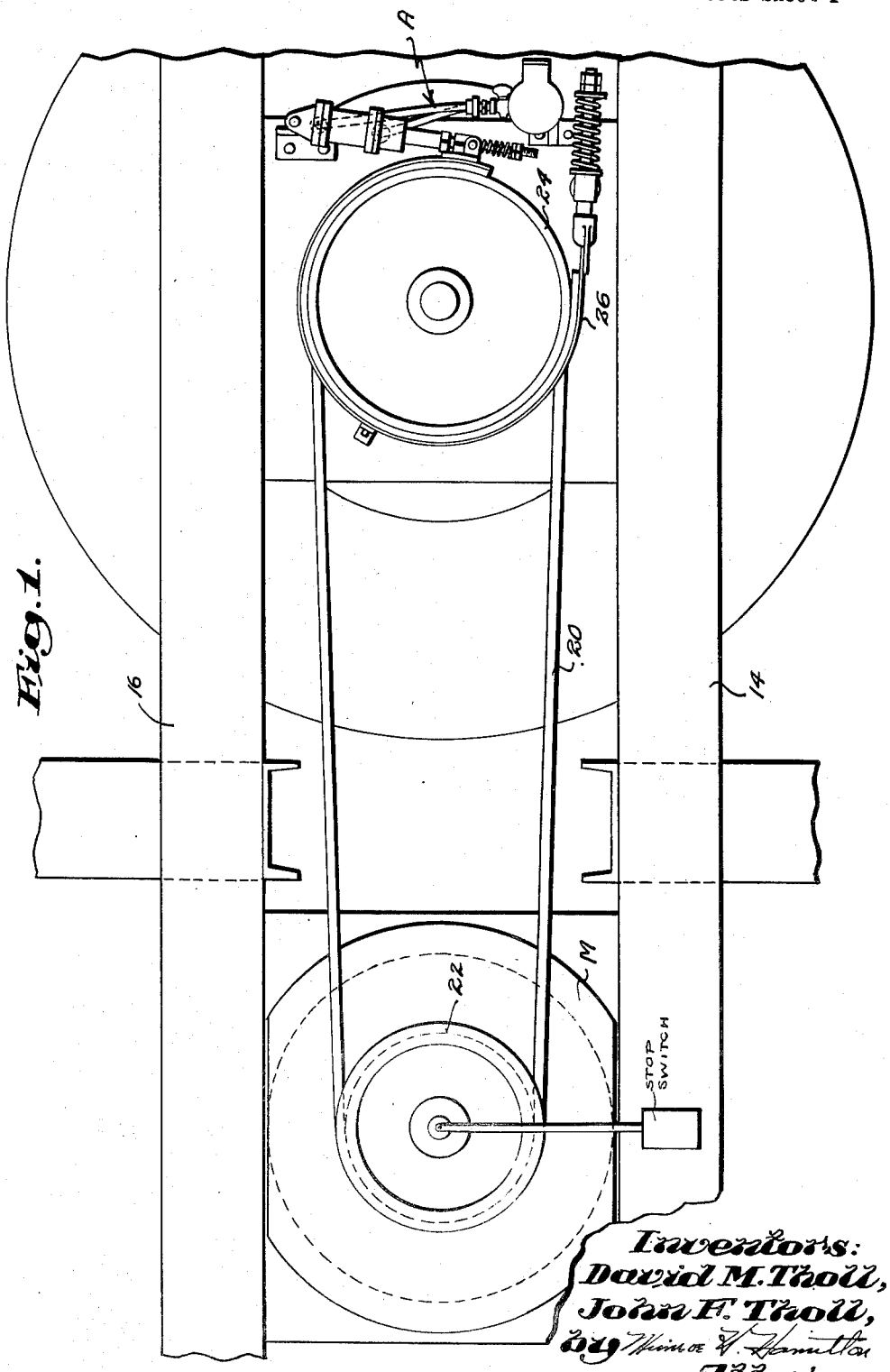


Fig. 1.

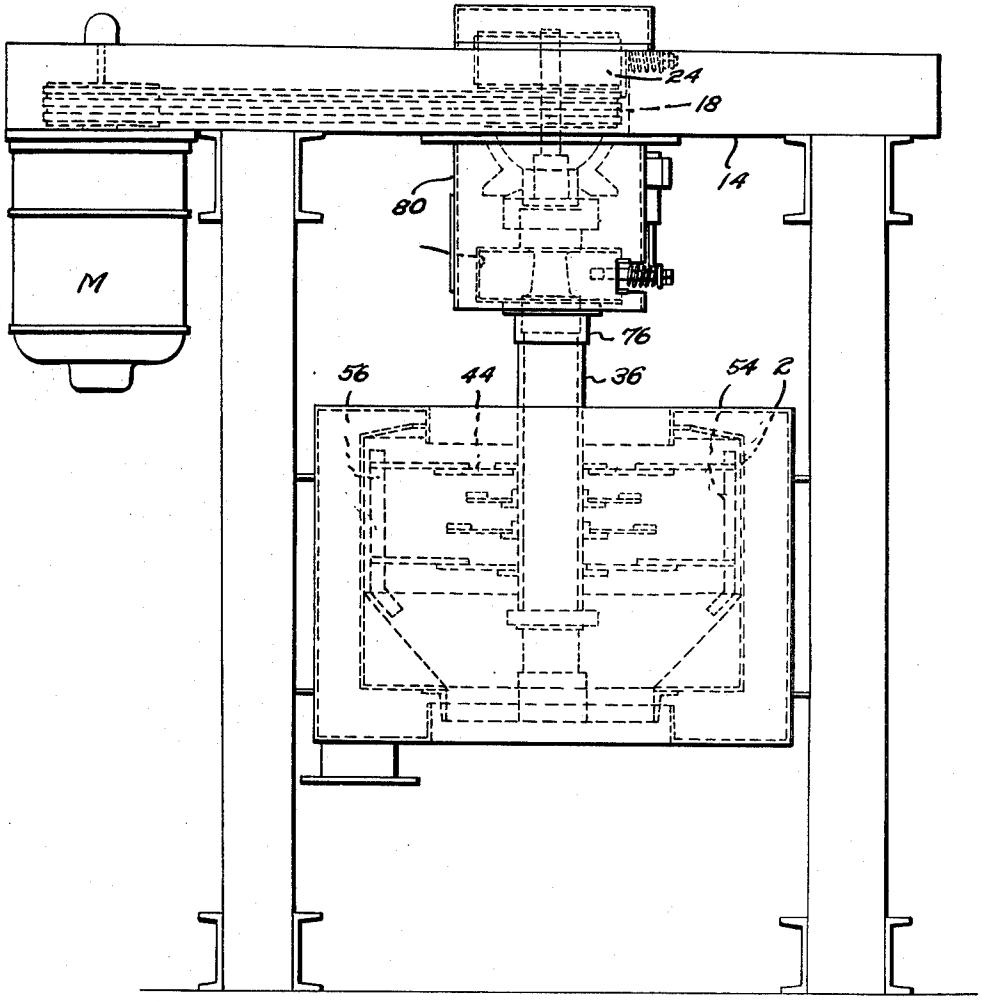
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CENTRIFUGAL CHIP EXTRACTOR MACHINE

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Fig. 2.



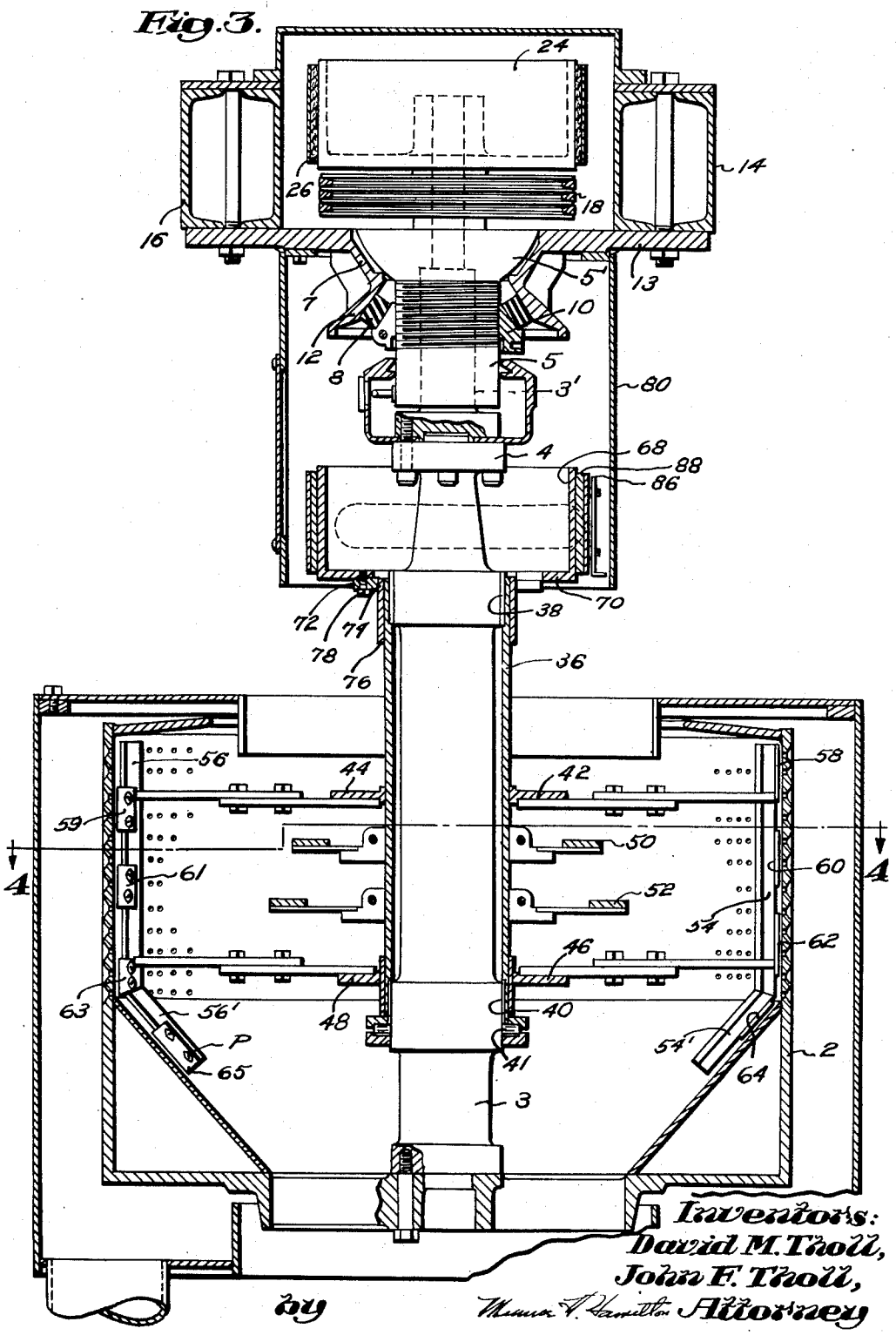
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CENTRIFUGAL CHIP EXTRACTOR MACHINE

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Fig. 3.



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Fig. 4.

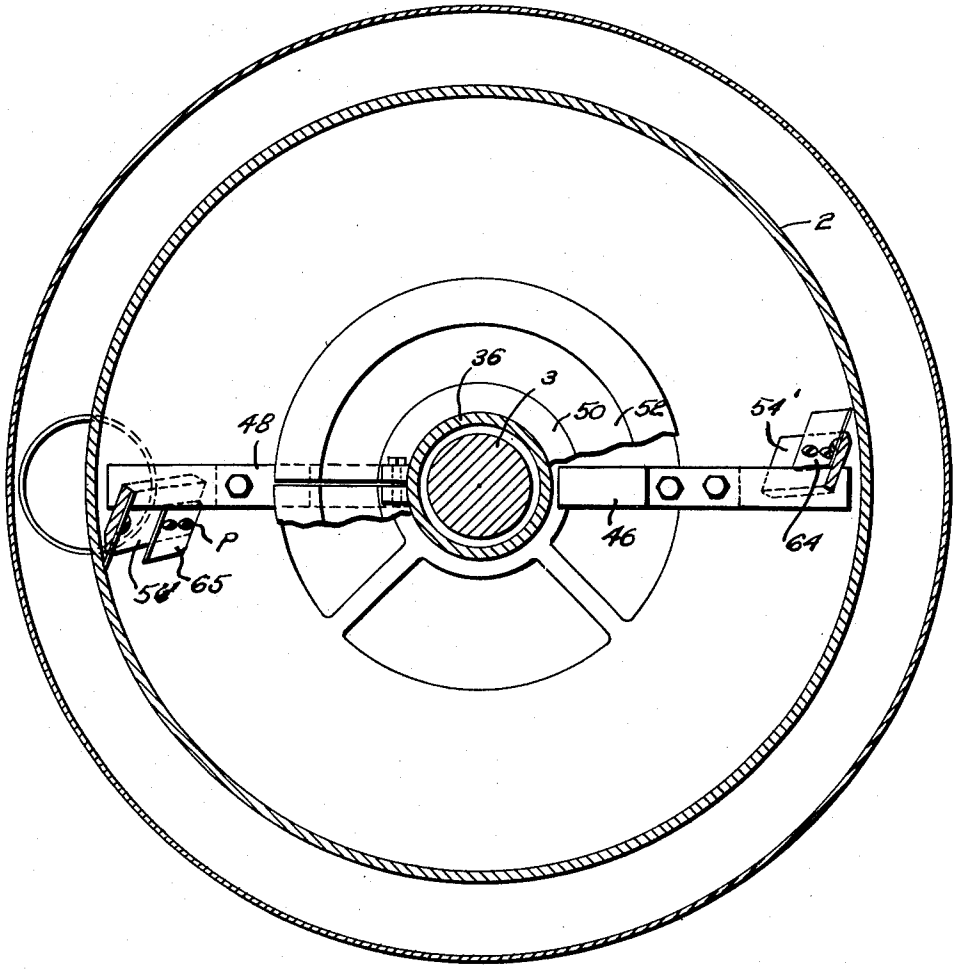


Fig. 5.

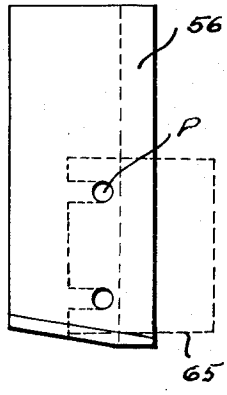
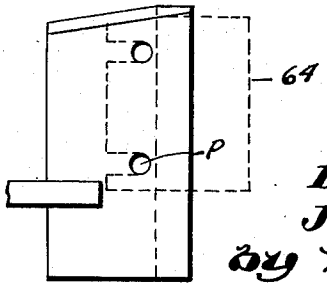


Fig. 6



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Fig. 7.

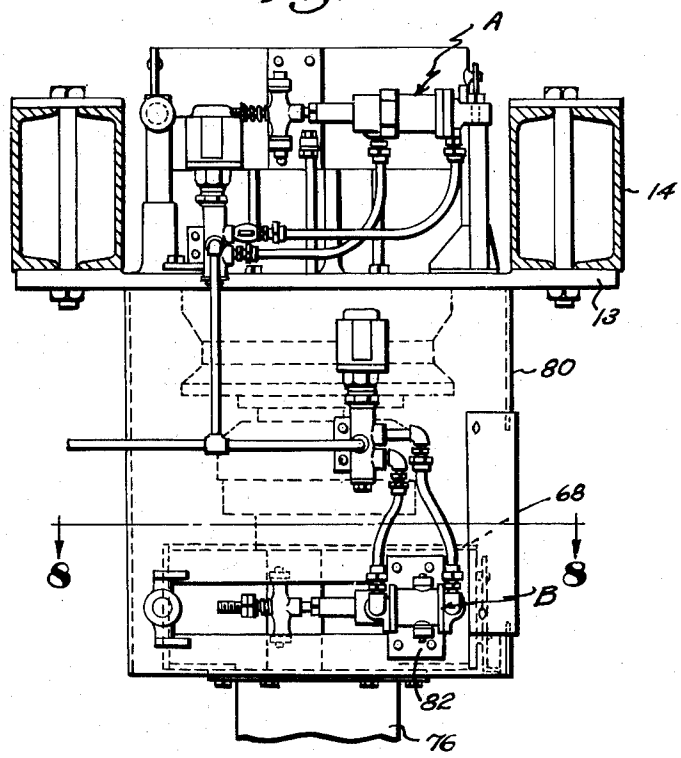
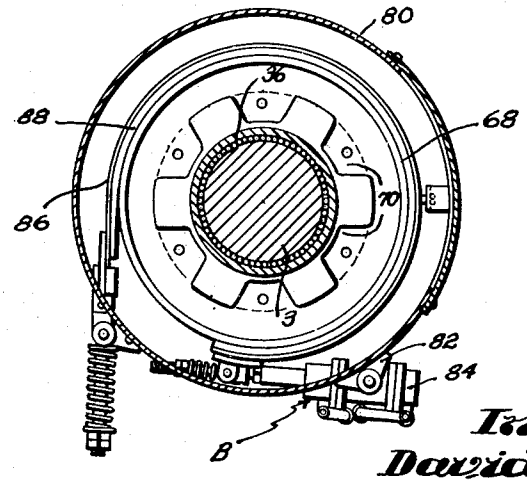


Fig. 8.



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CENTRIFUGAL CHIP EXTRACTOR MACHINE

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Application June 25, 1954, Serial No. 439,336

7 Claims. (Cl. 210—69)

This invention relates to centrifugal separators of the suspended basket class and, more particularly, the invention relates to an improved discharger shoe and suspension head assembly for use in positively displacing and discharging material which may collect on the inner peripheral surface of a basket member.

In one specific aspect, the invention deals with problems arising in connection with the separation of oil from oily mixtures of metal chips and other foreign bodies. As oil is centrifuged in the separator away from the metal chips, a relatively thick sludge tends to form and becomes deposited on the inner surface of the basket. Difficulty is experienced in satisfactorily displacing this sludge when the centrifuging operation is completed.

I am aware that various discharge shoe mechanisms are well known in the art, particularly those mechanisms of the class employed in centrifuging sugar mixtures and similar fluid bodies. However, these prior art structures require special control apparatus and they necessitate undesirable changes in the design of a centrifugal of the type desired to be employed in separating metal chips from oil.

It is an object of the invention to deal with the problem indicated and to devise an improved discharger shoe and suspension head assembly which can be quickly and cheaply built into an existing type of centrifugal and which will insure rapid and positive removal of sludge deposits of the type formed in the course of centrifuging metal chips and oil mixtures. Another object of the invention is to provide a discharger shoe apparatus which includes a unique braking means constructed and arranged to obviate the need for positive motivation of the discharger shoe blades. Still another object of the invention is to devise a discharger shoe and suspension head assembly which may be installed and operated in conjunction with a conventional type spindle drive and which may be employed without in any way interfering with the deflector plates commonly employed in these centrifugals for distributing material as it is loaded into the basket, against the walls of the basket.

The nature of the invention and its objects will be more fully understood and appreciated from the following description of preferred embodiments of the invention selected for purposes of illustration and shown in the accompanying drawings in which

Fig. 1 is a fragmentary plan view of the centrifugal of the invention showing portions of a pulley drive and brake means;

Fig. 2 is a view in end elevation further illustrating parts of the centrifugal and the discharger shoe mechanism of the invention;

Fig. 3 is an enlarged vertical cross-section of a spindle driven basket having combined therewith a discharger shoe and suspension head assembly;

Fig. 4 is a plan cross-section taken on the line 4—4 of Fig. 3;

Fig. 5 is a detail plan view of a discharger shoe element;

Fig. 6 is another detail view of a discharger shoe element;

Fig. 7 is a fragmentary side elevational view further illustrating a pair of braking mechanisms and respective air motor controls for these braking mechanisms; and

Fig. 8 is a plan cross-section taken on the line 8—8 of Fig. 7.

Referring more in detail to the structure shown in the drawings and, in particular, to Figs. 2 and 3, the basket, 2, is supported on the lower end of a shaft, 3, an upper section, 3', of which is connected by a coupling 4 (Fig. 3), and is supported in a suspension head assembly which includes certain parts of a known construction. Thus, as shown in Fig. 3, this assembly includes a non-rotating sleeve, 5, provided with an integral head, 5', the outer surface of which consists of a section of a sphere centered in the axis of the shaft, 3.

It will be understood that, at certain periods in the operation of a suspended basket centrifugal of the class indicated, the basket spindle has a strong tendency to gyrate and the suspension head shown in Fig. 3 includes a concave socket member, 7, supporting the head, 5', of the sleeve to permit such gyratory motion. In order to limit and cushion this action, an annular tapered elastic buffer, 8, is interposed between a tapered collar, 10, encircling the sleeve, 5, and a flaring skirt portion, 12, extending downwardly from the supporting frame piece, 13, attached to horizontally disposed beams, 14 and 16. Suitable bearing means of conventional construction are located within the sleeve, 5, to take a part of the thrust exerted by the load and to support the shaft or spindle radially.

In one preferred method of driving the shaft, 3, a pulley member, 18, is fixed to the upper end of the shaft shown in Fig. 3 and this pulley may be driven by belts, as 20 (Fig. 1), in turn engaged by a motor-driven pulley, 22, driven by an electric motor M. A brake drum, 24, which may be formed integrally or separately of the pulley, 18, is secured to the shaft, 3, and formed with a brake shoe, 26. This brake shoe, 26, is resiliently maintained against the drum and may be selectively controlled by an air motor device generally indicated by the arrow, A (Fig. 7). The air motor, A, is of conventional type, being connected to a source of compressed air and electrically controlled in the usual manner and is, therefore, thought to require no further description here. It is also pointed out that the suspension head assembly and the drive means so far described are much like similar mechanisms used heretofore.

In accordance with the invention, I combine with the parts above described a discharger shoe mechanism of specially devised construction and I incorporate this mechanism with the driven spindle and suspension head assembly in a manner carefully chosen so as to enable the various component parts thus combined to cooperate with one another in novel fashion.

My improved discharger shoe and suspension head combination is based on the novel concept of mounting discharger shoe blades directly on the basket spindle in such a manner that, during the loading and centrifuging operation, the blades may normally revolve with the basket. With such an arrangement, it has been found possible to incorporate a special braking device to selectively hold the discharger shoe blades in a stationary position at certain times while the basket is rotating, with the result that a highly efficient cleaning or scraping operation may be carried out. In this operation, there is employed only the driving means for the basket without the need for additional motivation of the discharger shoe blades.

As shown in Fig. 3, I locate around the spindle an annular discharger shoe holder which, in one preferred

embodiment, may consist of a cylindrical sleeve **36** supported on upper and lower sleeve bearings **38** and **40** and additionally supported at the lower end of the holder by a thrust bearing **41**. These sleeve bearings are fixed on the spindle **3** at the points indicated in Fig. 3 and adjacent body portions of the spindle **3** are enlarged to provide for using a sleeve diameter considerably larger than spindle diameters ordinarily employed at this point in machines of this class.

On the sleeve **36** are solidly secured radially extending bars **42**, **44**, **46** and **48** which may be suitably spaced apart, as shown at points above and below the conventional deflector plates **50** and **52** (Fig. 3). At the outer extremities of the bars noted are fastened, as by welding or other suitable means, vertically disposed discharger shoes **54** and **56** having inwardly extending bottom sections **54'** and **56'**. On these discharger shoes are located resilient steel scraper blades, as **58**, **59**, **60**, **61**, **62**, **63**, **64** and **65**. These resilient blades may preferably be detachably secured on pins, generally indicated by the letter P, in a manner such that the blades are caused to be resiliently held in sliding engagement with the inner peripheral surface of the basket **2**, as suggested in Fig. 3.

By means of the arrangement described, it will be seen that, when the spindle **3** is driven by its respective driving pulley **18**, it will normally tend to carry with it the sleeve member **36** and the attached discharger shoe components. In such case, it will be obvious that the bars **42**, **44**, **46** and **48**, as well as the vertically disposed discharger shoes, do not interfere or impede in any way movement of material to be centrifuged, either at the point where the material is being loaded into the basket or during the centrifuging operation. Especially it is pointed out that only a negligible degree of interference by the bars occurs as material drops on to the deflector plates **50** and **52** during the loading operation. It should be further realized and appreciated also that the presence of the discharger shoe components in no way interferes with the operation of the conventional spindle braking means and the spindle may be acted on by this braking means at any time and in the same manner as it would be without the discharger shoe mechanism installed.

As noted above, I further provide a special braking mechanism which is located on the spindle **3** at points just below the suspension head assembly. In this position, the special braking mechanism, I find, may cooperate with the pulley driving members for the spindle **3** to permit the pulley drive to operate and to be arrested by the conventional braking drum **24** and, yet, the holder sleeve **36** and its component discharger shoe parts may be locked in a stationary position when the spindle brake **24** is in a released position. This flexible independence of the braking mechanisms permits the spindle to start up from a position at rest and all of the different operations may be controlled from a common control center for both braking mechanisms. This constitutes a novel feature of importance, as will be hereinafter set forth more in detail.

Attention is again directed to Fig. 3 wherein is best shown an important component of the special braking apparatus consisting of a pulley **68**. This pulley member is of bowl-shaped construction and has a diameter substantially larger than that of the shaft **3** around which it is located. The bottom of this pulley member is recessed to define a central opening and a series of annularly spaced-apart lug portions **70**. These lug portions are supported upon correspondingly shaped lug portions **72** of an interrupted flange **74** secured around the upper end of sleeve **36** by means of a collar **76**. Fastenings, as bolts **78**, are threaded through the respective adjacent lugs of the flange and pulley and solidly secure the pulley to the sleeve **36**, as illustrated in Fig. 3.

It is pointed out that, in locating a pulley member in this particular position, a problem arises in assembling the pulley and, at the same time, being able to later disconnect the coupling **4** to permit repairs or replacement of parts, as frequently may be necessary in these machines. To deal with this problem, I have devised a complementary lug and slot arrangement in the flange **74** and the pulley bottom and I further form the lugs and the spaces between them of sizes so chosen that, when the bolts **78** are removed, the pulley may be rotated through an arc of, for example, 30° and the pulley lugs may then be moved downwardly through the corresponding openings of the flange **74** and the pulley is thereby lowered out of the way to permit access to the bolts of coupling **4**.

A further desirable feature of the construction described resides in the fact that the complete pulley and mounting is freely supported on the sleeve **36** and the vertical load may be adequately carried by the thrust bearing **41** without other mounting or bearing means. As a result of this simplified mounting of the pulley **68**, it is only necessary to provide a positive brake shoe means for engagement with the outer surface of the pulley. To accomplish this, I have also devised a cylindrical housing **80** which is rigidly suspended from the framepiece **13** and which extends downwardly around the pulley, as noted in Fig. 3. At one side of this housing, I mount a bracket **82**, best shown in Fig. 7, on which is received an air motor, generally indicated by the arrow B, of conventional character and connected to a source of compressed air common to the air motor for the brake **26**. This air motor B includes a plunger which is operatively connected to a spring-held brake band **86**, which engages around a brake shoe **88** on the pulley **68**. With the brake mechanism in the position described, it will be apparent that, by actuating the plunger and tightening the brake band **86** on its respective shoe **88**, the pulley **68** may be locked in a stationary position and, yet, the brake mechanism for pulley **24** may be separately released and the spindle **3** driven as desired and at varying speed such as are necessary.

It will be apparent that, upon locking the discharger shoe blades in a fixed position and thereafter rotating the basket **2**, the discharger shoe blades will act on the surface of the basket and dislodge any sludge or particles collected thereon so that this material may be ejected from the bottom of the basket.

In order to control these separate braking operations, as well as the intermittent driving of the basket, I may utilize various mechanical or electrically operated controls. In the preferred form of the invention shown in the drawings, I have utilized an electrical control which includes electrical circuits of a type commonly employed with air motors of the class described.

As an example of a typical operating sequence of the mechanism, and assuming that the basket is empty and ready to receive a batch of material to be centrifuged, the brake mechanisms for the spindle and the pulley **68** are released. Thereafter, a circuit is closed through the motor to drive the spindle and basket at a slow speed, for example, 360 R. P. M. During this rotative movement of the basket, material is loaded in to substantially fill the basket. Next, the rotative speed of the basket is increased, for example, up to 700 to 750 R. P. M. and the basket is run at this speed for a period of approximately two minutes to centrifuge oil out of the mixture.

The speed of the basket is then reduced to produce a regenerative braking action and, finally, all circuits are opened and the basket machine brake is set to insure the basket coming to a stop.

With all parts of the machine at rest, the discharger shoe brake mechanism may then be actuated to lock the discharger shoes in a stationary position. As soon as this is done, a circuit is closed through the motor to drive the basket for a short interval, which may produce perhaps only one revolution of the basket or more if

desired and, at this time, the blades act on the basket periphery to dislodge material.

Immediately thereafter, the spindle brake is applied long enough to bring the basket and spindle to a dead stop for a momentary dwell during which period the dislodged material will fall away from the basket.

From the foregoing description, it will be seen that I have provided a novel and effective mechanism for removing sludge and other deposits on the peripheral surface of a basket member of the type described and that this mechanism may be conveniently combined with existing machines with little change in the component parts and, finally, the arrangement is such that desirably new and simplified functions are realized, making use of the conventional driving and braking means available ordinarily on the centrifugals.

While I have shown and described a preferred embodiment of the invention, it will be understood that various changes and modifications may be resorted to in keeping with the spirit of the invention as defined by the appended claims.

What is claimed is:

1. In a centrifugal separator of the type having a power-driven spindle and a centrifugal basket suspended on the spindle and rotatable thereby about a vertical axis, the combination of a shoe-supporting member surrounding the spindle and rotatable relative to the spindle, a discharger shoe element secured to said supporting member in the basket and extending outwardly from said member into contact with the basket in position to scrape material therefrom, the shoe element and its supporting member being rotatable with the basket and spindle, a brake associated with the spindle for selectively braking and releasing the spindle, a second brake associated with said supporting member for selectively braking and releasing said member, and means for selectively operating said brakes independently of each other.

2. The combination according to claim 1, in which said supporting member is rotatably mounted on the spindle.

3. The combination according to claim 1, comprising also a thrust bearing on the spindle, said supporting member being mounted on the thrust bearing.

4. The combination according to claim 1, comprising also a stationary frame, a suspension head assembly supported on the frame and in which the spindle is rotatably mounted, the spindle brake including a brake pulley mounted on the spindle above the head assembly, and the second brake including a brake pulley mounted on said supporting member below the head assembly.

5. The combination according to claim 1, comprising also a stationary frame, a suspension head assembly supported on the frame and in which the spindle is rotatably mounted, and means releasably securing part of said second brake to said supporting member to permit access to the head assembly.

6. The combination according to claim 1, comprising also a stationary frame, a suspension head assembly supported on the frame and in which the spindle is rotatably mounted, the spindle extending downward from said assembly to the basket, a thrust bearing on the lower portion of the spindle within the basket, said supporting member being mounted at its lower end on the thrust bearing and extending upward therefrom toward the head assembly, said second brake including a brake pulley mounted on the upper portion of the supporting member.

7. The combination according to claim 1, comprising also a stationary frame, a suspension head assembly supported on the frame and in which the spindle is rotatably mounted, and a skirt depending from the frame and surrounding the head assembly, said second brake including a brake pulley mounted on said supporting member within the skirt, and brake mechanism coacting with said pulley and mounted on the skirt.

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