Nov. 24, 1959 W. E. NORVELL 2,914,176

BOLTER DRIVE MECHANISM

Filed Feb. 28, 1956

FIG. 3

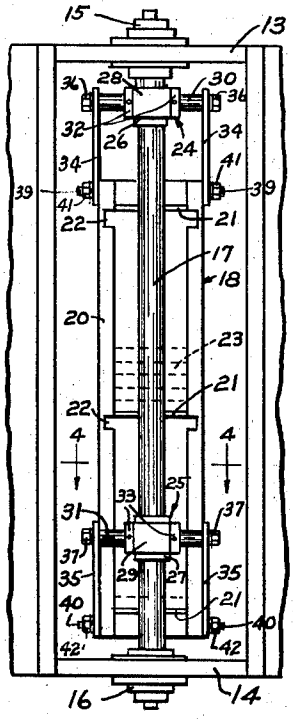


FIG. 2

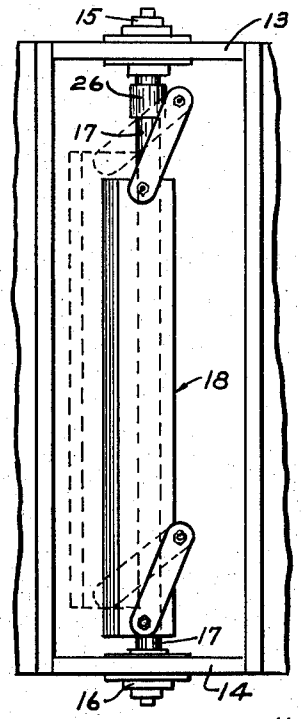


FIG. 4

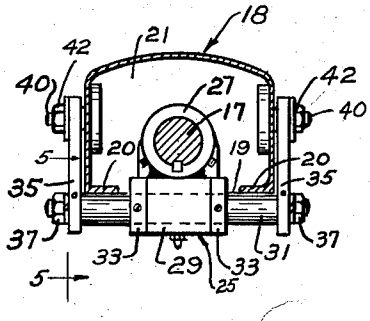


FIG. 6

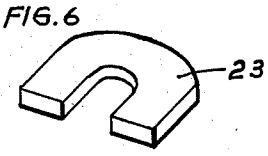


FIG. 1

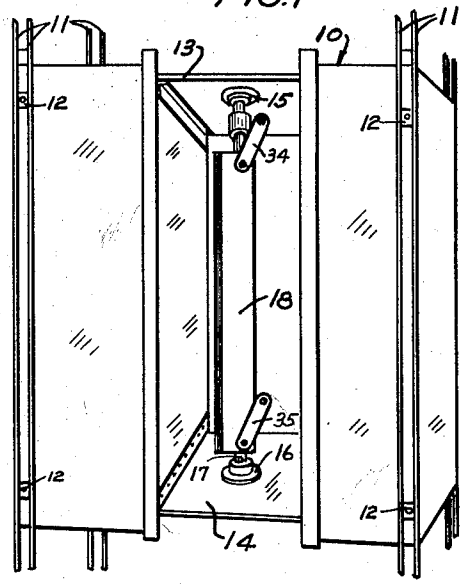
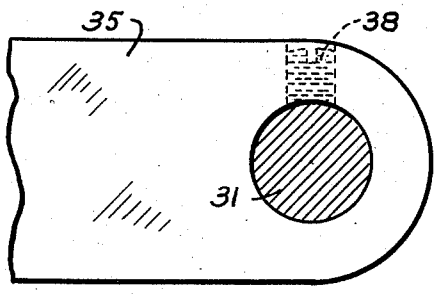


FIG. 5



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BOLTER DRIVE MECHANISM

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2 Claims. (Cl. 209—366.5)

This invention relates to bolters and sifters and more particularly relates to apparatus for imparting gyratory movement such to bolters and sifters.

Drive mechanism for oscillating bolters or sifters by moving them in gyratory patterns have taken several different forms in the past. Most of such bolter drive mechanisms have had certain distinct disadvantages. One such disadvantage is that many such drive mechanisms do not operate positively to produce the desired gyration of the bolter when the drive mechanism is first started. The gyration may move in extremely large circles at first before operating speeds are attained whereupon the bolter will ultimately settle down to a predetermined and desired size of gyration of movement. Another disadvantage of some drive mechanisms for bolters is that they are difficult to start into gyrations from a rotary motion, that is, after the drive mechanism is started the bolter will not be positively caused to gyrate at a predetermined speed each time the drive mechanism is started. Another distinct disadvantage of some types of drive mechanisms for gyrating bolters, is that control apparatus for varying the diameter of the circle of gyration is somewhat difficult to adjust so that the desired diameter of the gyration circle may be obtained with a high degree of accuracy and it has also been experienced that some such control apparatus will go out of adjustment after the apparatus has initially been set.

With these comments in mind it is to the elimination of these and other disadvantages that my invention is directed along with the inclusion therein of other novel and desirable features.

An object of my invention is to provide a drive mechanism of simple and inexpensive construction and operation for shaking a flexibly suspended bolter or sifter body.

Another object of my invention is the provision of a novel rotary mechanism for shaking a flexibly suspended bolter body which will start the bolter body to gyrate in small circles of gyration at low speeds and will progressively enlarge the circles of gyration and therefore the shaking of the bolter body as the rotary speed increases.

Still another object of my invention is to provide a new drive mechanism which is adapted to vigorously shake a flexibly suspended bolter body and which is readily and easily adjustable to change the diameter of circular gyratory movement of the bolter body to change the shaking thereof.

A further object of my invention is the provision of a bolter shaking drive mechanism which is adjustable to vary the degree of shaking of the bolter body and which is of extremely rugged construction to prevent the mechanism from going out of adjustment after the magnitude of shaking has been initially set.

A still further object of my invention is to provide a rotary bolter drive mechanism adapted to vigorously shake a flexibly suspended bolter body and constructed in such a manner that the bolter is shaken to the desired degree each time the drive mechanism is operated.

These and other objects and advantages of my invention

will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to the same parts throughout the several views and in which:

Fig. 1 is a perspective view of a bolter or sifter body having the invention mounted thereon;

Fig. 2 is a detail elevation view of a portion of the mechanism shown in Fig. 1;

Fig. 3 is a detail elevation view of the same mechanism shown in Fig. 2 wherein said mechanism is rotated 90 degrees so as to effectively show a right side elevation view of a portion of the mechanism shown in Fig. 2;

Fig. 4 is a detail transverse section view of a portion of the mechanism shown in Figs. 2 and 3 and taken on a substantially horizontal plane as indicated at 4—4 of Fig. 3;

Fig. 5 is a detail section view of a portion of the mechanism as indicated at 5—5 in Fig. 4; and

Fig. 6 is a detail perspective view of a weight to be carried in the mechanism shown in Figs. 2–4.

One embodiment of the present invention is shown in the figures and described herein. The bolter or sifter body which is indicated in general by numeral **10** is provided with means for flexibly suspending the body and in the form shown such means include a plurality of flexible slats or reeds **11** which are vertically disposed and secured to the bolter body by means of brackets **12**. The lower ends of the reeds **11** may be suitably secured to fixed mounting structure for supporting the bolter body. The bolter body is free to shift in horizontal directions to a limited extent as is conventional in the mounting of many types of bolters.

The bolter body **10** is provided with upper and lower mounting portions or bridge trees **13** and **14** which have bearings **15** and **16** respectively secured therein. A rotary drive shaft **17** is journalled in bearings **15** and **16** for rotation about a vertical axis which extends substantially centrally through the bolter body. The rotary drive shaft **17** may be connected to a suitable source of rotary driving power for rotating the shaft about its vertical axis.

The present invention includes means for vigorously shaking the bolter body and for producing the shaking by moving the body in a substantially circular gyratory pattern. Such means include an elongated substantially channel-shaped carrier or weight bucket indicated in general by numeral **18**. The carrier **18** is disposed adjacent the rotary drive shaft **17** with the open side **19** of the channel shape thereof facing the drive shaft **17**. The carrier **18** is provided with inwardly turned lips or flanges **20** adjacent the opposite sides thereof and being spaced apart for receiving the rotary drive shaft therebetween. The carrier **18** is provided with a plurality of weight-supporting shelves or plates **21** which are respectively disposed adjacent the upper and lower ends of the carrier and midway of the length of the carrier. As best seen in Fig. 3, the inturned lips or flanges **20** are provided with a plurality of recesses **22** therein.

Substantially U-shaped weights **23**, as best seen in Fig. 6 are insertable into the interior of carrier **18** to be removably mounted therein on the weight-supporting shelves or plates **21** in the manner indicated in dotted lines in Fig. 3.

Means are provided for movably mounting the carrier **18** upon the rotary drive shaft **17** and for restricting circumferential movement of the carrier or any portion thereof relative to the drive shaft **17**. In the form shown, such mounting means include a pair of upper and lower mountings indicated in general by numerals **24** and **25**. The mountings **24** and **25** are substantially identical to each other and include mounting sleeves **26** and **27** which are keyed to the drive shaft **17** adjacent the upper and lower ends thereof and are also secured to the drive shaft by set screws to restrict movement of the sleeves longitu-

dinally of the shaft. The mounting sleeves **26** and **27** have bearing sleeves **28** and **29** respectively affixed thereto and disposed transversely thereof. A pair of upper and lower link shafts **30** and **31** are respectively journalled in the upper and lower bearing sleeves **28** and **29** for rotation about parallel axes extending transversely of the rotation axis of drive shaft **17**. The link shafts **30** and **31** are provided with collars **32** and **33** which are respectively secured thereto on opposite ends of the bearing sleeves **28** and **29** for preventing any longitudinal movement of the link shafts. Collars **32** and **33** are affixed to the corresponding link shafts as by set screws.

The upper and lower mountings **24** and **25** include parallel links **34** and **35**. Each of the links **34** is rigidly secured or affixed to the opposite ends of link shaft **30** as by nuts **36** which are secured upon the ends of shafts **30** and bear firmly against the links **34**. The links **35** are similarly rigidly affixed to the opposite ends of link shaft **31** as by securing nuts **37**. As best seen in Fig. 5, a set screw **38** may be provided in the link **35** bearing against the link shaft **31** to restrict relative rotary movement of the link shaft and the links. The link **34** may be similarly non-rotatably affixed to the link shaft **30**.

The outer ends of the links **34** and **35** are swingably secured to the upper and lower end portions respectively of the carrier **18**. The carrier **18** is provided at the upper and lower ends thereof with mounting studs **39** and **40** upon which the outer ends of the links **34** and **35** may be mounted and secured thereon by means of nuts **41** and **42**.

Operation

In operation, the rotary drive shaft **17** will be connected to a source of rotary power. As the speed of the source of power progressively increases, the rotary shaft **17** will progressively increase in rotary speed from its stop or standing position to rotary speeds. While the rotary shaft **17** is in a stationary condition and while rotating at low speeds, the carrier **18** having weights therein will be disposed close to the shaft **17** so that the combined centers of gravity and the weights therein are disposed in close proximity with the shaft **17**. The shaft **17** will rotate and the carrier **18** will remain closely adjacent thereto. As the shaft **17** accelerates or progressively increases in speed, centrifugal force against carrier **18** will cause the same to gradually swing outwardly away from shaft **17** so as to dispose the combined centers of gravity of carrier **18** and the weights therein outwardly away from the rotation axis of shaft **17**. Because the links **34** and **35** are rigidly affixed to their respective link shafts **30** and **31**, there will be a smooth and gradual uniform shifting of the carrier from the drive shaft. No portions of the carrier **18** are permitted to move circumferentially with respect to the drive shaft **17**. As a result of carrier **18** swinging outwardly from the drive shaft **17**, the drive shaft **17** and the bolter body will move in a substantially circular gyratory pattern about vertical axes spaced from the rotation axis of rotary shaft **17**. As the rotary speed of drive shaft **17** increases, the carrier **18** will swing outwardly to a greater distance from drive shaft **17** and the diameter of the circular gyratory movement of the bolter body will progressively increase so as to increase the shaking of the bolter body and the contents thereof. Because the rotary drive shaft **17** is disposed at the exact center of the bolter body and because the carrier **18** gradually moves outwardly from the drive shaft as the rotary speed is increased, the gyratory movement of the bolter body will increase in a regular and smooth manner and there will be substantially no erratic movement of the gyratory or shaking movement of the bolter body as the shaft **17** is brought up to operating rotary speeds.

It has also been found that after operating speeds have been attained the bolter body will move in a gyratory pattern which is regular and uniform. Furthermore, when the rotary drive shaft **17** is slowed or decelerated from operating speeds to a stopped condition, there will be substantially uniform decrease in the diameter of gyratory movement of the bolter body and erratic movement thereof during the stopping operation is kept at an absolute minimum. The rigid swinging connection between the rotary drive shaft **17** and the carrier **18** contributes very substantially to the effecting of the smooth and uniform increase and decrease in gyratory movement of the bolter body as the drive shaft **17** and carrier **18** are progressively accelerated and decelerated.

It has been found that different materials require different amounts of shaking by the bolter. In order to adjust the vigorousness of the shaking operation performed by the bolter, certain of the weights **23** may be removed from the carrier **18** or added thereto so as to change the amount of weight carried by carrier **18** and swinging around the drive shaft **17**. By changing the number of weights carried by the carrier **18**, the diameter of the substantially circular gyratory movement of the bolter body will be changed so as to change the magnitude of shaking oscillation of the bolter body.

The weights **23** will be inserted into the carrier through the slots **22** in the inturned lips or flanges **20** thereof and will be stacked upon the supporting shelves **21**. It should be noted that the weights **23** are substantially U-shaped so as to permit the carrier **18** to swing into close proximity with the drive shaft and to substantially surround the same when the drive shaft is stopped or moving at a slow speed.

It will be seen that I have provided a new and improved bolter or sifter having drive mechanism for producing a substantially circular gyratory movement of the bolter body and which mechanism is constructed so as to produce smooth and uniform increases and decreases in the gyratory movement of the bolter body as the rotary speed of the drive shaft is accelerated and decelerated and which mechanism is constructed so that the diameter of the substantially circular gyratory movement may be readily and easily adjusted by adding or removing weights to the carrier and that after the adjustment has initially been made based upon the requirements of the material handled by the bolter, the mechanism will not go out of adjustment due to the shaking action produced.

It will, of course, be understood that various changes may be made in the form, detail, arrangement and proportion of the parts without departing from the scope of my invention which consists of the matter described herein and set forth in the appended claims.

What I claimed is:

1. A bolter comprising a flexibly suspended bolter body having upper and lower shaft mounting portions, an upright rotary drive shaft journaled in said portions for rotation about an upright axis, said drive shaft being connectable with a source of rotary driving power, an upright weight carrier formed of relatively thin sheet material, said weight carrier being substantially U-shaped and including a pair of inwardly turned flanges at opposite sides thereof, said flanges being spaced apart for receiving the rotary drive shaft therebetween, said weight carrier being normally disposed in substantially surrounding relationship to said drive shaft when the apparatus is at rest, a first bearing sleeve and a second bearing sleeve connected to said drive shaft at spaced points therealong, each of said bearing sleeves extending transversely of the longitudinal axis of said drive shaft, a first link shaft rotatably journaled in said first bearing sleeve, a second link shaft rotatably journaled in said second bearing sleeve, means preventing longitudinal movement of said link shafts relative to the associated bearing sleeves, a first pair of links having one end thereof rigidly secured to the opposite ends of said first link shaft, and a second pair of links having one end thereof rigidly secured to the opposite ends of said second link shaft, the opposite ends of said first pair of links being pivotally connected to the upper end portion of said weight carrier, the op-

posite ends of said second pair of links being pivotally connected to the lower end portion of said weight carrier, whereby the weight carrier is adapted to pivot outwardly away from said drive shaft about the axes of said first and second link shafts and relative circumferential movement, between said drive shaft and said weight carrier is prevented, shelf means supported within said U-shaped weight carrier for mounting weights in the weight carrier, at least one pair of recesses formed in said flanges for inserting weights to said weight carrier, and a plurality of flat substantially U-shaped weights supported within said weight carrier, said weights being substantially symmetrical and including a pair of leg portions, said weights being mounted within the weight carrier such that when the apparatus is at rest, said leg portions lie adjacent diametrically opposite portions of the drive shaft such that the weight members are in partially surrounding relationship to the drive shaft and the center of gravity of the drive shaft and bolter at low rotary speeds of the rotation of said drive shaft whereby at low speeds of rotation of the drive shaft, the centrifugal force generated by the weights is quite small thereby restricting gyration

of the drive shaft and bolster at low rotary speeds of the drive shaft and progressively increasing the gyratory movement of the drive shaft and bolter as the drive shaft accelerates toward operating speed.

2. Apparatus as defined in claim 1, wherein said shelf means comprises a plurality of shelves supported within said U-shaped weight carrier at vertically spaced portions thereof, and a plurality of recesses formed in said flanges for inserting weights on the various shelves to accordingly adjust the vertical distribution of the weights within the weight carrier.

References Cited in the file of this patent

UNITED STATES PATENTS

883,526	Combs	Mar. 31, 1908
946,716	Brantingham	Jan. 18, 1910
1,095,797	Brantingham	May 5, 1914
1,104,870	Brantingham	July 28, 1914
1,142,146	Combs	June 8, 1915
2,516,207	Hartwig	July 25, 1950

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

November 24, 1959

Patent No. 2,914,176

William E. Norvell

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 19, strike out "drive shaft and bolter at low rotary speeds of the", and insert instead -- weights is disposed closely adjacent the axis of --; column 6, line 1, for "bolster" read -- bolter --.

Signed and sealed this 17th day of May 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents