June 19, 1962 A. W. LIPPMANN 3,039,609

POSITIVE MOTION HORIZONTAL SCREEN SHAFT ASSEMBLY

Filed July 6, 1959 3 Sheets-Sheet 1

Fig. 1

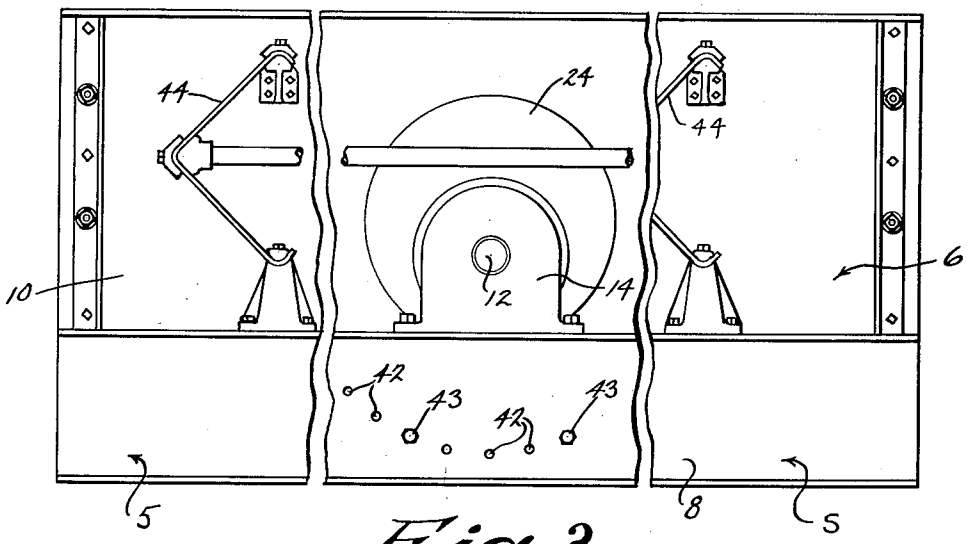
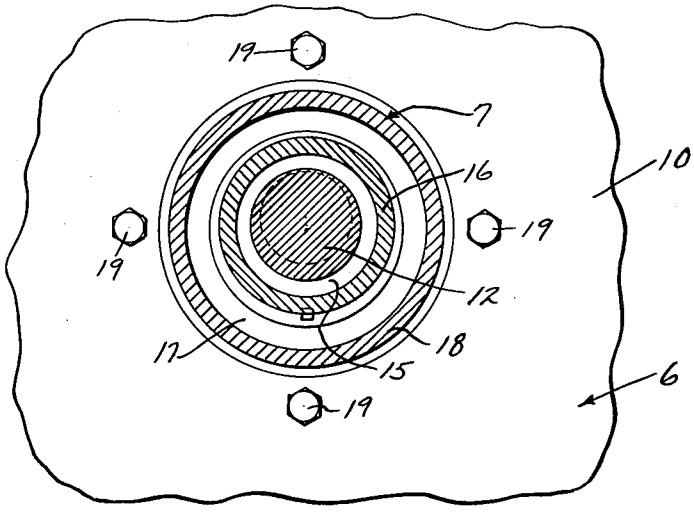


Fig. 3



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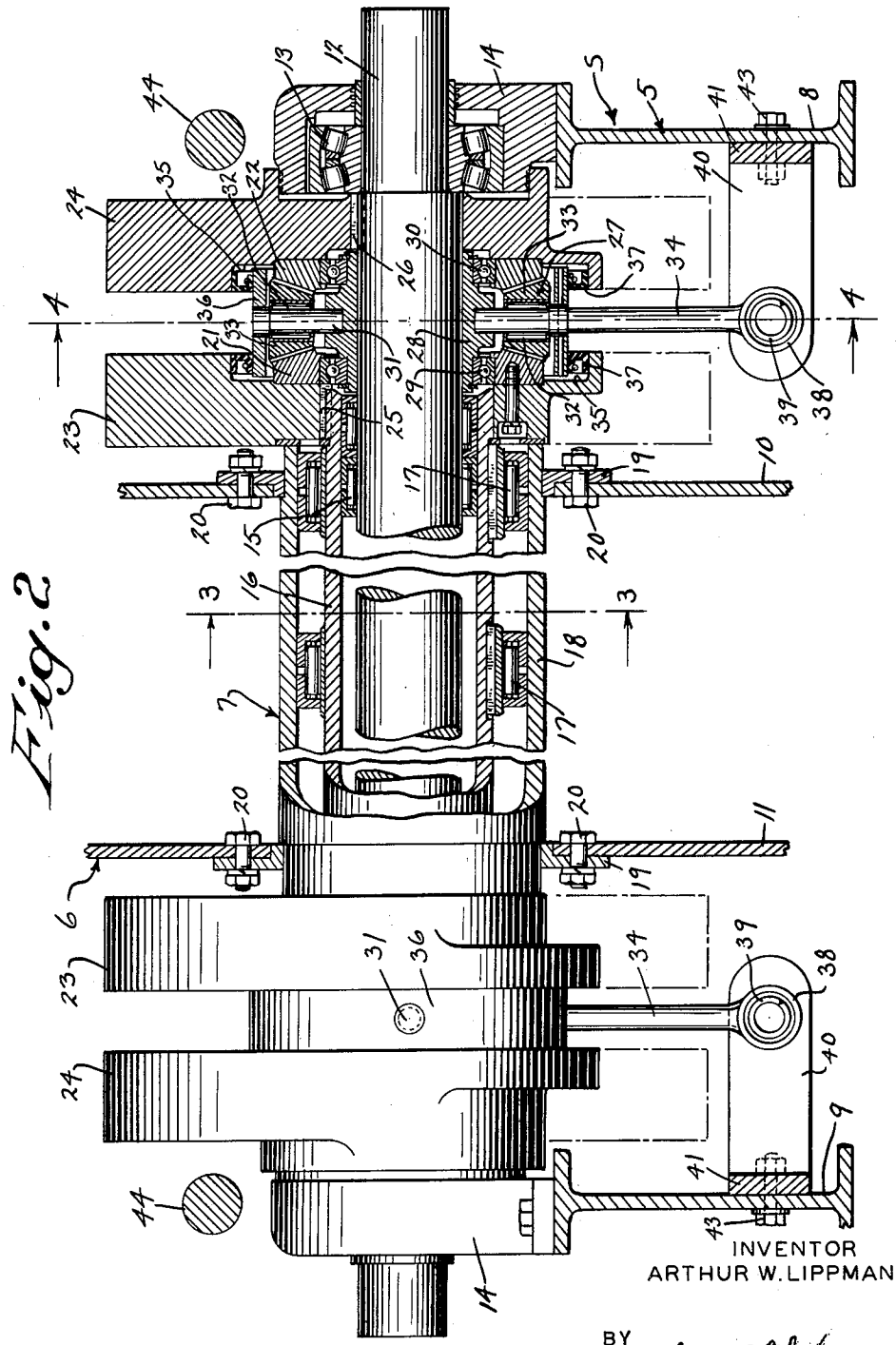


Fig. 2

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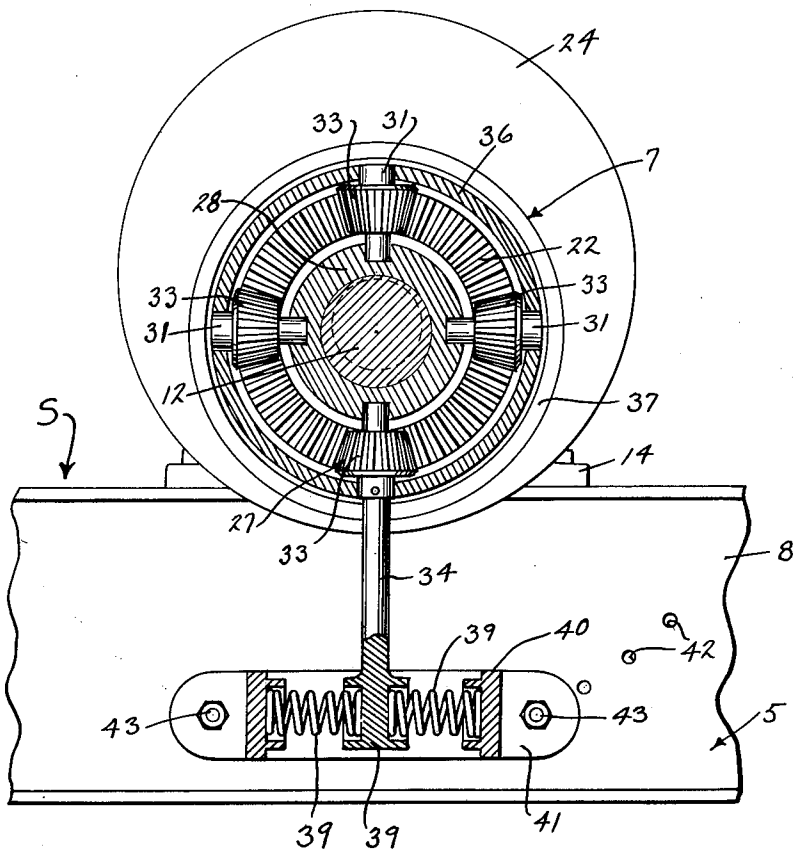
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POSITIVE MOTION HORIZONTAL SCREEN SHAFT ASSEMBLY

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Fig. 4



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United States Patent Office 3,039,609 Patented June 19, 1962

3,039,609

POSITIVE MOTION HORIZONTAL SCREEN SHAFT ASSEMBLY

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Filed July 6, 1959, Ser. No. 825,340
3 Claims. (Cl. 209—341)

This invention appertains to vibrating screens of the type employed for sifting, screening and grading various kinds of materials.

It is customary to employ vibrating screens having a body for supporting the screen decks mounted on a sub-frame with means for imparting an eccentric vibrating movement to the body. With this type of screen, it is necessary to mount the screen at an angle to the horizontal, so that the material will work its way to the lowest ends of the screen decks. This does not always result in the best grading and screening of the material, in that the material has a tendency to travel at too fast a rate on the inclined screen body. Hence, in numerous installations, it is desirable to have the screen mounted in a horizontal plane instead of at an angle to the horizontal, so that a better screening and grading of material is assured. However, with a horizontal screen, the problem of removing the screened and graded material from the decks is a difficult one.

One of the primary objects of my invention is to provide a horizontal screen with means for imparting a novel motion to the screen body, whereby the material on the screen decks will be given a desired bounce in a direction toward one end of the body, so that the material will automatically work its way off of the decks and be efficiently graded and screened during its travel.

Another salient object of my invention is to provide means for imparting a straight line motion to the screen body by a novel arrangement of a power driven eccentric shaft and a power driven eccentric tube mounted on the eccentric shaft, the tube in turn being rotatably mounted in an outer tube or casing carrying the screen body, the compound motion of the eccentric shaft and the eccentric tube giving the desired motion to the outer tube and screen body.

A further important object of my invention is the provision of novel means for mounting the eccentric shaft, the eccentric tube and the outer driven tube or casing relative to one another with a novel means for driving the eccentric tube from the power driven shaft at an even rate with the eccentric shaft.

A still further important object of my invention is the provision of a novel arrangement of counter-balancing weights carried by the eccentric shaft and the eccentric tube relative to the drive for the eccentric tube from the shaft.

With these and other objects in view, the invention consists in the novel construction, arrangement and formation of parts, as will be hereinafter more specifically described and claimed, and illustrated in the accompanying drawings, in which drawings,

FIGURE 1 is a side elevational view of one preferred form of my horizontal screen;

FIGURE 2 is an enlarged fragmentary central transverse sectional view through the screen illustrating the novel shaft and tube assembly;

FIGURE 3 is a transverse sectional view through the shaft assembly taken on the line 3—3 of FIGURE 2, looking in the direction of the arrows, the view illustrating the eccentricity of the power driven shaft and intermediate tube, and

FIGURE 4 is a transverse sectional view through the shaft assembly taken on the line 4—4 of FIGURE 1,

looking in the direction of the arrows, the view illustrating the novel drive employed between the eccentric power driven shaft and the eccentric intermediate tube.

Referring to the drawings in detail, wherein similar reference characters designate corresponding parts throughout the several views, the letter S generally indicates my novel horizontal screen assembly.

The screen assembly S includes a stationary sub or base frame **5**, a screen body **6** and my novel shaft and drive assembly **7** for operating and supporting the body **6** from the sub or base frame **5**.

In accordance with my invention, the base frame **5** is arranged in a horizontal plane and can be constructed in any preferred way and from any desired material. As illustrated, the frame includes a pair of spaced parallel side beams **8** and **9**. The beams can be of any desired type, such as I beams, as shown, channel beams or the like. The beams **8** and **9** are rigidly and firmly connected together in any desired way, and can be rigidly and firmly mounted on any type of supporting structure.

The screen body **6** can also be constructed in any preferred way and as illustrated, includes a pair of spaced parallel longitudinally extending side plates **10** and **11**. The side plates **10** and **11** can be rigidly secured together and in their desired spaced relation, and braced and reinforced as preferred to provide a rigid rugged structure. The side plates **10** and **11** also carry any preferred number of screen decks (not shown).

My novel drive and shaft assembly **7** includes a centrally disposed drive shaft **12**. The terminals of the shaft **12** are rotatably mounted in suitable bearings **13** mounted in bearing housings **14** rigidly secured to the upper faces of the side beams **8** and **9**. The portion of the shaft **12** between the bearings **13** is eccentric, i.e., the same has an eccentric throw portion, best shown in FIGURE 3. This shaft carries at spaced points anti-friction bearings **15** for rotatably supporting an intermediate drive or eccentric tube **16**. The throw of the tube is best shown in FIGURE 3, and by referring to this figure, it can be seen that the eccentricity of the shaft **12** and the tube **16** is the same. However, it is to be understood, that the shaft **12** and the tube **16** can be of different eccentricities. The shaft **12** is power driven in any preferred way from a desired type of prime mover (not shown). Anti-friction bearings **17** are eccentrically carried by the intermediate tube **16** and mounted on these bearings **17** is the outer center tube or casing **18**. The outer center tube or casing **18** has rigidly fastened thereto mounting brackets **19** and these brackets are in turn rigidly bolted, as at **20**, to the side plates **10** and **11** of the screen body **6**.

Means is provided for driving the intermediate tube **16** from the power driven shaft **12** and in a direction opposite to the direction of rotation of the shaft **12**. This drive shaft can be at one end of the shaft **12** only, but similar driving means from the shaft to the tube **16** can be employed at each side of the screen **5**. Where the driving means is at each side of the screen, the same will be identical and hence only one of such driving means will be described. It can be seen, however, that adjacent to each end of the shaft **12** is arranged a pair of facing beveled ring gears **21** and **22**. These ring gears are rigidly carried respectively by facing counterbalanced throw wheels **23** and **24**. The counterbalanced throw wheel **23** is keyed as at **25**, to the intermediate tube **16** and the counterbalanced throw wheel **24** is keyed, as at **26**, to the shaft **12**. Arranged between the facing beveled ring gears **21** and **22** is a spider **27** and this spider includes a hub **28** mounted for free independent movement of the shaft **12**. The ring gears **21** and **22** carry suitable anti-friction bearings **29** and **30** for the hub **28**. Projecting radially from the hub **28** is a plurality of stub shafts **31**

and these stub shafts have rotatably mounted thereon by means of bearings **32**, beveled drive pinions **33** which constantly mesh with the ring gears **21** and **22**. One of the stub shafts can be extended downwardly to form a restraining bar **34**. The restraining bar will be later more clearly set forth, but the same functions to prevent rotation of the hub **28** and its stub shafts **31**.

The entire assembly at different desired points is provided with suitable dust seals, lubricant retaining seals and the like. Particular attention is called, however, to the arrangement of the counterbalancing wheels **23** and **24**, relative to the drive between the shaft **12** and intermediate tube **16**. As best shown in FIGURE 2, the inner faces of the counterbalancing wheels **23** and **24** are provided with cavities **35** in which are fitted the ring gears **21** and **22**. The outer terminals of the stub shafts **31** carry an annular band **36** which extends into the cavities and seals **37** are interfitted between the outer walls of the cavities **35** and the outer face of the band **36** so that an efficient dirt and grease seal will be had for the drive. The construction of the spider **27**, as shown, is by way example only and in actual practice, the hub can be provided with spokes and these spokes can have formed thereon the band **36**. Likewise, the restraining bar **34** need not be an extension of one of the pinion shafts **31**.

From the description so far, it can be seen that the shaft **12** is rotated in a desired direction, say in a clockwise direction, FIGURES 3 and 4, and the rotation of this eccentric shaft will impart an oscillating vibrating motion to the intermediate tube **16**. The counterbalancing wheel **24** and its ring gear **22** will be driven in a clockwise direction, and the rotation of the ring gear will impart rotation to the pinions **33** and the pinions in turn will impart rotary movement to the ring gears **21**, the counterbalancing wheel **23** and tube **16** is a counter-clockwise direction, and in a direction opposite to the shaft **12**. The intermediate tube **16** is given its oscillating vibrating movement by the shaft **12**, as stated, and a rotary movement by the drive and as the tube **16** is eccentric a compound movement will be imparted to the outer center tube **7** and the screen body **6** and this movement is translated into a so-called straight line motion. Material on the screen decks by this straight line motion back and forth will be given a desired bounce and a bounce in one direction of the screen body **6**.

Now referring back to the restraining bar **34**, the same is provided at its lower outer end with a head **38**, and the opposite sides of the head are engaged by cushioning devices, such as coil springs **39**. The outer ends of the coil springs are received in arms **40** carried by a bracket plate **41**. The bracket plate **41** can be adjustably mounted on its base or sub frame I beam. Hence, each beam **8** and **9** is provided with a series of bolt holes **42** and the bracket plate **41** by means of bolts **43** can be adjustably secured in place. The bolts **43** can be placed in selected openings **42**. The bolt holes **42** are laid out on an arc of a circle and in the direction of feed of the material being graded and screened. By adjusting the bracket, the spider assembly with its pinions **33** can be bodily moved on the eccentric shaft to obtain a desired direction of throw between the counterbalancing wheels **23** and **24**. The restraining bar **34** can be connected with the sub frame **5** in different manners, such as by a pivoted link.

Between the sub or base frame **5** and the screen body **6** is arranged any desired type of stabilizing mechanism **44**. The stabilizing mechanism **44** can be of the type shown and claimed in my Patent No. 2,456,791 issued to me Dec. 21, 1948, and hence this stabilizing mechanism **44** will not be described in detail. It is to be understood, of course, that the screen body **6** can be mounted on the sub frame **5** by any other desired type of stabilizer, such as coil springs, air springs or bags, rubber cushion blocks etc.

From the foregoing description, it can be seen that I have provided an efficient but simple form of means for imparting a desired straight line motion to a screen body, whereby the screen body can be arranged in a horizontal plane to bring about a more efficient screening and grading function.

Changes in details may be made without departing from the spirit or the scope of this invention, but what I claim as new is:

1. A screen comprising a base frame, a screen body on said base frame, and means for supporting and imparting a straight line motion to the screen body including a transversely extending power driven eccentric shaft rotatably carried by the base frame, an outer center tube housing the shaft and rigidly secured to the screen body, an intermediate eccentric tube rotatably mounted on the shaft and rotatably mounted within the outer center tube, means for driving the eccentric tube from the shaft but in a reverse direction from said shaft including a pair of facing beveled ring gears, a pair of counterbalanced wheels secured respectively to the shaft and to the intermediate eccentric tube, means connecting one ring gear to one counterbalanced wheel and means securing the other ring gear to the other counterbalanced wheel, a spider between said ring gears including a hub rotatably mounted on the counterbalanced wheels, stub shafts radiating from the hub, and pinions rotatable on the stub shafts meshing with the ring gears.

2. A screen as defined in claim 1, and an outer annular band carried by the spider, and seals between the band and the counterbalanced wheels.

3. A screen as defined in claim 1, and an outer annular band carried by the spider, the facing portions of said counterbalanced wheels having cavities receiving the edges of the band, and seals between walls of the cavities and the band.

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