Feb. 6, 1951 M. A. GLASCO 2,540,517

PAPER STOCK SCREENING APPARATUS

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Fig. 1.

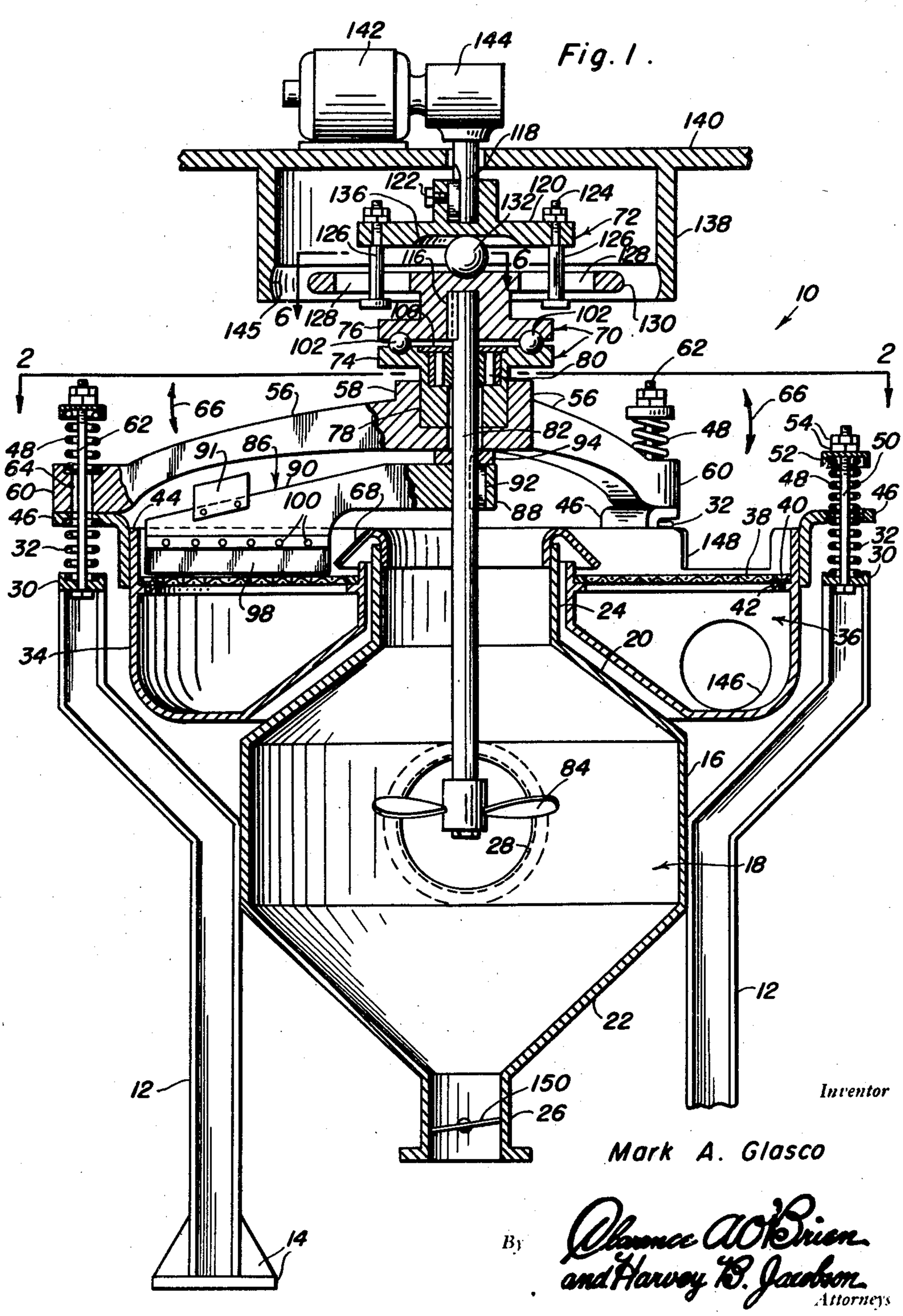

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Fig. 2.

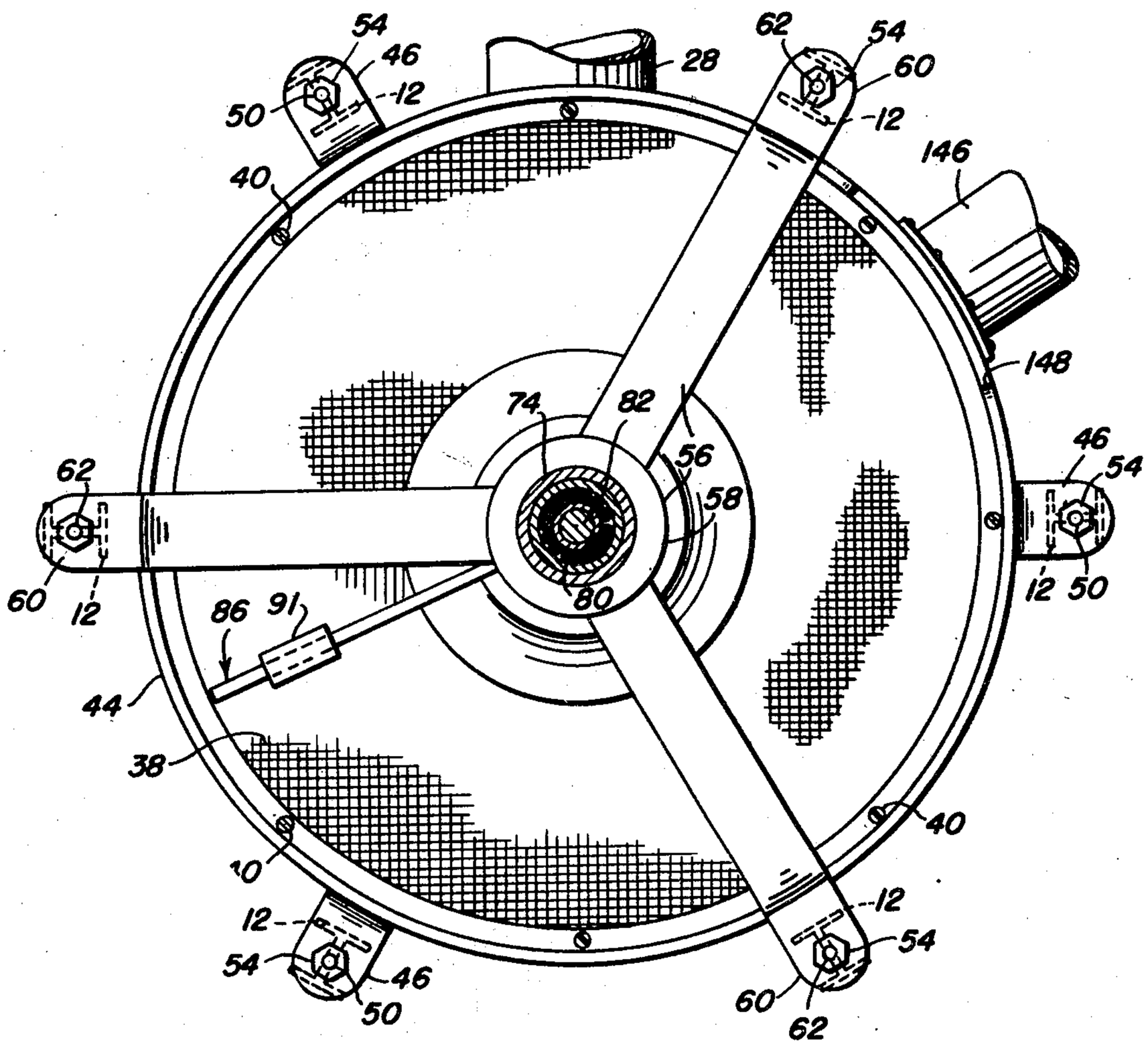

Fig. 7.

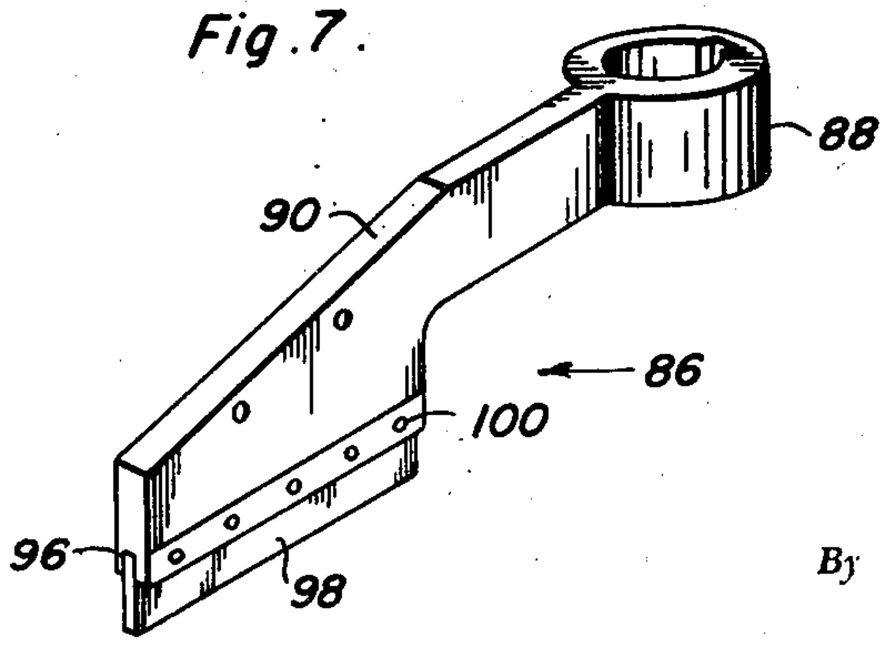

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Fig. 3.

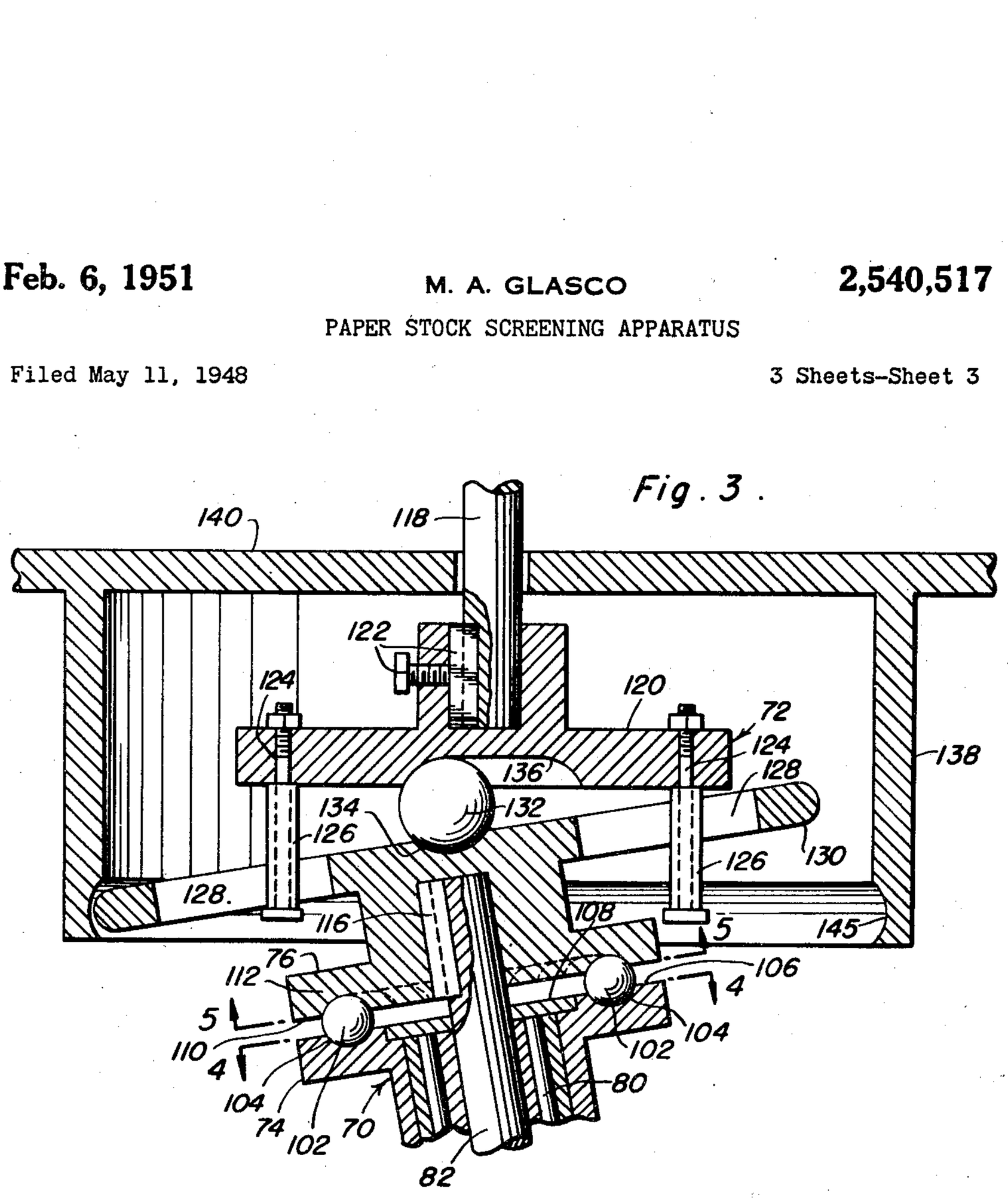


Fig. 4.

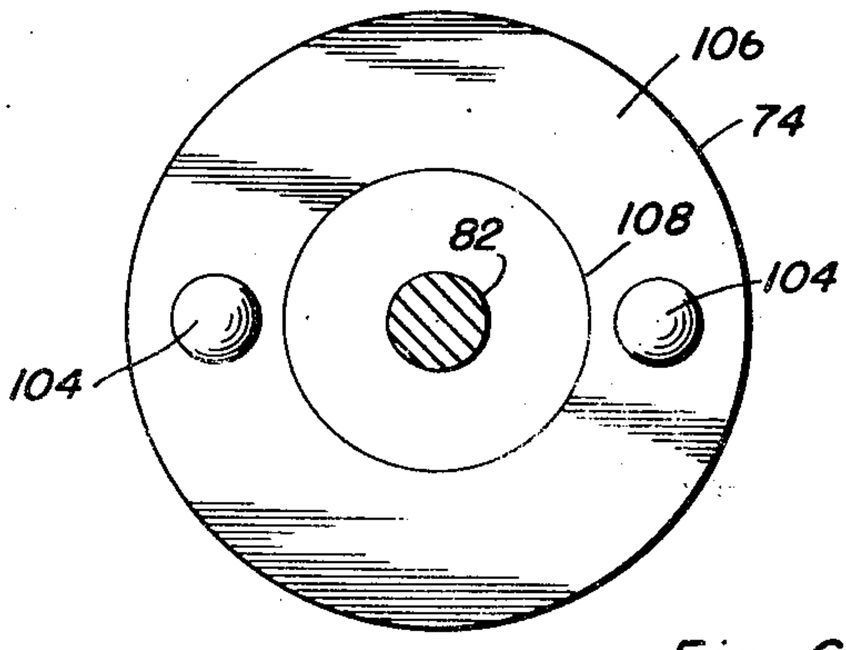


Fig. 5.

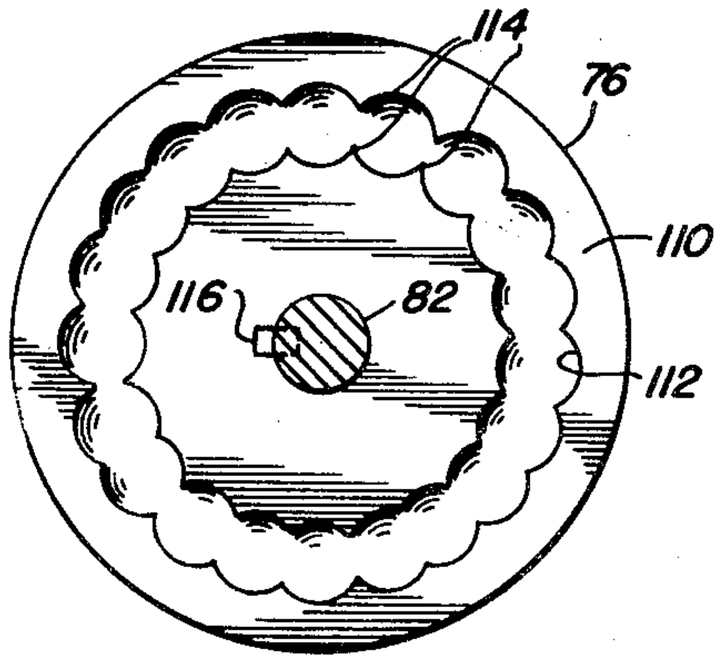
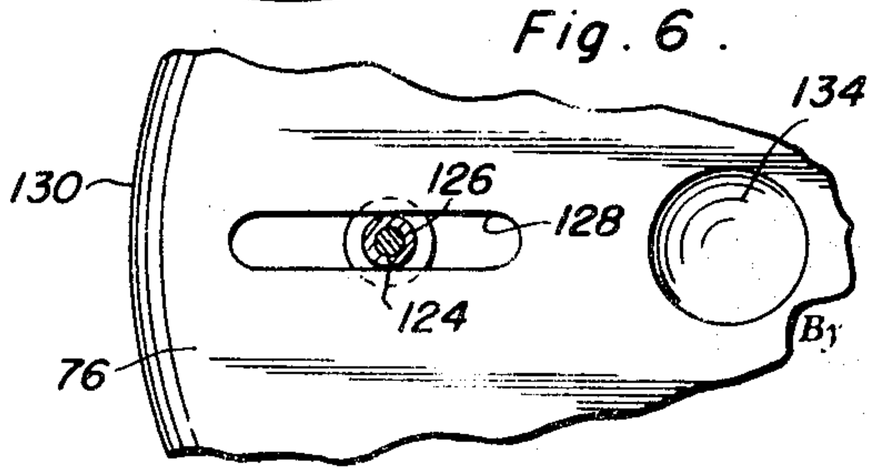


Fig. 6.



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UNITED STATES PATENT OFFICE

2,540,517

PAPER STOCK SCREENING APPARATUS

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Application May 11, 1948, Serial No. 26,361

3 Claims. (Cl. 92—29)

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This invention relates to new and useful improvements and structural refinements in machines for screening paper stock or pulp, and the principal object of the invention is to effect the separation of particles of foreign matter from the paper stock in a highly efficient and expeditious manner.

This object is achieved by the provision of an apparatus wherein the paper stock undergoes two separate stages of purification, the first stage taking place in what may be referred to as a primary chamber where relatively large particles of foreign matter are separated by gravity, and the second occurring on a foraminous top of a secondary chamber, where relatively small and light particles of foreign matter are separated by the effect of vibration and rocking to which the secondary chamber with its foraminous top or screen is subjected.

An important feature of the invention resides in the provision of means for simultaneously vibrating the secondary chamber and rocking the same from one side to another, whereby the second purifying or screening operation is not only effectively performed, but whereby the foraminous top of the secondary chamber is prevented from becoming clogged or otherwise obstructed.

An additional feature of the invention lies in the provision of a rotating agitator in the primary chamber and in the provision of a rotating, flexible brush member which is movable on the foraminous top of the secondary chamber, both the agitator and the brush member materially assisting in the separation of foreign matter from the paper stock.

A still further feature of the invention resides in the provision of resilient or yieldable supporting means for the secondary chamber, whereby the latter is permitted to vibrate as well as to rock while the screening operation is in progress.

An important advantage of the invention lies in its simplicity of construction and in its comparatively small size, which enables the apparatus to be installed and efficiently operated even in relatively small plants.

Another advantage of the invention resides in its simplicity of operation, so that it may be efficiently supervised and serviced even by persons of comparatively limited skill.

With the above more important objects and features in view and such other objects and features as may become apparent as this specification proceeds, the invention consists essentially

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in the arrangement and construction of parts as illustrated in the accompanying drawings, in which:

Figure 1 is a vertical cross sectional view of the invention;

Figure 2 is a cross sectional view, taken substantially in the plane of the line 2—2 in Figure 1;

Figure 3 is a cross sectional view of the vibrating head and rocking mechanism used in the invention;

Figure 4 is a cross sectional view taken substantially in the plane of the line 4—4 of Figure 3;

Figure 5 is a cross sectional view, taken substantially in the plane of the line 5—5 of Figure 3;

Figure 6 is a cross sectional view, taken substantially in the plane of the line 6—6 of Figure 1; and

Figure 7 is a perspective view of a brush member used in the invention.

Like characters of reference are employed to designate like parts in the specification and throughout the several views.

Referring now to the accompanying drawings in detail, the invention consists of a paper stock screening apparatus designated generally by the reference character 10, the same embodying in its construction a plurality (preferably six) upright frame members 12 which are equally spaced and which may be of I-shaped cross sectional configuration, having their lower end portions provided with suitable feet 14 so that they may be firmly secured to a floor, or some other supporting structure.

A substantially cylindrical body 16 is secured by welding, or the like, to intermediate portions of the frame members 12, the body 16 providing what may be referred to as a primary chamber 18 and having substantially frusto-conical portions 20, 22 equipped with an outlet neck 24 and a sediment discharge neck 26, respectively. It is to be noted that the necks 24, 26 are located at the upper and lower ends respectively of the chamber 18, and the chamber is also provided in one side thereof with a paper stock inlet duct 28.

The upper end portions of the frame members 12 are outwardly offset, as is best shown in Figure 1, and are provided with suitable dish-shaped plates 30 constituting seats for compression springs 32, hereinafter again mentioned.

An annular vessel 34, configurated substantially as shown, surrounds the neck 24 and the frusto-conical portion 20 of the body 16, the vessel 34 forming a secondary chamber 36 and

having a foraminous top such as may assume the form of a screen 38 secured by suitable screws 40 to an inwardly projecting annular flange 42 with which the vessel 34 is provided. The foraminous wall or screen 38 is surrounded by an annular rim 44 formed by the circumferential wall of the vessel 34, and a set of outwardly projecting angle brackets 46 are secured to the rim 44 and rest upon the aforementioned compression springs 32. Moreover, additional compression springs 48 are positioned on the brackets 46 (see Fig. 1) and center bolts 50 extend through the seats 30, compression springs 32, brackets 46 and springs 48, being equipped at their upper end portions with inverted spring seats 52 and pairs of lock nuts 54.

A three-legged spider 56 includes a central boss 58 and the end portions 60 of its legs rest upon each alternate of the angle brackets 46 provided on the vessel 34. The end portions 60, as well as the brackets 46, are interposed between the compression springs 32, 48, and the bolts 62 passing through the brackets 46 as well as through the end portions 60, are somewhat longer with respect to the bolts 50 for obvious reasons. However, the bolts 62 as well as the bolts 50 are provided with the inverted spring seats 52 and pairs of lock nuts 54. It is to be noted at this point that the brackets 46 as well as the end portions 60 of the spider 56 are formed with substantially large apertures or bores as indicated at 64, so that the vessel 34 as well as the spider 56 are free to rock (in unison) from one side to another, as exemplified by the arrows 66.

An outturned lip 68, configurated as shown in Figure 1, is provided on the outlet neck 24, the lip 68 overhanging or extending above the screen 38, whereby material discharged upwardly through the neck 24 will be deposited on the screen.

As is facilitated by the resilient mountings 32, 48, the vessel 34 as well as the spider 56 are subjected to simultaneous vibration and rocking from one side to another, the vibration being effected by means of a vibrating head, designated generally by the reference character 70, while the rocking is effected by means of a rocking mechanism designated generally by the reference character 72.

The vibrating head 70 embodies in its construction a non-rotatable unit 74 and a rotatable unit 76, the former being pressed in a counterbore 78 formed in the boss 58 of the spider 56 and being provided with a roller bearing assembly 80 so as to accommodate a rotatable shaft 82. This shaft, being vertically disposed, extends through the unit 74 and through the boss 58 of the spider 56, the lower end portion thereof extending through the neck 24 into the primary chamber 18 and carrying a propeller-shaped agitator 84.

A brushing member 86 is carried by the shaft 82 and comprises a boss 88 formed integrally with a radially extending arm 90, the boss 88 being keyed to the shaft 82, as at 92, and a spacer 94 being interposed between the boss and the under surface of the boss 58 of the spider 56, substantially as shown in Figure 1. The outer end portion of the arm 90 is provided with a slot 96 in which is secured a flexible brushing blade 98 by fastening elements such as the rivets 100. It is to be noted that the blade 98 of the brush member 86 is movable over the screen 38 while the shaft 82 rotates.

The aforementioned vibrating head 70 also includes a pair of balls 102 which are seated in concave depressions 104 provided in the upper

surface 106 of the unit 74, the depressions 104 being diametrically opposed and being disposed exteriorly with respect to a retainer ring 108 provided in the unit 74 for the purpose of retaining the roller bearing assembly 80 in position. The unit 76 is, of course, axially aligned with respect to the unit 74, and the under surface 110 of the unit 76 is formed with an annular groove 112 constituting what may be referred to as a track for the balls 102. In effect, the groove or track 112 assumes the form of an annular row of concave depressions which overlap or intersect one another as shown in Figure 5, so that portions of the grooved track are alternately deep and shallow. That is to say, the relatively deep portions of the tracks are the depressions themselves, while the relatively shallow portions are the points of intersection or overlapping of the depressions, as indicated at 114. (See Figure 5.)

The balls 102 are intended to engage and travel in the track 112 when the unit 76 rotates while the unit 74 remains stationary, and each time the balls move from one set of depressions of the track to another set, they surmount the relatively shallow points or portions 114, thus urging the unit 74 together with the shaft 82 downwardly from the unit 76. On the other hand, after the balls have surmounted the shallow points, they are received in the next set of depressions, permitting the unit 74 and the shaft 82 to rise upwardly toward the unit 76. It will be apparent that as the unit 76 is rotated, a reciprocating, vibratory motion will be imparted to the unit 74, and hence to the spider 56, the vessel 34 and the brush member 86. The shaft 82 is non-rotatably but slidably connected at its upper end to the unit 76 by means of a key 116.

The aforementioned rocking mechanism 72 includes in its construction a drive spindle 118 which is normally in axial alignment with the shaft 82, the spindle 118 carrying a face plate 120 which is secured thereto as at 122. A pair of diametrically opposed studs 124 are provided in the face plate 120 and project downwardly therefrom, being equipped with antifriction roller sleeves 126.

These sleeves slidably and rotatably engage a pair of diametrically opposed slots 128 formed in a flange 130 of the aforementioned unit 76 and a spherical fulcrum element 132, seated in a concave depression 134 formed in the center portion of the flange 130, shiftably engages a dish-shaped depression or recess 136 formed in the under surface of the face plate 120.

It should be explained at this point that matters are so arranged that the compression springs 32, 48, acting in mutually opposite directions, retain the spider 56 in such position that the unit 74 is disposed as close as possible to the unit 76 so as to urge the balls 102 in engagement with the track 112, and also, that the entire vibrating head 70 is disposed as close as possible to the face plate 120, thus retaining the element 132 in the recess 136.

When the spindle 118 rotates, the head 70 will, of course, impart vibratory movement to the spider 56 and to the vessel 34, as already described, and at the same time the element 132 will be permitted to shift from one side of the recess 136 to another, so that the entire head 70, the shaft 82, the spider 56 and the vessel 34 will be caused to rock from one side to another, as indicated by the arrows 66. The rocking and vibrating movements are not considerable, but

nevertheless they are present and simultaneous. If desired, a suitable weight 91 may be secured to the arm 90 to accentuate the rocking motion by virtue of its eccentric disposition with respect to the shaft 82.

If desired, the mechanism 72 may be surrounded by a protecting enclosure 138 provided on the under side of a stationary plate 140, the latter also being used to support an electric motor 142 which rotates the spindle 118 through the medium of a suitable reduction drive 144. It will be noted that the enclosure 138 will effectively restrict the extent of the rocking movement of the mechanism 72, as exemplified in Figure 3 wherein an edge portion of the flange 130 contacts an annular groove 145 provided in the closure 138.

Finally, it should be added that the chamber 36 is provided with a screened pulp outlet duct 146, while a refuse discharge opening or recess 148 is formed in the aforementioned flange 44.

Having thus described the construction of the invention, its method of operation will now be explained.

The paper stock which is to be screened is admitted through the duct 28 into the primary chamber 18, where the rotating agitator 84 will cause relatively large, heavy particles of foreign matter to become separated from the paper stock and gravitate downwardly through the sediment outlet neck 26, while the paper stock itself will be discharged upwardly through the outlet neck 24 onto the screen 38. It is to be noted in this connection that the agitator 84 not only rotates, but oscillates in all different vertical planes within the chamber 18, the oscillating of the agitator being effected by the rocking mechanism 72.

In any event, the paper stock discharged onto the screen 38 will be distributed over the screen by the rotating brush member 86 and pulp fibres will be caused to pass through the screen into the secondary chamber 36, from which the screened pulp may be evacuated through the duct 146 by suction or gravity. Simultaneously, light rejects, etc. will be forced to the outer edges of the screen, and ultimately discharged through the opening by the brush member 86 or by gravity.

The screening operation is materially facilitated by the simultaneous vibration and rocking of the vessel 34 together with the associated screen 38, which vibrating and rocking motion is, of course, effected by means of the aforementioned vibrating head 70 and by the action of the off-balanced member 86 on the rocking mechanism 72, respectively. The screened paper stock is discharged from the apparatus through the recess or opening 146, and attention is particularly directed to one important feature of the invention, namely, the rocking action of the vessel 34 in various different vertical planes. While the paper stock is being screened, the pulp fibers may become caught in the openings of the screen 38, with the result that the screen would normally become clogged or otherwise obstructed. However, in the instant invention, the vessel 34 is rocked from one side to another, causing the pulp fibers to change their positions and vibration causes them to travel over the screen until they ultimately pass therethrough. As the screen is tilted in various directions, any fibers which may become lodged in the screen while passing therethrough will be "washed," so to speak, by the circular or partially circular flow of the stock in the chamber 36, thus freeing the caught fibers and preventing the screen from becoming obstructed. The flow of stock in the chamber 36 is produced by the rocking of the chamber in various directions, causing the stock in the chamber to gravitate from one side to another.

The accompanying Figure 3 illustrates the rocking mechanism 72 in action, the amplitude of the rocking motion being somewhat exaggerated for illustrative purposes.

If desired, a normally closed retaining valve, or the like, as indicated at 150, may be provided in the neck 26 to retain heavy rejects in the chamber 18, until it is necessary to discharge such rejects through the neck 26.

Having described the invention, what is claimed as new is:

1. In a paper stock screening appartus, the combination of a substantially tubular primary chamber provided in one side thereof with a material inlet port and having an outlet port at its upper end, an annular secondary chamber surrounding the upper end portion of said primary chamber and having a foraminous top adapted to receive material discharged from said outlet port, said secondary chamber being provided with an outlet opening disposed below the foraminous top thereof, an upstanding marginal rim provided at the outer edge of said foraminous top and formed with an outlet recess, a rotatable agitator shaft extending into said primary chamber through the outlet port of the latter, an agitating member secured to said shaft in said primary chamber, and a brush member secured to said shaft and engageable with said foraminous top.

2. The device as defined in claim 1 together with stationary supports for said primary chamber, means for movably mounting said secondary chamber on said supports, and additional means for imparting oscillatory and vibratory movement to the secondary chamber.

3. In a paper stock screening apparatus, vibration producing means comprising a stationary disc and a rotatable disc having spaced opposing faces, the face of one disc being formed with a plurality of concave depressions overlapped to provide a continuous annular track with alternate depressions and crests, the face of the remaining disc being provided with a plurality of individual concave seats, and a plurality of spherical elements interposed between said discs, each element being rotatable in one of said seats and engageable with the alternate depressions and crests of said track.

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