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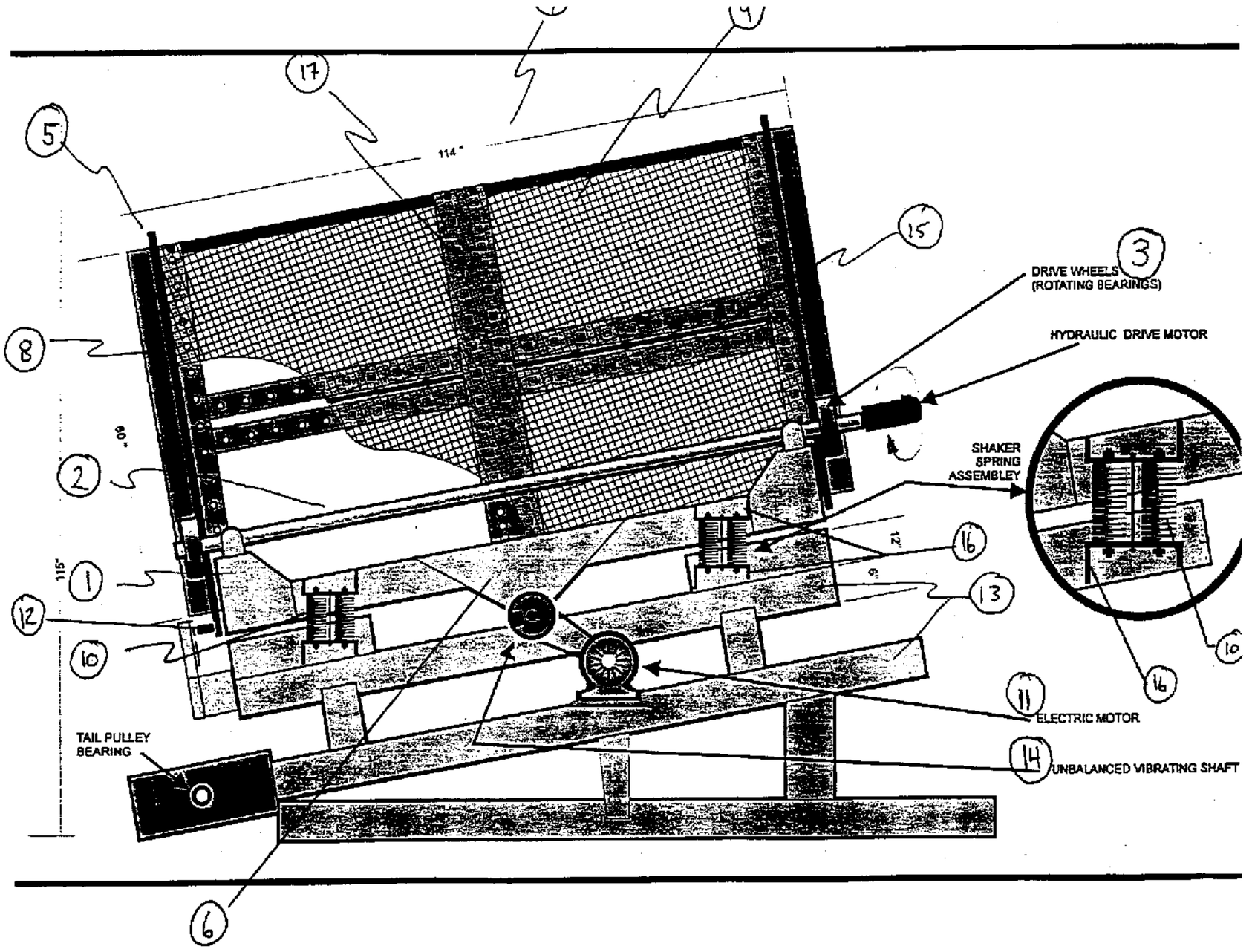
(54) **DISPOSITIF POUR SEPARER UN MELANGE DE PIERRE ET DE SABLE**

(54) **APPARATUS FOR SEPARATING STONE AND SAND MIXTURE**



(57) The present invention relates to an apparatus for separating into two components the stone and sand mixture which is a byproduct of ordinary rock crushing operations for example at a quarry. More specifically, the invention relates to a forwardly inclined cylindrical drum which is simultaneously rotated and vibrated to separate the sand and stone mixture into a stone component and a sand component according to size. The stone and sand mixture is deposited by a conventional conveyor into the intake opening of the drum where the sand component is mechanically moved through the perforations of the drum while the stone component traverses the drum exiting at the exhaust opening. Two additional conventional conveyors integrated into the operation of the apparatus transport the separated components away from the drum.

ABSTRACT

The present invention relates to an apparatus for separating into two components the stone and sand mixture which is a byproduct of ordinary rock crushing operations for example at a quarry. More specifically, the invention relates to a forwardly inclined cylindrical drum which is simultaneously rotated and vibrated to separate the sand and stone mixture into a stone component and a sand component according to size. The stone and sand mixture is deposited by a conventional conveyor into the intake opening of the drum where the sand component is mechanically moved through the perforations of the drum while the stone component traverses the drum exiting at the exhaust opening. Two additional conventional conveyors integrated into the operation of the apparatus transport the separated components away from the drum.

TITLE: APPARATUS FOR SEPARATING STONE AND SAND MIXTURE

INVENTOR: CECIL ARNOLD

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus for separating a stone and sand mixture using a forwardly inclined perforated drum that is simultaneously rotated and vibrated to separate the mixture into two components.

The ordinary stone crushing process results in much waste as the stone and sand mixture byproduct is not commercially useful. When separated, however, the stone and sand components can be commercially utilized cutting down on the amount of waste generated. The stone component, also known as tailings or HL3 chips, can be used in the production of concrete and asphalt. Similarly, the sand, also referred to as manufactured sand, also has useful applications.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved apparatus for separating the stone and sand mixture which typically results following the stone crushing process at a quarry using conventional rock crushing equipment.

The object of the present invention is achieved by conveying the stone

and sand mixture into the intake opening of a cylindrical perforated drum which is forwardly inclined such that the exhaust opening of the drum is situated below the intake opening. By simultaneously rotating and vibrating the drum, the stone and sand mixture is separated into two components, the size of the sand component being determined by the size of the perforations of the drum. The smaller sand component is mechanically moved through the perforations while the larger particles comprising the stone component traverse the drum and exit at the exhaust opening. The separated components are collected and transported away from the perforated drum by conveyors.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings which form part of the specification and are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views.

Figure 1 is a side view of the separating apparatus.

Figure 2 is an end view of the exit end of the separating apparatus.

Figure 3 is an enlarged view of the shaker spring assembly.

PREFERRED EMBODIMENT

The present invention, shown in Figures 1 and 2, consists of a perforated

drum 7 mounted upon an upper frame 1 which is in turn mounted on a lower frame 13 which is fixed with reference to the ground. The rigid upper frame 1 and rigid lower frame 13 are connected in alignment by four sets of springs 10, each set consisting of two springs arranged in tandem (shown in Figure 3). The springs 10 provide the only points of attachment between the upper and the lower frames, and carry the weight of the upper frame 1, the perforated drum 7, and its contents. The springs, which are in compression, maintain a gap between the upper and lower frames at all times. This gap provides the space necessary for the upper frame to vibrate with reference to the lower frame.

The upper frame 1 is rectangular in shape and is constructed from 3" x 6" x 0.25" steel tubing. Included in the upper frame 1 are two shafts 2 running along side of the drum on each side thereof. The drum is mounted upon drive wheels 3, 12" inches in diameter, located at the ends of each shaft. The drive wheels are preferably coated in urethane to prevent excess vibration of the drum during operation. Each shaft is suitably connected to a hydraulic drive motor 4 that rotates the shaft and respective drive wheels, which in turn rotate the drum in the manner hereinafter set out. The electricity to power the hydraulic motors may be supplied by a generator associated with the apparatus.

The perforated drum 7 has its own structural frame including circular rails 8 at each end which contact the drive wheels. A guide circle ring 5 affixed to

each circular rail 8 extends outwardly 3" perpendicular to each respective circular rail. The guide circle rings 5 fit inside of the drive wheels at each end of the drum holding it in place as it rotates. The guide circle rings 5 prevent sideways shifting of the drum, while the weight of the drum keeps the circular rails 8 at in contact with the urethane drive wheels. The speed at which the drum rotates is variable and is controlled by a regulator associated with the equipment.

Positioned at the middle of each length of the upper frame 1 is a downward pointing triangular bracket 6, each bracket supporting one end of a vibrator shaft (not shown) which passes under the drum. Each end of the vibrator shaft is conventionally secured to the triangular brackets 6. A 9.6" x 1.5" unbalanced wheel 14 is attached at each end of the vibrator shaft. One end of the vibrator shaft is connected by a belt to an electric motor secured to the lower frame 13 which rotates the vibrator shaft at approximately 1800 RPM. It is the rotation of the unbalanced wheels 14 connected to the vibrator shaft which causes the upper frame 1 including drum to vibrate with reference to the lower frame 13. The rate of vibration is approximately 3000 vibrations / minute at an amplitude of an 1/8 of an inch. It is the simultaneous rotation and vibration of the drum that is the essential feature of how the apparatus works. The description of the apparatus and its operation are given by way of example only, and naturally may be varied without deviating from the spirit of the invention.

The perforated drum 7 is 60" in diameter and is 114" in length. It rests on top of the urethane drive wheels as described above. At each end of the drum are circular rails 8 made of 3/16" plate steel to which the perforated screen 9 and guide circle ring 5 are affixed. The support frame of the perforated drum 7 is further comprised of a third circular ring 17 at the centre of the drum and a plurality of rectangular plates 15 oriented longitudinally. The screen 9 which encloses the drum is preferably perforated with 1/8" diameter holes spaced 7/16" apart centre to centre. The inside of the drum is flush.

As previously described the only attachment between the upper and lower frame is by four sets springs, two sets per side. The springs are suitably engineered having regard to the apparatus parameters in order to achieve the desired vibration. Affixed to both the upper and lower frame are brackets 16 which attach the opposing ends of the springs 10 to each frame. The shaker spring assembly including attachment brackets is shown enlarged at Figure 3. The springs 10 are attached such that they are substantially vertical, perpendicular to the horizontal.

The lower frame 13 is rectangular in shape and is made of 3" x 6" x 0.25" steel tubing. The lower frame 13 is further constructed such that it orients the upper frame 1 and perforated drum 7 at a 10 degree angle with reference to the horizontal, a feature which facilitates the movement of the stone chips through

the simultaneously rotating and vibrating perforated drum 7. Mounted to the lower frame 13 is an electric motor 11 which drives the belt connected to the vibrating shaft. Electricity for the motor is supplied by generator which is also a constituent part of the apparatus.

Also attached to the lower frame 13 is an end guide roller 12 located below the exhaust opening of the drum which further stabilizes and supports the drum as it rotates and vibrates. The end guide roller 12 rotates freely as it engages the lower guide circle ring 5 and does not actively contribute to the rotation of the drum. The end guide roller prevents the weight of the drum from bending the springs downwards bringing the upper and lower frames out of alignment.

Three conveyors integrated into the overall operation of the separating apparatus are required. The design of conveyors is conventional. The function of the conveyors is to carry the stone and sand mixture to the drum, and to carry the separated stone and sand away from it.

The first conveyor carries the stone and sand mixture to the into the intake opening of the drum which as described above is preferably oriented at a 10 degree angle. The rate at which the stone and sand mixture is delivered to the drum is controlled by the speed of the belt and other conventional regulatory

mechanisms.

As the sand is separated from the stone, the sand sifted through the perforations of the drum falls to a second conveyor located directly below the drum. Inwardly angled steel plates attached the upper frame (not shown) funnel sand onto the conveyor. This conveyor transports material in the opposite direction relative to the conveyor carrying the stone and sand mixture to the drum.

The third conveyor is located at the exhaust opening of the drum. It is built to receive and convey the separated stone upwardly away from the exit end of the drum. Stones too large to fit through the perforations of the drum traverse from the intake opening through to the exhaust opening aided by the simultaneous rotation and vibration of the drum.

From the foregoing, it will be seen that this invention is one well adapted to attain all the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and sub-combinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of the claims.

Since many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

CLAIMS

Having thus described the invention, what is claimed is:

1. An apparatus for separating a stone and sand mixture comprising a perforated cylindrical drum rotatably mounted upon a first frame means, a second frame means fixed with reference to the ground, said first frame means vibrationally mounted upon said second frame means, said drum being forwardly inclined along its longitudinal axis, rotator means for rotating said drum about its longitudinal axis, vibrator means for vibrating said first frame with reference to said second frame, motor means to simultaneously operate said rotator and vibrator means.

2. The invention as claimed in claim 1, wherein in said cylindrical drum is angularly inclined with reference to the first frame means between 4 and 38 degrees.

3. The invention as claimed in claim 1, wherein said cylindrical drum is angularly inclined with reference to the second frame means between 4 and 38 degrees.

4. The invention as claimed in claims 2 or 3, wherein said rotator means consists of a rotatable shaft having urethane coated drive wheels located at each end for engaging and turning said drum.

5. The invention as claimed in claim 4, wherein said vibrational mounting means comprise sets of springs located at regular spaced intervals between said frames.

6. The invention as claimed in claim 5, wherein said sets of springs consist of four sets each said set having two springs arranged in tandem.

7. The invention as claimed in claim 6, wherein said vibrator means consist of a rotatable shaft having at least one unbalanced wheel attached to said first frame and being rotated with reference thereto.

8. The invention as claimed in claim 7, wherein said motor means consist of an electric motor.

9. The invention as claimed in claim 8, wherein said first frame means and second frame means are constructed of steel.

FIGURE 1

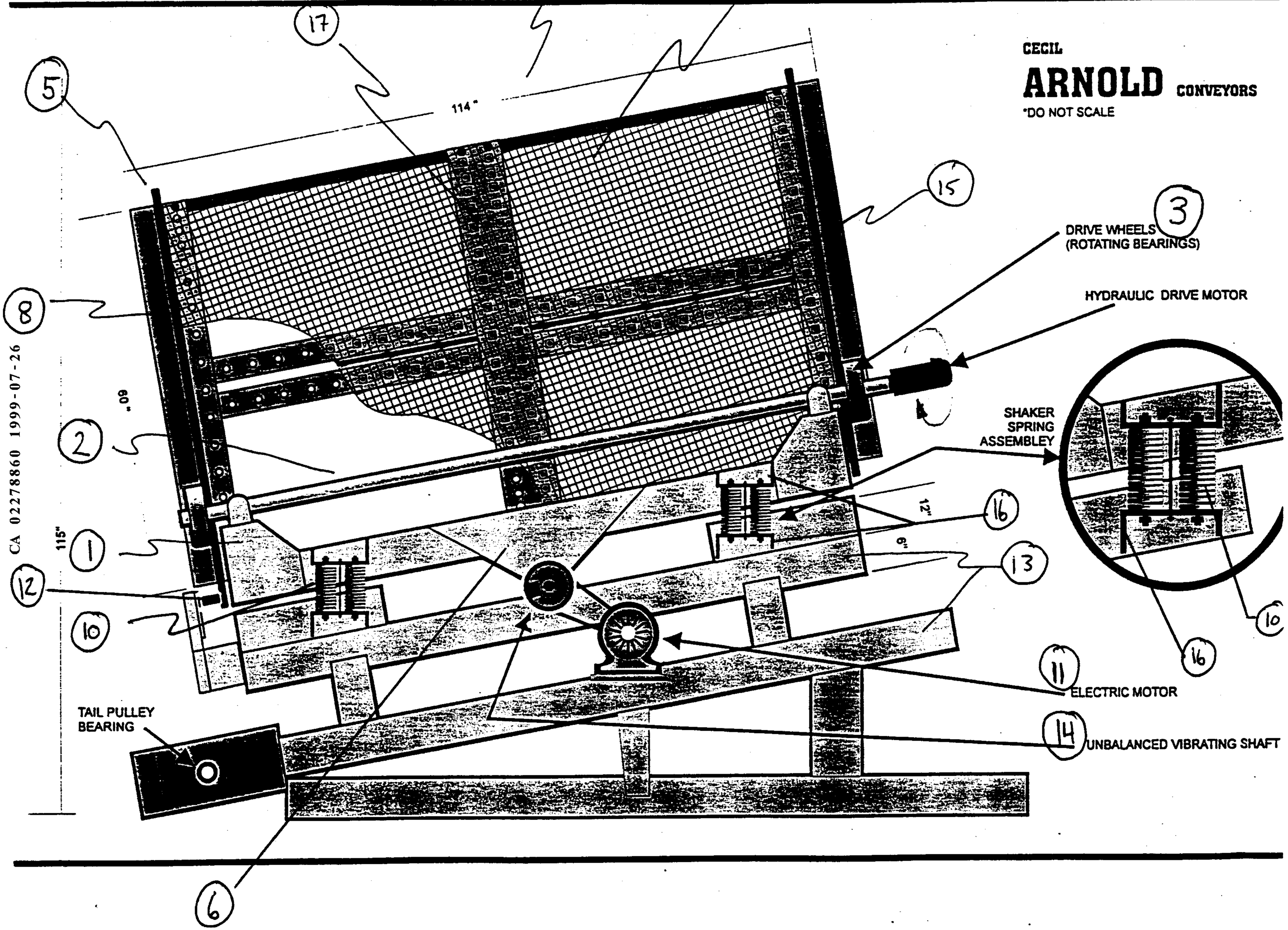


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FIGURE 2

CECIL

ARNOLD CONVEYORS

*DO NOT SCALE

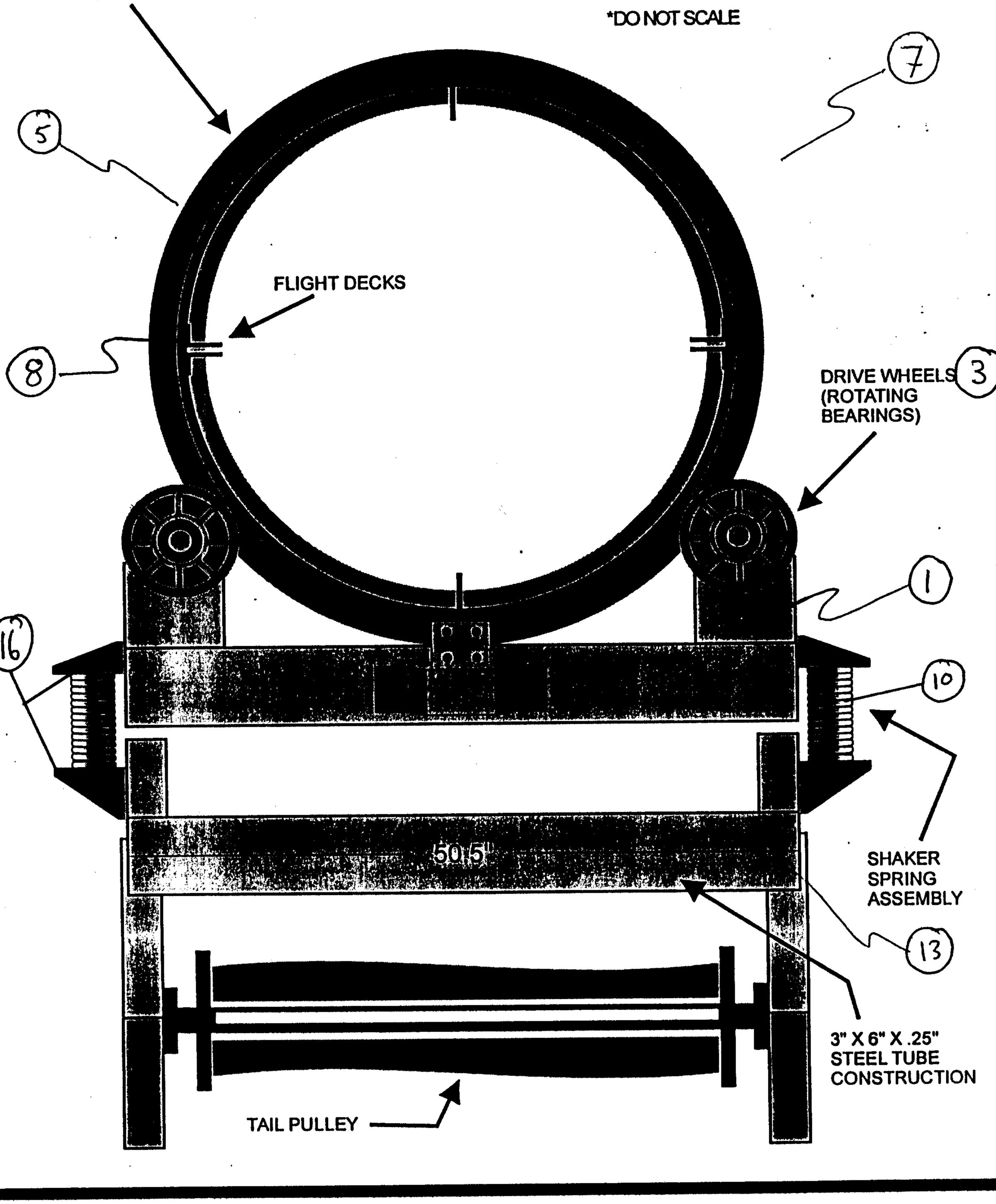
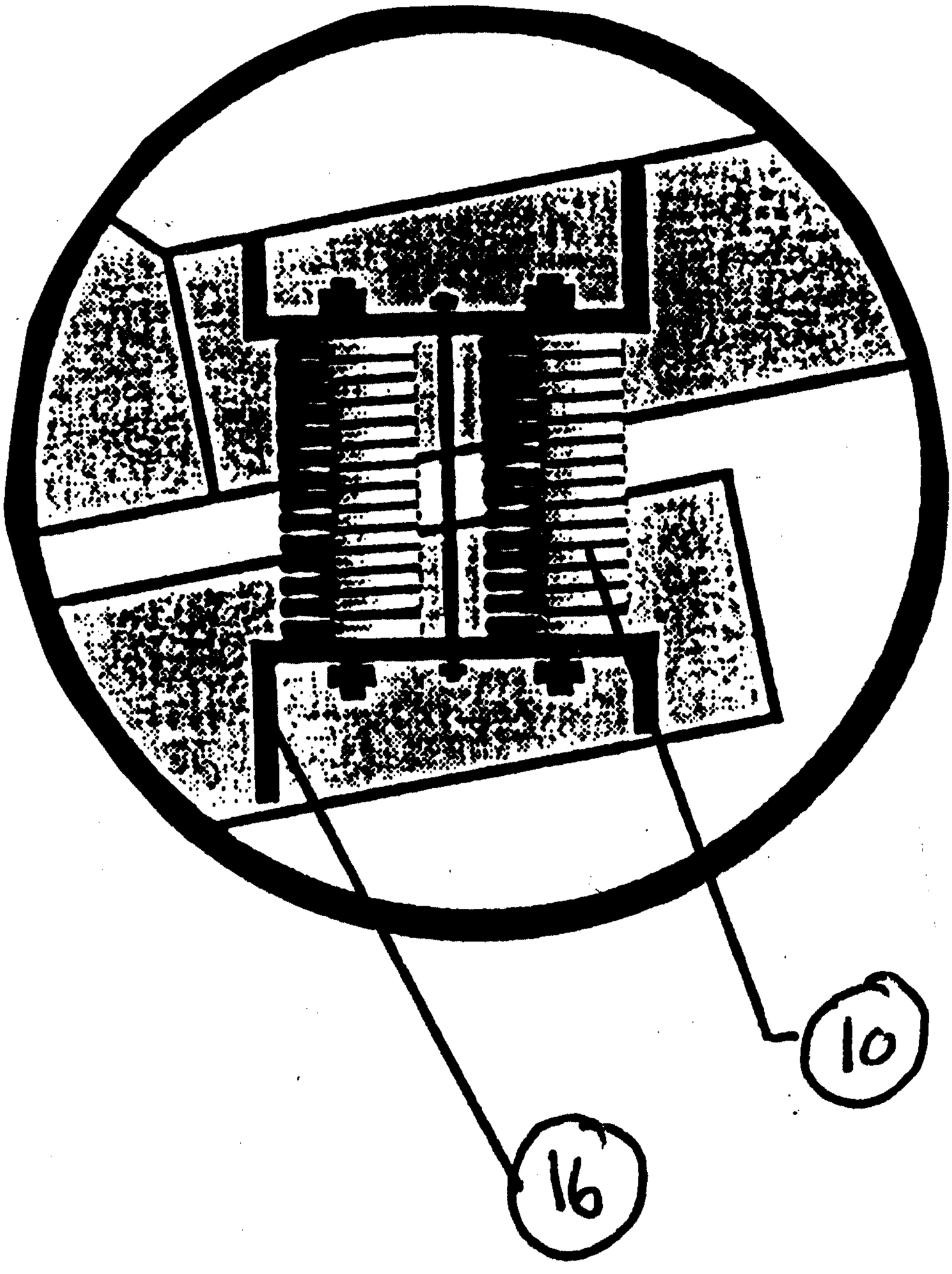
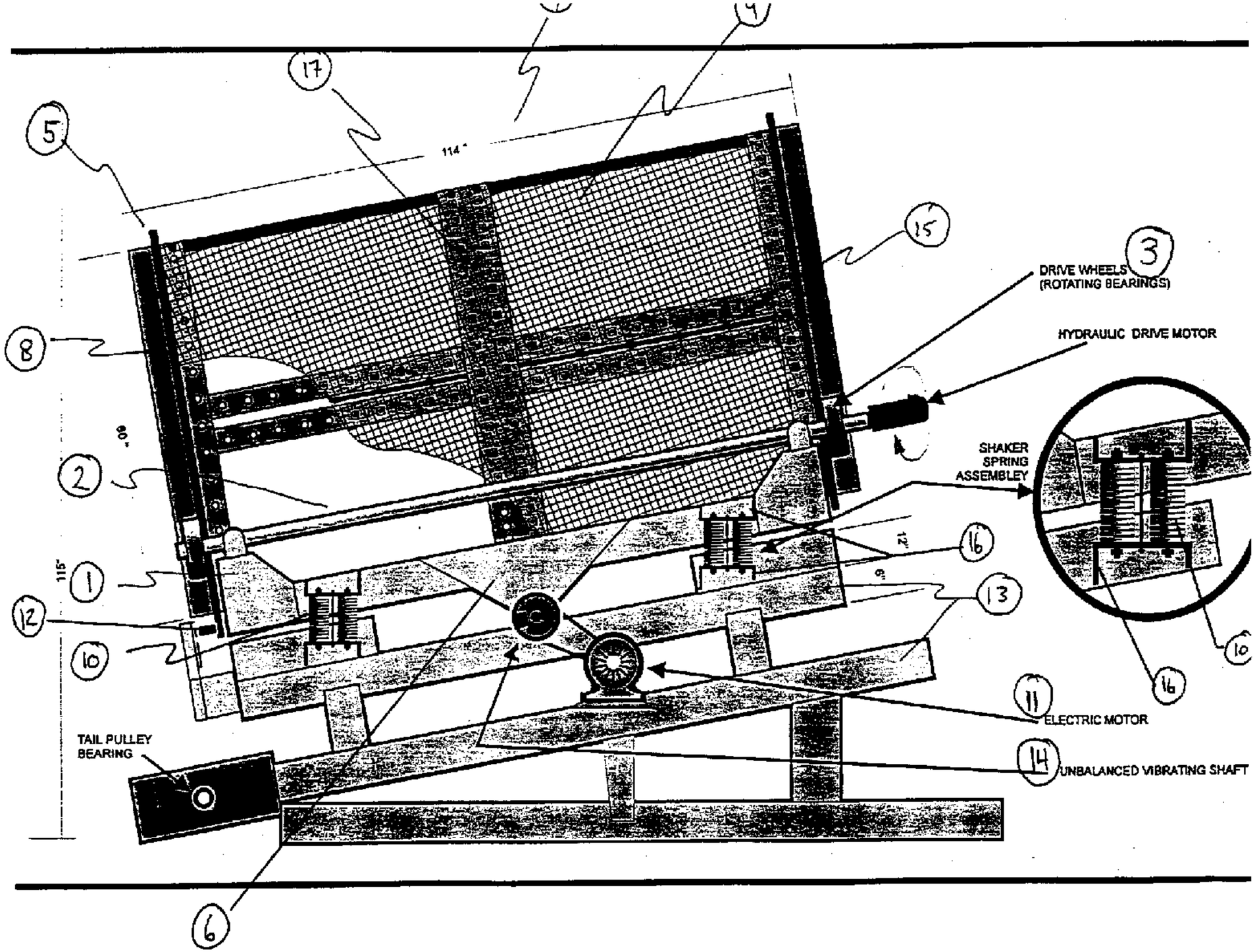


FIGURE 3




114"
115"
8'-0"
DRIVE WHEELS
(ROTATING BEARINGS)
HYDRAULIC DRIVE MOTOR
SHAKER
SPRING
ASSEMBLEY
ELECTRIC MOTOR
UNBALANCED VIBRATING SHAFT
TAIL PULLEY
BEARING
17
5
15
3
8
2
1
12
10
16
13
11
14
6