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VIBRATING MECHANISM

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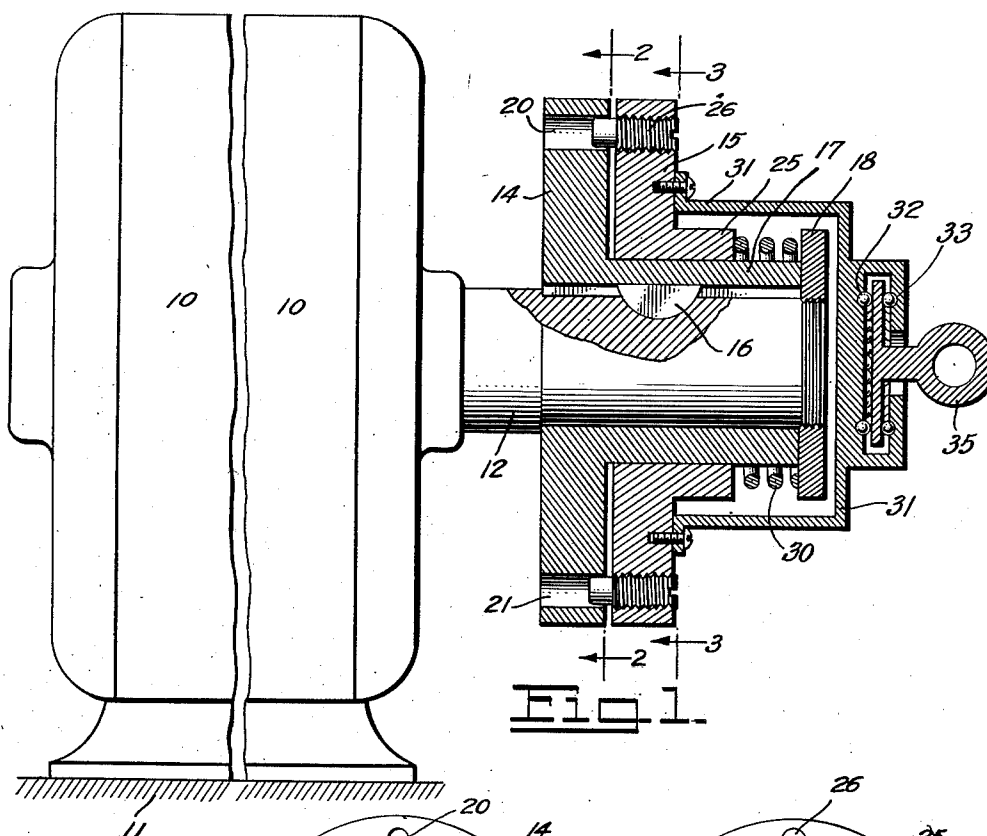


Fig. 1.

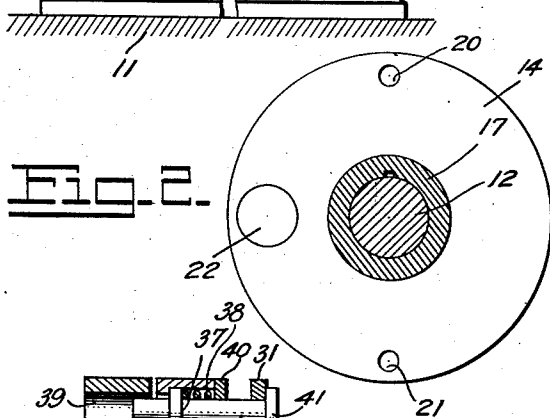


Fig. 2.

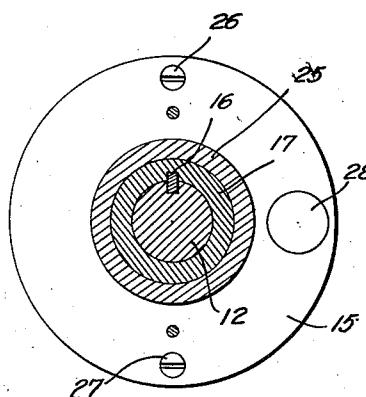


Fig. 3.

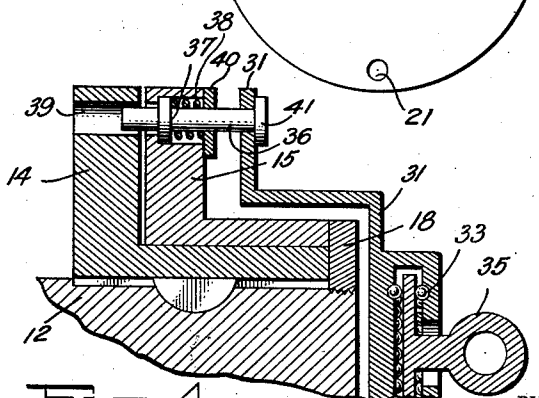


Fig. 4.

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VIBRATING MECHANISM

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6 Claims. (Cl. 74-87)

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This invention relates to vibrating apparatus, and more particularly to an improved wobble mechanism for oscillating or vibrating machinery, said mechanism being rapidly controllable to full-on and full-off vibrating condition.

Many mechanisms are known for vibrating or oscillating machinery such as shaker screens, conveyors, sifters, mixers, and like apparatus. It is conventional to produce the necessary vibrations or oscillations by rotating a shaft journaled on the apparatus and provided with a wheel having an off-center mass. It is also known to adjust the amount of eccentricity of the off-center mass in order to vary the magnitude of the oscillating forces produced. However, it is often desirable in many types of apparatus to provide means for rapidly initiating or rapidly stopping the vibratory action. It is also desirable to provide for no off-center load on a driving shaft during the time it is being started and brought up to normal speed, in order to reduce the starting load on the driving power source.

It is an object of my invention to provide an improved rotary vibrator mechanism in which the vibratory forces produced may be easily and instantaneously started and stopped without materially altering the speed of rotation of the drive shaft.

It is another object of my invention to provide a rotary vibrator mechanism driven by an electric motor and controllable so that the motor may be brought up to speed under no vibratory load, and so that the vibratory load may be applied to the drive motor while the motor is operating at full speed.

It is still another object of my invention to provide an improved vibration control mechanism which is economical and durable, and which also is easily applicable to many types of apparatus as a substitute for the more complicated conventional types of vibrators.

Other objects and advantages of this invention will be readily apparent to those skilled in this art after examination of the following description of the preferred embodiments illustrated in the accompanying drawings, wherein:

Figure 1 is an axial section view partly cut away of one form of my apparatus vibrating mechanism.

Figure 2 is a cross section view taken on the line 2-2 of Figure 1.

Figure 3 is a cross section view taken on the line 3-3 of Figure 1.

Figure 4 is an axial section view partly cut

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away of a modified form of my apparatus vibrating mechanism.

Referring to Figure 1, for the purposes of illustration, the vibrator mechanism includes an electric motor 10 rigidly secured to an apparatus to be vibrated, said apparatus being only partly indicated by the numeral 11. The mechanism also includes a rotary shaft 12 extending from the motor 10 and includes rotary members or discs 14 and 15 mounted on said shaft. The disc or wheel 14 is rigidly secured to the shaft 12 for rotation thereby, and for this purpose a conventional drive key 16 may be used. The disc 14 may be provided with an elongated hub 17, and a nut 18 may be threaded on the end of shaft 12 to engage the end of hub 17 for securing the disc 14 on the shaft.

The disc 14 is provided near its periphery with two apertures 20 and 21 equal distances from the center of the disc and spaced one hundred and eighty degrees apart, as shown in Figure 2. The disc 14 is also provided with a relatively heavy insert 22 secured to or in one side of the disc 14 with the center of gravity of the insert 22 located at ninety degrees from each of said apertures 20 and 21. The second disc 15 may be provided with a hub 25 journaled and slidable on the hub 17 of disc 14. The disc 15 is provided near its periphery with two pins 26 and 27 projecting from the face of the disc and positioned equal distances from the center of the disc and spaced one hundred and eighty degrees apart as shown in Figure 3. The pins 26 and 27 are thus located so as to project into the apertures 20 and 21. The pins and apertures serve as locking means to lock disc 15 to disc 14 for rotation therewith. The pins 26 and 27 are engaged by the side walls of the apertures 20 and 21 to provide a driving connection, and it is obvious that various other equivalent forms of abutments and abutting or engaging members may be substituted for the aperture and pin form of locking means illustrated. The disc 15 is also provided with a relatively heavy insert 28 secured to or in one side of the disc 15 with the center of gravity of the insert 28 located at ninety degrees from each of said pins 26 and 27. The masses and positions of inserts 22 and 28 are such that when the discs 14 and 15 are connected together by pins 26 and 27 entered in apertures 20 and 21 with the inserts 22 and 28 diametrically opposite, the connected discs provide a balanced assembly which when rotated by the drive shaft 12 produces substantially no vibration or wobble. A compression spring 30 is provided on the end of hub

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17 between the nut 18 and the outer end of hub 25 to bias the disc 15 toward the disc 14.

A control member 31 is secured to and rotates with the disc 15, and may be of cup shape enclosing the end of shaft 12. The outer end of member 31 is provided with double thrust bearings 32 and 33 engaging a disc having an operating knob or handle 35 secured thereto.

Operation of the above vibrating mechanism will now be described. The electric motor 10 is secured rigidly to the apparatus 11 to be vibrated. The discs 14 and 15 are positioned relative to each other so that weight 22 on disc 14 is diametrically opposite the weight 28 of disc 15. The discs 14 and 15 are connected one to the other by pins 26 and 27 entered into apertures 20 and 21. With discs 14 and 15 arranged in this position the off-center weights balance each other and the disc and control assembly may be rotated and have minimum or no unbalance. The motor 10 may be started and the shaft 12 may be brought up to speed with substantially no load on the motor. The discs 14 and 15 being connected by pins 26 and 27 rotate at the same speed. When the vibratory or wobble action is desired, the operator merely gives a brief axial outward pull on handle 35 to move the disc 15 and its pins 26 and 27 to the right, compressing spring 30 and disconnecting disc 15 from disc 14. Both discs are rotating, but disc 15 starts to slow down slightly as soon as pins 26 and 27 leave apertures 20 and 21. After the brief axial pull on handle 35 has disconnected the discs, the operator releases the handle 35 and spring 30 then forces the disc 15 to the left to cause the pins 26 and 27 to again enter the apertures 20 and 21 in disc 14. During the disconnection, the disc 15 slips one hundred and eighty degrees behind disc 14 so that on reconnection, pin 26 enters aperture 21. In this second position the off-center masses 22 and 28 are no longer diametrically opposite, but are adjacent one to the other, thereby producing maximum unbalance of the rotating disc assembly. In this unbalance position maximum wobble or vibration is conveyed to the apparatus 11. Since the discs 14 and 15 are always rotating at the same speed when interlocked, it is found that temporary disconnection allows the disc 15 to gradually lag until it is one hundred and eighty degrees behind disc 14 at which time the pins 26 and 27 easily re-enter the apertures in disc 14 to establish a lock between discs. The operation is the same whether the assembly is changing from balance to unbalance or from unbalance to balance, and the change is effected substantially instantaneously without stopping the motor 10. The disc assembly may be mounted on a shaft driven by a belt, gear, or other drive in installations where it is not desirable to mount the assembly directly on an electric motor shaft.

The construction illustrated in Figure 4, is similar to that shown in Figure 1 except that two pins carried by disc 15 are slidable in disc 15 and each is provided with a spring to urge it into an aperture in disc 14. The pin 36 has a shoulder 37 engaged by a compression spring 38 to urge the pin into aperture 39 of disc 14. A washer 40 is secured to disc 15 to back up the spring 38. The pin 36 has a head 41 engaged by the control member 31 to provide for movement of the pin outward of the aperture 39. It is to be understood that pin 36 and its mounting is duplicated at one hundred and eighty degrees, although not shown in the cut-away Figure 4 illustration. The

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Figure 4 construction is operated in the same manner as the Figure 1 construction except that an axial pull on handle 35 merely pulls two pins 36 to the right against springs 38, instead of moving disc 15 itself to the right.

Each operation of the described wobble mechanisms causes the pin carrying disc to lose one-half of one revolution from the other disc, thereby causing the mechanism to change rapidly from balanced or minimum wobble operation to unbalanced and full wobble operation or vice versa. It will be apparent that use of the described wobble mechanism operated by an electric motor permits a motor to be brought up to speed quickly under no load conditions, and to have the full wobble load applied to it while running at full speed. It will also be apparent that the described mechanism does not require that the driving motor be stopped each time it is desired to temporarily stop the vibrating or wobble action. The time delay of starting and stopping the drive motor is therefore eliminated.

This invention contemplates the use of various modifications of the constructions disclosed herein, as it will be readily apparent that numerous variations and equivalent details are possible within the scope of the following claims.

I claim:

1. A controllable vibration producing mechanism comprising in combination, a member mountable on a driven shaft for rotation therewith, said member having a mass unbalanced with respect to the axis of rotation of said member, a second member mounted adjacent to said first member for rotation on the same axis of rotation, said second member also having a mass unbalanced with respect to said axis of rotation, locking means carried by one of said members for engagement with the other of said members in only two relative positions of said members, said locking means being movable with respect to and into and out of locking engagement with the other of said members during the rotation of both of said members, and control means operable during rotation for momentarily disengaging said locking means, said two relative positions of said members being one hundred and eighty degrees apart, whereby in one position the unbalanced mass of one member balances the unbalanced mass of the other member, and in the other position of said members the unbalanced masses are adjacent and combine to produce vibration.

2. A controllable vibration producing mechanism comprising in combination, a rotary shaft adapted to be driven by a motor, a disc secured to said shaft for rotation therewith, a second disc free from said shaft and rotatable on the same axis as the rotational axis of said first disc, each of said discs having a heavy mass secured to one side thereof, said first disc having only two abutments therein adjacent to the periphery of the disc, one abutment being spaced one hundred and eighty degrees from the other abutment and each abutment being spaced ninety degrees from the center of gravity of said heavy mass on said disc, said second disc carrying only two projecting pins adjacent to the periphery of the said second disc, one pin being spaced one hundred and eighty degrees from the other pin and each pin being spaced ninety degrees from the center of gravity of said heavy mass on said second disc, said pins being movable with respect to and into and out of locking engagement with said abutments on said first disc during the rotation

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of both of said discs, spring means to bias said pins into locking relation with said abutments, and control means operable during rotation to withdraw said pins from said abutments.

3. A vibration producing mechanism as defined in claim 2, said first disc having a projecting hub, said second disc having a hub journaled and axially slidable on said hub of said first disc.

4. A vibration producing mechanism as defined in claim 2, said two abutments comprising two apertures in said first disc, said projecting pins carried by said second disc being axially slidable in said disc, and said spring means including a spring for and engaging each of said pins to bias said pins to a projecting position.

5. A vibration producing mechanism as defined in claim 2, said second disc being slidable axially with respect to said first disc, said spring means

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engaging said second disc to bias it toward said first disc.

6. A vibration producing mechanism as defined in claim 2, said control means including a cup-shape rotary member enclosing the end of said shaft and having a control handle and a double thrust bearing connecting said handle to said member.

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