Nov. 30, 1954 G. L. OSWALT 2,695,523

VIBRATING MECHANISM

Filed March 30, 1948

FIG. 1.

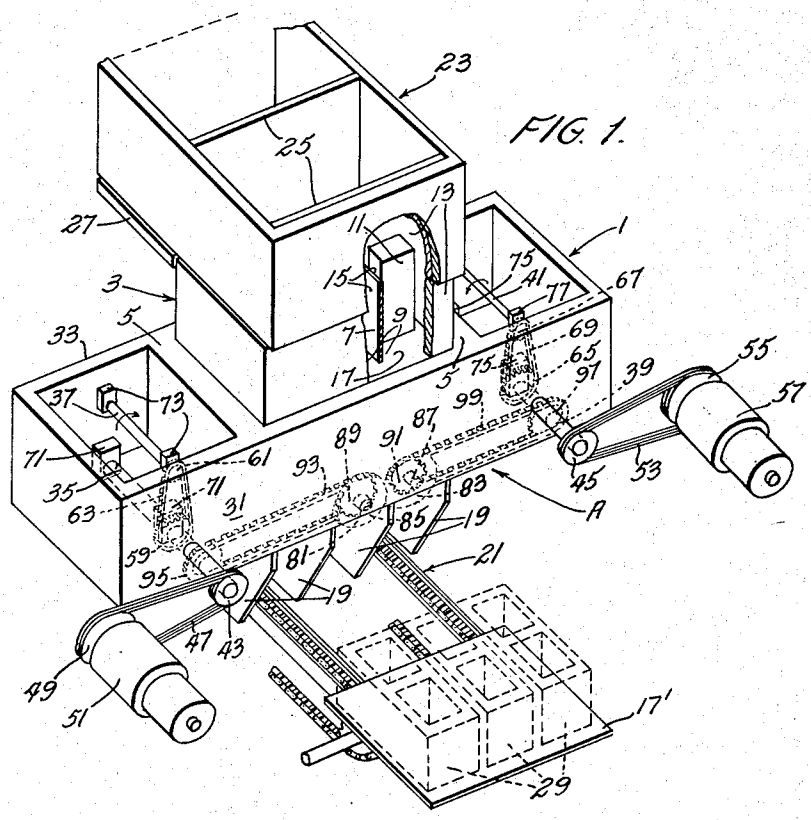



FIG. 2.

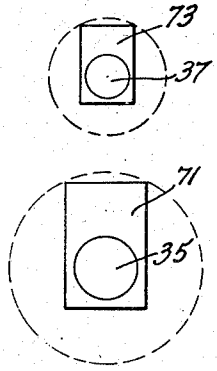



FIG. 3.

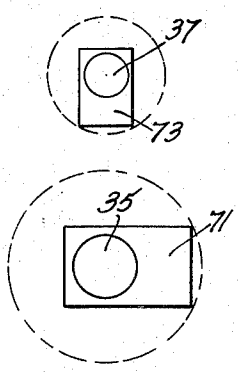



FIG. 4.

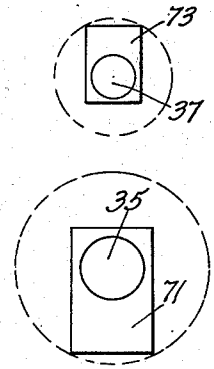
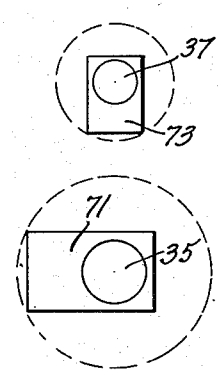



FIG. 5.




INVENTOR
GEORGE L. OSWALT

BY Brown, Jackson, Boettcher & Dienner
ATTORNEYS

United States Patent Office 2,695,523
Patented Nov. 30, 1954



2,695,523

# VIBRATING MECHANISM

George L. Oswalt, Forest Park, Ill.

Application March 30, 1948, Serial No. 17,955

4 Claims. (Cl. 74—61)

My invention relates to vibrating mechanism and more particularly to a mechanism for vibrating a mold body.

The vibrating mechanism of my invention may be applied in conjunction with a wide variety of materials, articles, or machines but it is particularly well adapted for use in the molding of concrete blocks, or the like, and I shall, therefore, illustrate it in that connection. Concrete blocks are composed of cement and an aggregate consisting primarily of cinders, or the like, the aggregate being of such size that even when mixed with the cement and proper proportion of water it does not flow readily into spaces between the walls of a mold and cores which may be positioned within the mold. Consequently, it is necessary to vibrate the mold as the mix is fed into it in order that the mold space may be completely and compactly filled. Vibration not only causes complete filling of the mold and compacting of the material therein but also speeds up the molding process.

In a competitive industry such as the building materials industry, speed is essential in the manufacturing operations. Hence, vibrating mechanism in conjunction with molds has been employed in both large and small operations of various kinds. For example, vibrating mechanism is employed in some of the larger concrete block manufacturing machines presently on the market which are adapted to produce six hundred 8" x 8" x 16" blocks per hour. The rate of production in such a machine depends in part upon automatic delivery by a feeding mechanism of measured charges of the mix from a supply source to a mold, but also depends upon vibration of the mix for a predetermined period of time for each charging operation. In such machines, vibration of the mold may start as the feeding mechanism begins to reach the mold and continues while the feed mechanism is over the mold, and as it is withdrawn from the mold. When the feed mechanism is withdrawn, it carries back with it any of the mix which has not gravitated into the mold with the assistance of the vibratory action.

It is the primary object of my invention to provide an improved form of vibrating mechanish which will result in speeding up the production of concrete blocks by machinery presently in use or by new types of machines. I have found from extensive experiments with a large concrete block making machine, the regular capacity of which is six hundred blocks per hour, or ten blocks a minute, that I can increase the rate of production, by the use of my invention, to nine hundred blocks per hour, or fifteen blocks per minute.

In addition to speeding up the rate of production of concrete blocks my invention also causes the blocks to be stronger by six per cent or more.

It is a further advantage of my invention that the manufacture thereof and installation in existing equipment will greatly increase the productive capacity of such machinery without proportionate cost by the addition of the improved mechanism.

In attaining the foregoing object and advantages I vibrate a mold body which has a bottom plate or pallet by accentuating the downward movement during vibration while feeding the mix into the top of the mold. That is to say, instead of shaking the mix upwardly and downwardly the same way by the vibratory movement, the mix which is being fed downwardly by gravity is directed downwardly more rapidly, or by a sharper movement, than it is directed upwardly.

Other objects, uses and advantages of my invention will become apparent, or be obvious, from the following description when taken with the accompanying drawing in which:

Figure 1 is a perspective view showing a mold body incorporating my invention and portions of an automatic concrete block molding machine;

Figure 2 is a diagrammatic showing of the positions of a pair of shafts and their eccentrics such as those illustrated at either of the ends of the mold body of Figure 1;

Figure 3 is a diagrammatic view similar to that of Figure 2 but illustrating the relative positions of the shafts and eccentrics after the larger eccentric has made a quarter revolution;

Figure 4 is a view similar to the view of Figure 2 but illustrating the relative positions of the shafts and eccentrics after the larger eccentric has made one-half of a revolution; and

Figure 5 is another diagrammatic view illustrating the relative positions of the shafts and eccentrics when the larger eccentric has made three-quarters of a revolution.

Referring now particularly to Figure 1, which illustrates, fragmentarily, an automatic concrete block molding machine, there will be seen a supporting frame **1** for a mold **3**. The frame **1** and mold **3** could, of course, be an integral structure which could be designated in its entirety as a "mold body." However, for convenience in the manufacture of a variety of different sizes of blocks, and other structural elements, the mold **3** is shown as being separate but carried rigidly within the frame **1** between frame members **5**, **5** so that any vibrations produced within the frame are transmitted directly to the mold **3**. With such construction molds for other forms of blocks or structural elements may then be substituted for the mold **3**.

Interiorly of the mold **3** there may be a plurality of dividing walls, such as the wall **7**, which form separate compartments **9** so that multiple units of blocks or other structural elements may be manufactured simultaneously. Cores **11** fixed in compartments **9**, together with the dividing walls **7** and outer walls **13**, define mold cavities **15** of restricted horizontal cross-section. The mold **3** may have for its bottom a closure plate or pallet **17** which is adapted to be raised and supported in place against the bottom of the mold by a plurality of supporting pallet pusher plates **19**. The frame **1** has independent supporting means (not shown) and the pallet pusher plates **19** may be resiliently or otherwise supported together in their various positions, one of which positions is below the chain feeding mechnism, which is indicated generally by the reference numeral **21**. The details of the various supporting means are not, however, required for an understanding of my invention. Above the mold **3** there is provided a guide mechanism, indicated generally by the reference numeral **23**, which guides a feeding mechanism, indicated by the reference numeral **25**, in its movement from a position beneath a hopper (not shown), wherein the feeding mechanism is in the dotted line position of Figure 1, to the position, as shown in Figure 1, wherein the feeding mechanism has moved over the top of the mold **3** to deliver a measured charge of mix formed of cement, cinders, or other aggregate and water. The feeding mechanism **25** is open at its bottom and, consequently, the wall **27** is supported beneath the guide.

The chain drive mechanism **21** is of the endless belt type and is indicated only fragmentarily. It is adapted to feed a series of pallets forward in correct spaced relation from a stack of pallets (not shown) behind and below the mold **3**. As a pallet moves into position over the retracted pallet pusher plates **19**, the pallet pusher plates are adapted to rise and lift the pallet upwardly against the bottom of the mold **3**. At this time the feed mechanism **25** is in its rearward position (the dotted line position of Figure 1) beneath a hopper (not shown) which is adapted to hold a large quantity of the mix. When a pallet such as palllet **17** is firmly in place beneath the mold **3**, the feed mechanism **25** is automatically moved forward to carry with it a charge of the mix, and, as the feed mechanism **25** begins to slide over the top of the mold, the frame **1** and mold **3** are vibrated in a manner to be explained below. Vibration of the frame and mold continues as the feed mechanism **25** moves into its forward position, as shown in Figure 1 (all of the mix being removed for clearness of illustration). After a predetermined period of vibration, the feed mechanism **25** is retracted toward its dotted line position and any excess of mix which has not

been vibrated down into the cavities 15 of the mold compartments 9 is carried back so that the top surface of the mold is leveled. Vibration of the mold and frame may continue during retraction of the feed mechanism 25.

When the feed mechanism 25 has been fully retracted, a pressing head (not shown) may descend from a position above the guide 23 and mold 3 to press the mix firmly into the mold cavities 15 against the resistance of the pallet 17. After such a pressing head has descended a predetermined amount in order to compress the mix and form a block of a certain height, the pallet pusher plates 19 and the pressing head descend together in spaced relation and a formed block, or blocks, descends from the mold on pallet 17 until the pallet pusher plates 19 pass below the level of the feed chain mechanism 21, whereupon the pallet is carried forward on mechanism 21 for discharge at the front end thereof as shown by pallet 17', carrying blocks 29, which are shown in dotted outline. While the formed blocks are being carried forward on a pallet 17', another pallet is simultaneously being forwarded by the chain feed mechanism 21 and the pallet pusher plates 19 into the position beneath the mold 3. The timed movements of the pallets and their supporting mechanism may be carried out by power means and controls of a known type which do not form a portion of the invention.

The vibrating mechanism for the frame 1 and mold 3 will now be described. The front wall 31 and rear wall 33 of frame 1 support a pair of rotatable shafts 35 and 37 at one side of the mold body 3 and another pair of shafts 39 and 41 at the other side of the mold body 3. The forward ends of all of the shafts find a bearing in the front wall 31 and the rear ends of each of said shafts find a bearing in the rear wall 33 of frame 1. In addition, the forward ends of the shafts 35 and 39 extend through the front wall 31 and have secured onto their respective free ends pulley wheels 43 and 45. A drive belt 47 connects the pulley wheel 43 with the pulley wheel 49 which is connected to the drive shaft of an electric motor 51. Similarly, the pulley wheel 45 is drivingly connected by the pulley 53 to the pulley wheel 55 which is connected to the drive shaft of the electric motor 57.

It will be readily understood that it is not necessary that each pair of shafts be vertically aligned in the frame 1, nor need there be a pair of shafts at each end of frame 1. Other locations of eccentric shafts and varying numbers of shafts may be employed so long as a sharp downward movement and a gentler upward movement is applied to the mold.

Shaft 35 has a sprocket 59 secured thereto and shaft 37 has a smaller sprocket 61 secured to it. The two sprockets are drivingly interconnected by a chain 63 and the sprockets are of such relative size that the upper shaft 37 is rotated at twice the speed of the lower shaft 35. Similarly shaft 39 has a sprocket 65 secured to it and the shaft 41 has a smaller sprocket 67 secured to it and the two sprockets are interconnected by a chain 69. Because of the respective sizes and numbers of teeth of the sprockets 65 and 67, shaft 41 will be driven at a speed twice that of the shaft 39. Similarly shaft 37 will be driven at twice the speed of shaft 35.

Shaft 35 has a pair of eccentric weights 71 secured to it which weights have their centers of gravity on a line parallel to shaft 35. The upper shaft 37 also carries a pair of eccentric weights 73 the centers of gravity of which lie on a line parallel to the shaft 37. Shaft 39 has a pair of eccentric weights 75 secured to it with their centers of gravity on a line parallel to said shaft and, similarly, the upper shaft 41 has a pair of eccentric weights 77 which have their centers of gravity on a line parallel to the shaft 41. Weights 71 are heavier than the weights 73 and the weights 75 are heavier than the weights 77, with the weights 71 and 75 preferably being the same size and shape and with the weights 73 and 77 preferably being the same size and shape. Although the centers of gravity of each pair of weights preferably will be on a line parallel to the axis of rotation of their shaft, other suitable locations may be employed.

It will be observed that with the shafts in the positions shown in Figures 1 and 2 the eccentric weights of each shaft extend vertically upwardly. After one complete revolution of shafts 35 and 39 all of the eccentric



weights will again assume the position shown in Figure 1, the upper shafts 37 and 41 and their respective eccentrics having in the meantime made two complete revolutions before returning to the position shown in Figure 1. It will be appreciated that the eccentric weights may take other forms and that in fact they may be integral portions of the various shafts or offsets of said shafts.

When the four shafts are driven, the fact that the centers of gravity of said shafts, plus their respective eccentric weights, lie to one side of the central axes of the respective shafts will cause reactions in the supporting means for the shafts. As the center of gravity of each shaft and its weights move upwardly the supporting means is pushed downwardly and vice versa. It will be readily seen, therefore, that when the four shafts are rotating, the frame 1, which constitutes the supporting means for the various shafts, will be vibrated. If the eccentrics of all of the shafts followed the same path at the same speed and were coordinated in their positions, their reactions against the frame 1 would all be directed in the same direction at the same time. However, the upper shafts 37 and 41, having the smaller pairs of eccentric weights 73 and 77, respectively, rotate twice as fast as the lower shafts 35 and 39, having the pairs of eccentrics 71 and 75, respectively. Consequently, during the rotation of a pair of shafts at either end of the frame 1 the large pair of weights and the small pair of weights will be alternately cooperating to provide a cumulative reaction on the frame 1 and mold 3, or will be opposing each other and will be applying a reaction resulting from the difference between the two forces. In the preferred form of my invention the action of the pair of shafts 35 and 37 is the same as the action of the pair of shafts 39 and 41, except that the two pairs are rotating in opposite directions. The purpose of having them rotate in opposite directions is to prevent reactions in a sideward direction since that would tend to cause the mold body and frame to move sidewardly. Since the corresponding shafts at opposite sides of the mold 3 are rotating at the same speed and the various eccentrics of said shafts follow corresponding paths and have similar speeds, the reactions in a sidewise direction cancel each other and the vibration of the mold is therefore substantially only in an upward and downward direction.

If reference will now be made to Figures 2, 3, 4 and 5 wherein shafts 35 and 37 are illustrated diagrammatically along with their respective eccentrics 71 and 73, it will be possible to understand better the effect which the rotating shafts and eccentrics have with respect to each other. The action about to be described will be the same for the pair of shafts 39 and 41. When the shafts 35 and 37 are in the position shown in Figures 1 and 2 and are in motion, the reaction against the frame 1 and mold 3 will be in a downward direction. Then as the shafts rotate clockwise it will be seen that when shaft 35 has made a one-quarter revolution the upper shaft 37 has made a one-half revolution. Since the reaction against the supporting frame 1 is in the opposite direction from the moving center of gravity of each eccentric, it will be seen that, when the shafts 35 and 37 have reached the position shown in Figure 3, the vertical component of reactive force of the upper shaft 37 and its eccentrics is now in an upward direction whereas the vertical component of the reactive force exerted by the eccentrics 71 of shaft 35 is zero. Consequently, the frame is being moved in a direction opposite to that in which it was being moved when the shafts and eccentrics were in the position shown in Figures 1 and 2. When the shafts 35 and 37 are moving and are intermediate the positions shown in Figures 2 and 3, shaft 37 and its eccentrics 73 will be moving from a position wherein they exert a downward reactive force to a position wherein they exert an upward force, while the shaft 35 and its eccentrics 71 move from a position wherein they are exerting a downward reactive force to a position wherein they exert no vertical force in either direction.

As shafts 35 and 37 rotate farther and shaft 35 reaches a position wherein it has completed one-half of a revolution, the shaft 37 and its eccentric 73 will have made one complete revolution. Such positions are shown in Figure 4 and the reactions produced by the eccentrics 73 and 71 will be directly opposed to each other. Since

shaft **35** carries a heavier pair of eccentrics than does shaft **37**, the upward reaction will exceed the downward reaction so that the difference in forces will still produce upward movement of the frame **1** and mold **3**.

When the shaft **35** and its eccentrics **71** have made three fourths of a revolution, the shaft **37** and its eccentrics **73** will have made one and one-half revolutions and the reaction produced by shaft **37** and its eccentrics will be upward while the reaction produced by the shaft **35** and its eccentrics **71** in a vertical direction will be zero. Then as shaft **35** makes another quarter turn from the position shown in Figure 5 so that it attains a position such as that shown in Figure 2, the shaft **37** and its smaller pair of eccentrics **73** will rotate from the position shown in Figure 5 to a position 180° therefrom and will attain the position shown in Figure 2. At that time both shafts **35** and **37** and their eccentrics will produce a cumulative reaction on the frame **1** and mold **3** in a downward direction.

From the foregoing it will be seen that the upward movement, produced by the rotation of the pairs of shafts and their eccentrics at opposite ends of the frame **1**, will be a series of more gentle or moderated movements than will the series of movements of the frame and mold downwardly, since the shafts and eccentrics cooperate to produce a sharp downward movement, but are working directly against each other during at least a portion of the time when the frame **1** and mold **3** are directed upwardly. When the shafts **35** and **37** rotate from the position shown in Figure 5 to that shown in Figure 2, more and more force will be exerted by the rotating shafts and their eccentrics in producing a downward movement and the downward movement will be accelerated as the reactions of the two shafts and their weights against the frame become increasingly cumulative.

It is preferable to have the positions and movements of the pairs of shafts and their eccentrics at each end of the frame **1** coordinated so that the reactions are identical at each end of the frame, or substantially so, and to attain that end the mechanisms illustrated in my copending application, Serial No. 11,482, filed February 27, 1948, may be employed.

As an example of one form of coordinated mechanism, reference may be had to the mechanism which is shown in dotted outline and is identified by the letter A. The mechanism A comprises a pair of sprockets **81** and **83** which intermesh, said sprockets being carried on shafts **85** and **87**, respectively, which are borne in the front wall **31** of the frame **1**. Alongside the sprockets **81** and **83** on the respective shafts **85** and **87** are smaller sprockets **89** and **91**, sprocket **89** being connected by chain **93** to a sprocket **95** on the shaft **35**. The sprocket **91** is connected with a sprocket **97** on shaft **39** by a chain **99**.

It will be seen that when the motors **51** and **57** are started they will drive the shafts **35** and **39**, respectively, through the pulley wheels connected with the motors and with said shafts **35** and **39**. The sprockets **95** and **97** on shafts **35** and **39**, respectively, will drive the shafts **85** and **87** through the respective chain and sprocket drives so that the larger sprockets **85** and **83**, respectively, will rotate in opposite directions and mesh with each other. If one motor lags behind the other it will be assisted by the other motor through the positive interconnection just described. Since the positions and movements of the corresponding eccentrics on the pairs of shafts at opposite sides of the mold **3** are coordinated, the frame **1** and the mold **3** will rise and fall uniformly along their length instead of having one end up while the other end is down. As a result the substantially uniform vibration along the full length of the frame **1** and mold **3** provides blocks of uniform density, size and strength.

At the same time the driving of shafts **35** and **39** will cause the driving of the upper shafts **37** and **41**, respectively, by means of the chain drives between the shafts **35** and **37** and between the shafts **39** and **41**, respectively. Rotation, in the manner specified, of all of the shafts and the eccentrics connected therewith will then produce the desired vibratory action, namely, uniform vibration throughout the length of the frame **1** and mold **3**, which vibratory movement will have sharp downward movements and gentler or moderated upward movements. It will be appreciated that with the coordinating mechanism A one motor of suitable size could be employed in place of the two motors **51** and **57**.



Ordinarily the motor, or motors, will be started when the feeding mechanism **25** has moved forwardly in the guide **23** from the dotted line position to a position wherein the forward end of the feeding mechanism begins to pass over the mold **3**. Vibration continues while the feeding mechanism moves forward into the position shown in Figure 1 and continues while the feeding mechanism remains motionless and also as the feeding mechanism is withdrawn from above the mold **3**. Controls for starting the motors and stopping them in proper sequence may be employed so that the operation of the vibrating mechanism may be automatic.

While I have illustrated a preferred embodiment of my invention I do not intend to be limited thereto, since, to my knowledge, I am the first to conceive of vibrating mechanism wherein the downward movement is accentuated and the upward movement of the vibrated mold or frame is moderated.

I claim:

1. In combination, a frame structure adapted to hold material and to be vibrated, shaft supporting means at opposite ends of said frame structure, a pair of rotatable shafts rigidly carried at each of said ends of the frame structure in said shaft supporting means, eccentrics carried by all of said shafts, the eccentric of one shaft of each pair being of lesser weight than the eccentric of the other shaft, said shafts of each pair being drivingly connected whereby the shaft having the smaller eccentric weight is driven at twice the speed of the other shaft, but in the same direction, and whereby the eccentrics of each pair of shafts periodically both reach the uppermost position in their paths of rotation at the same time and periodically the shaft having the eccentric of lesser weight reaches the uppermost position of its path of rotation when the shaft having the eccentric of greater weight reaches the lowermost position of its path of rotation, means for driving the shafts at one end of the frame structure in one direction, and means for driving the shafts at the other end of the frame structure in the opposite direction.

2. The combination of claim 1 together with means for drivingly interconnecting the respective drive means for said pairs of shafts.

3. In combination, a frame structure adapted to support material and to be vibrated, a pair of rotatable elements rigidly and rotatably supported by said frame at each of the opposite ends thereof, each rotatable element having its center of gravity lying to one side of its axis of revolution, one rotatable element of each pair having such weight and such position of its center of gravity that the reaction produced by its rotation is less than that produced by the other rotatable element of the pair, said elements of each pair being adapted to be driven at different angular velocities and in the same direction whereby their eccentricities periodically produce cumulative reactions against the frame in one vertical direction and then opposing reactions against the frame in the opposite vertical direction, means for driving the pairs of rotatable elements at opposite ends of the frame coordinately and in opposite directions so that the cumulative reactions and the opposing reactions at each end of the frame are the same to cause rise and fall of the frame uniformly along its length.

4. The combination of claim 3 wherein the rotatable elements of each pair are drivingly interconnected so that their centers of gravity periodically both reach an extreme vertical position in their paths of rotation at the same time and periodically the center of gravity of one of said rotatable elements reaches the uppermost position of its path of rotation when the center of gravity of the other reaches the lowermost position of its path of rotation.


**References Cited** in the file of this patent

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 1,280,269 | Miller | Oct. 1, 1918 |
| 2,054,253 | Horsch | Sept. 15, 1936 |
| 2,161,822 | Kogl | June 13, 1939 |
| 2,319,313 | Flam | May 18, 1943 |
| 2,353,492 | O'Connor | July 11, 1944 |
| 2,407,168 | Lindkvist | Sept. 3, 1946 |