Our invention relates to the art of concrete block making, and has particular relation to a novel machine in which controlled vibration and compression are utilized to produce concrete blocks of uniform density and superior strength.

A further object of our invention is to provide a concrete block forming machine in which the exaction of blocks from the mold may be effected during vibration of the latter. Vibration of the mold during ejection of the blocks provides a troweling action upon the sides of said blocks whereby a smoother finished surface is obtained.

Still a further object of our invention is to provide a mechanism by which the mold holding a block being formed may be subjected to pure vertical motion so there will be no relative motion of the concrete flow of said mold block while said block is being compacted and formed or, on the other hand, may be subjected to vertical and lateral motion so there will be a circulatory flow of the concrete, which between these types of motion being under the control of the operator of the mechanism.

This invention is a division of our co-pending application for patent entitled "Making Concrete Blocks," filed June 6, 1948, and bearing Serial No. 63,812, now Patent 2,589,115.

The above objects and advantages of our invention will appear in connection with a detailed description made in connection with the accompanying drawings, in which:

Fig. 1 is a fragmentary side elevation of a vibrator mechanism and associated devices shown mounted upon a concrete block making machine;

Fig. 2 is an end elevation of said mechanism, as viewed from the left in Fig. 1; and

Fig. 3 is a fragmentary plan view as viewed in the direction of the arrow 3 in Fig. 2, showing details of construction of the adjustment means by which controlled vibration of the mold may be varied in amplitude and direction.

A concrete block making machine for which our invention is adapted is disclosed in detail in our co-pending application for patent Serial No. 63,812, entitled Method and Machine for Making Concrete Blocks, now Patent 2,589,115, and reference is had to the disclosure in said application with regard to the charging, transporting, and ejection devices with which our present invention operates.

Suffice it to say that such a machine receives a large quantity of premixed material from a hopper and mechanism periodically fills a concrete block mold and is actuated by a vibrator means with which our present invention is particularly concerned. Said mold comprises a rectangular box, open at the top and bottom. Said mold is of conventional construction and may be designed to form one or more desired blocks of selected configuration. Said mold is filled by a carrier box (not shown) which moves periodically over the mold and fills it with a predetermined quantity of mixture. The concrete mixture preferably has insufficient water to form a "wet" mix, and said intermixture is thus referred to as being in a "dry" state. Thus, considerable pressure is used to cause the particles to cohere. It is thus desirable that the mold box be vibrated while said materials flow into said mold box and to continue to vibrate until the intermixture flows into all of the portions thereof, to completely fill them, and form a complete block or pair of blocks, depending upon the size and shape of the mold. The vibrating mechanism with which our invention is concerned continues to operate rapidly, and vibration is continued while a plunger pushes the formed fresh block or blocks from the bottom of the mold to discharge them upon a pallet. Vibratory motion is essential to produce uniform settling and distribution of the concrete material throughout the bore of the mold and to make a homogeneous structure which is solidified by said vibration and faithfully portrays all the details of the inner chamber or bore of said mold.

It has been found desirable in many instances of operation of a vibrating mechanism with which our invention is concerned, to continue vibration during the full extraction of the blocks from the bottom of the mold. Due to the fact that the plunger, in stripping the formed blocks from the mold box, moves along a path at right angles to the open top and bottom thereof, it is desirable that the sides of the box be maintained in lines parallel with the movement of the stripper head or plunger. The strokes of the vibrators are relatively short with respect to the depth of the mold box, and thus, as the plunger moves the formed blocks from the mold, there is a multiplicity of short vibrations given to the ejection box which produces a troweling action upon the sides of the blocks thus formed and as they are stripped from the mold box. The production of vibrational forces while it is thus stripped tends to prevent the breaking of corners of blocks because there is no large portion of the external faces of the blocks which tend to hold up and adhere to the inner wall surfaces of the mold box while thus being discharged.

The foregoing is sufficient to provide a sufficient setting for the details of the invention with which this application is particularly concerned.

A block mold 1 is supported upon the upper ends of vibrator rods 2, one lying at each side of the mold box. Vertical slides 3 are arranged at the upper ends of each of said vibrator rods 2 and are mounted pivotally on pins 5 which project laterally from the opposite side walls of said mold into bearing holes provided in said slides. Vertical, V-shaped grooves 7 are formed in the sides of said slides 3 to receive the complementary notched edges of channel-shaped guide members 8. These guide members 8 are proportioned and arranged loosely to guide the slides 3 as the latter move vertically. Pivotally mounted bars 9 are secured pivotally at their forward ends to said guide members 8 and at their rearward ends to brackets 10 mounted upon the frame 11 of the machine, these bars serving to restrain lateral movement of the guide members 8.

Adjustment screws 12 are secured pivotally to the adjustment bars 9 intermediate the ends of the latter. These screws extend downwardly through flanged seats and are secured to the frame members 11. Adjustment nuts 14 are threaded upon said screws 12 on opposite sides of the brackets 13 to provide convenient means for varying the vertical position of the guide members 8 with respect to the slides 3 and the pins 5.

Brackets 4 are secured to the side walls of the mold 1 by bolts 6 and the rearward ends thereof are offset outwardly away from the sides of the mold 1 (see Fig. 3). Spaced parallel links 15 are secured pivotally at one of their ends to said brackets 4 and at their rearward ends to triangular plates 16. A second pair of parallel links 17 are secured pivotally at one of their ends to said triangular plate 16 at right angles to the connection of links 15. The lower ends of links 17 are secured pivotally to brackets 18 mounted upon the frame member 11. The arrangement of parallel links 15 and 17, respectively, function to prevent rotation of the mold 1 about a horizontal axis, for the reasons previously described.

The lower ends of the vibrator rods 2 are joined to a driven shaft 19 through eccentric cams 20. The driven shaft 19 carries pulleys 21 thereon and these engage drive belts 22 leading to power means (not shown). In function, the parallel links 15 and 17 control the tipping or tilting motion of the mold. That is to say, they retain the side walls of the mold in a vertical disposition at all times. The magnitude and elliptical or circular movement of the mold is made variable by adjusting the position of the guide members 8 relative to the pivot axis defined by pins 5 of the mold. Thus, when guide members 8 are positioned above the
The devices producing such vibratory action upon the mold box 1 may be incorporated in machines having automatic or semiautomatic operation. The adjustment of the guide member 8 with regard to the point of joining of the vibrating rods with the mold box provides a simple and efficient control to the amplitude, direction and degree of vibration given to the mold with corresponding changes and advantages in solidifying the mix within the mold, the discharge therefrom, and the finishing and suracing thereof as the formed blocks are discharged from said mold.

In operation, the pulleys 21 are rotated by the drive belt 22 to actuate the eccentric cams 20. Rotation of these eccentric cams, in turn, imparts an elliptical or circular movement to the vibrators 2. Further, since the slides 3 are arranged upon the upper ends of the vibrators 2, elliptical movement is imparted thereto except as the slides are restrained by the guides 8. Thus, the V-shaped grooves 7, which grooves fit somewhat loosely with the guide members 8, inhibit lateral movement of the slides 3. However, as shown in Fig. 2, the pins 5 which carry the mold box 1 are journaled in the slides 3 at a point below the engagement of the guides 8 with the slides. Because of this arrangement, an elliptical movement is imparted to the mold 1 and this movement follows a path in which the major axis of the ellipse is disposed in a vertical direction. On and of itself, such an elliptical mold box vibration is not novel. However, it also will be remembered that the spaced parallel links 15 and 17 are secured, by means of the bracket 4, to the mold box 1 in order to prevent tilting or tipping thereof. Accordingly, while the mold box itself defines a restricted elliptical or circular vibrational path, the side walls of the mold box are maintained in a vertical disposition by the parallel links 15 and 17. In this manner, ejection of a finished concrete block from the mold is facilitated since such ejection conventionally proceeds in a vertical direction and the side walls of the mold are maintained parallel to the vertical direction of ejection.

To change the type of vibrational motion which is imparted to the mold 1, the screws 12 may be adjusted so as to vary the position of the guide members 8 relative to the axis of the pins 5. When the guides are directly opposite the pins, a pure vertical motion is imparted to the mold. When the guides are above the pins (as shown in Fig. 2), that portion of each slide 3 and rod 2 which is below a guide 8 is free to move laterally a small amount in accord with the eccentric movement of the cams 20. This latter disposition of elements results in an operational motion as described in the paragraph above. That is to say, the mold box itself is moved in an elliptical path but the side walls thereof are maintained in a vertical disposition.

We claim:

1. In a machine for making concrete blocks, the combination of a frame, a driven shaft mounted on said frame, power means for driving said shaft, spaced vibrator rods mounted eccentrically at the ends of said driven shaft, a slide member carried by each said vibrator rod, a mold suspended pivotally between said slide members, vertical guide member means mounted upon said frame and operatively engaging said slide members, a bar pivotally interconnecting each guide and said frame, and link means interconnecting said mold and said frame to prevent tipping of said mold.

2. In combination with the frame of a machine for making a concrete block, laterally spaced vibrator rods, eccentric cam and motor members mounted upon said frame and connected to corresponding first ends of said vibrator rods to move the rods with an eccentric circular motion in both a vertical and a lateral direction, laterally spaced slide members carried upon corresponding second ends of said vibrator rods and pivotally carrying a mold box therebetween, a guide means fixed against movement and loosely gripping each slide member in an operational motion as described to constrain the same to substantially vertical movement, and a parallel link means joined to said mold and to said frame to inhibit tipping of the mold during vibration.

3. A machine for making a concrete block, comprising a frame member, a pair of elongated bars secured adjustably to spaced points upon said frame, each bar carrying a guide member adjacent the end thereof, laterally spaced vertical vibrator rods carrying slide members upon the upper ends thereof, each said guide member loosely and slidably accommodating one of said slide members to restrict the movement of the latter relative to the former to a substantially vertical path, drive means mounted upon said frame and engaging the lower end of each vibrator rod to move the latter in an elliptical path, a mold box suspended pivotally between said slide members, and spaced parallel link means secured pivotally to spaced points upon said mold box to prevent tipping thereof during actuation of said drive means, said link means including a double parallelogram arrangement of a first pair of links.

References Cited in the file of this patent

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