United States Patent [19]

Holm

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[54] **VIBRATION CASTING STATION WITH SWING-IN MOLD CLAMPING HOOKS**

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[52] **U.S. Cl.** ..... **425/432,** 249/172, 425/450 C

[51] **Int. Cl.** **B28b 7/04**

[58] **Field of Search** ..... 425/432, 450 C, 450 R; 249/172

[56] **References Cited**

UNITED STATES PATENTS

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[57] **ABSTRACT**

A casting station in an installation for making concrete components, in which molds having hinged side walls are successively conveyed to the casting stations with the walls held in an upright position without using locking devices. The station is provided with a row of clamping hooks at each side of the mold when located on transverse vibration beams, and said hooks are lifted from a lower outwardly inclined position into an upper upright position in which the upper ends of the clamping hooks are brought into position over a protruding part of the side walls, upon which the hooks are lowered under pressure whereby the walls are locked to the mold bottom and the mold and the vibration beams are connected into a rigid unit during the subsequent pouring and vibration operation. When the casting has been completed the mold is released by moving the clamping hooks in the opposite sequence.

4 Claims, 7 Drawing Figures

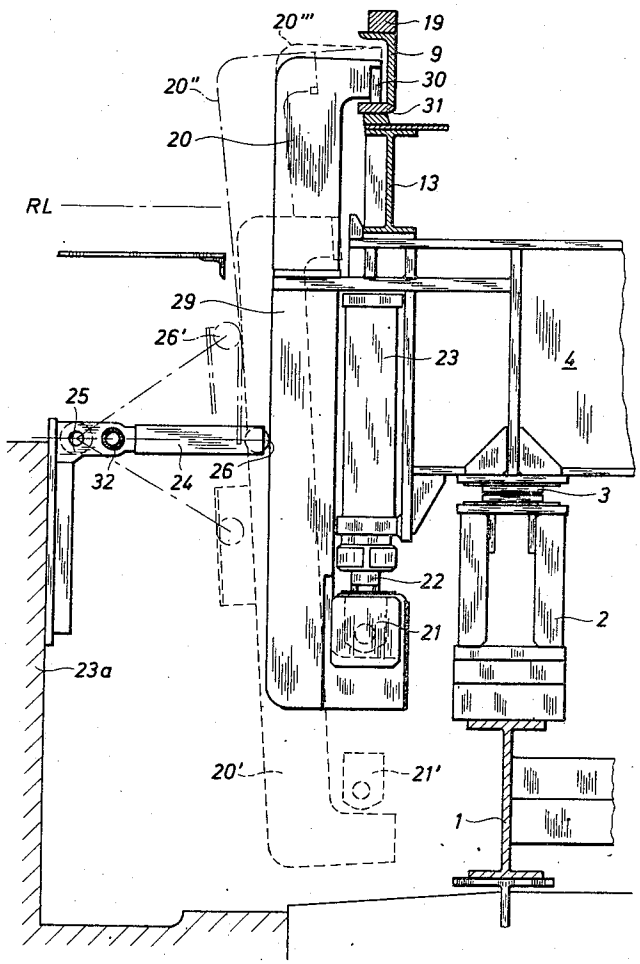


Fig. 1

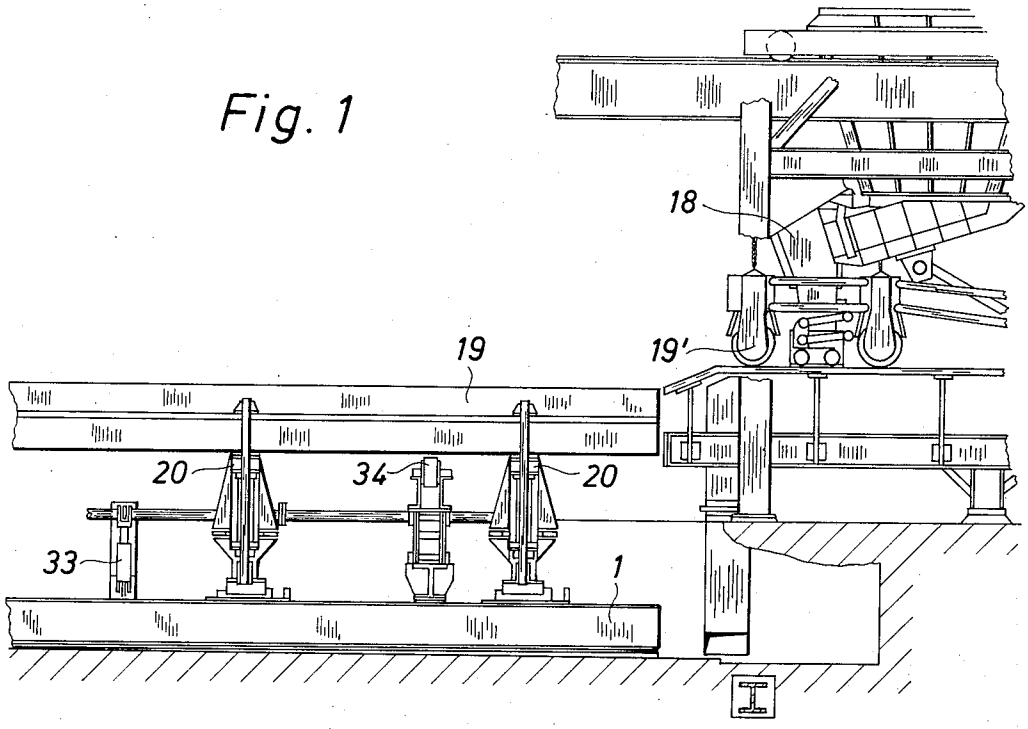


Fig. 2

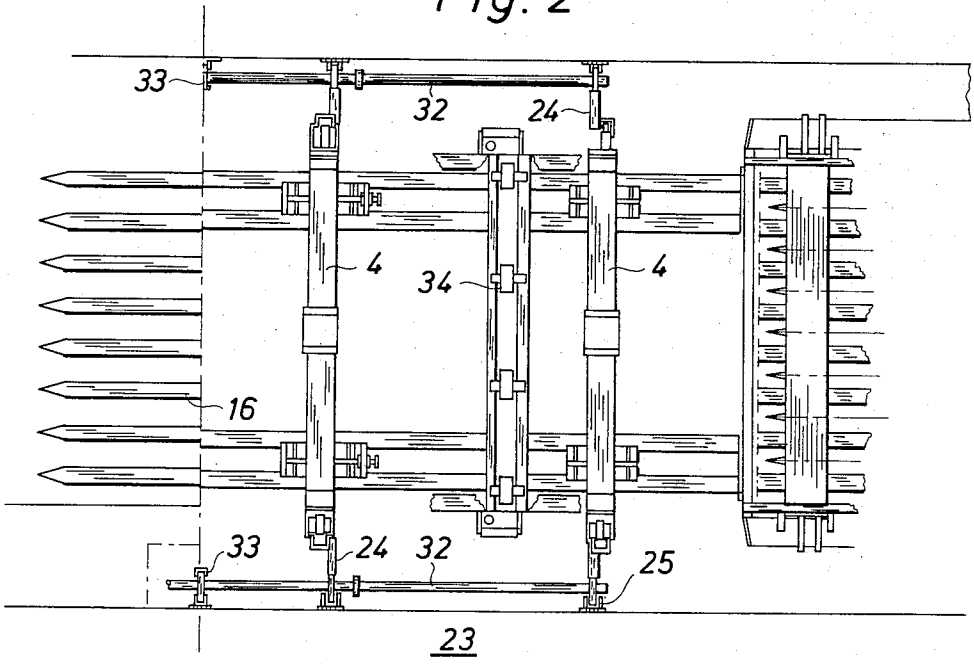


Fig. 3

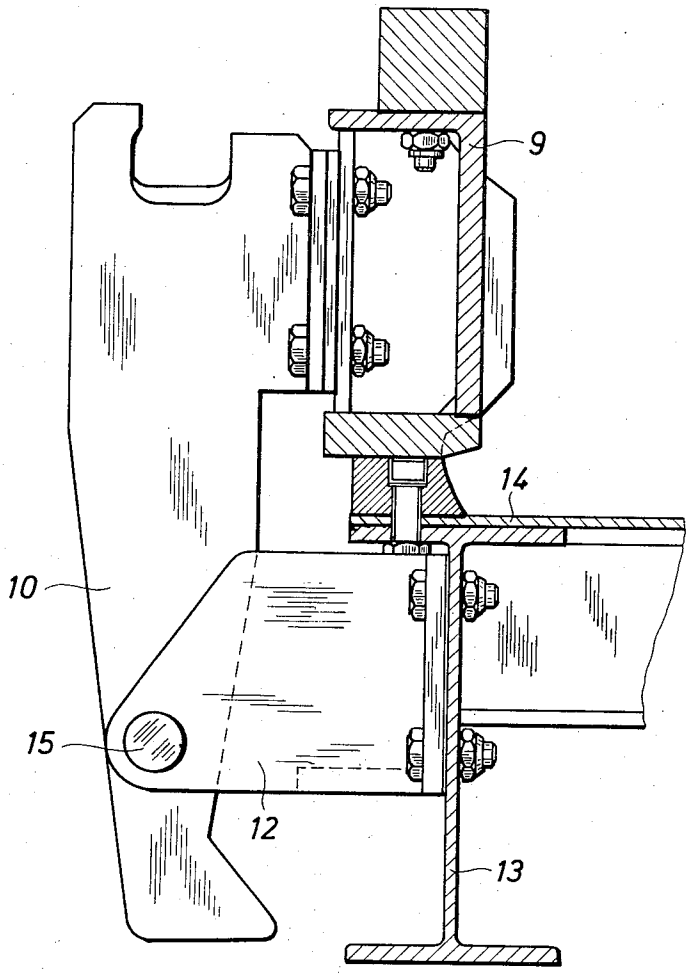


Fig. 4

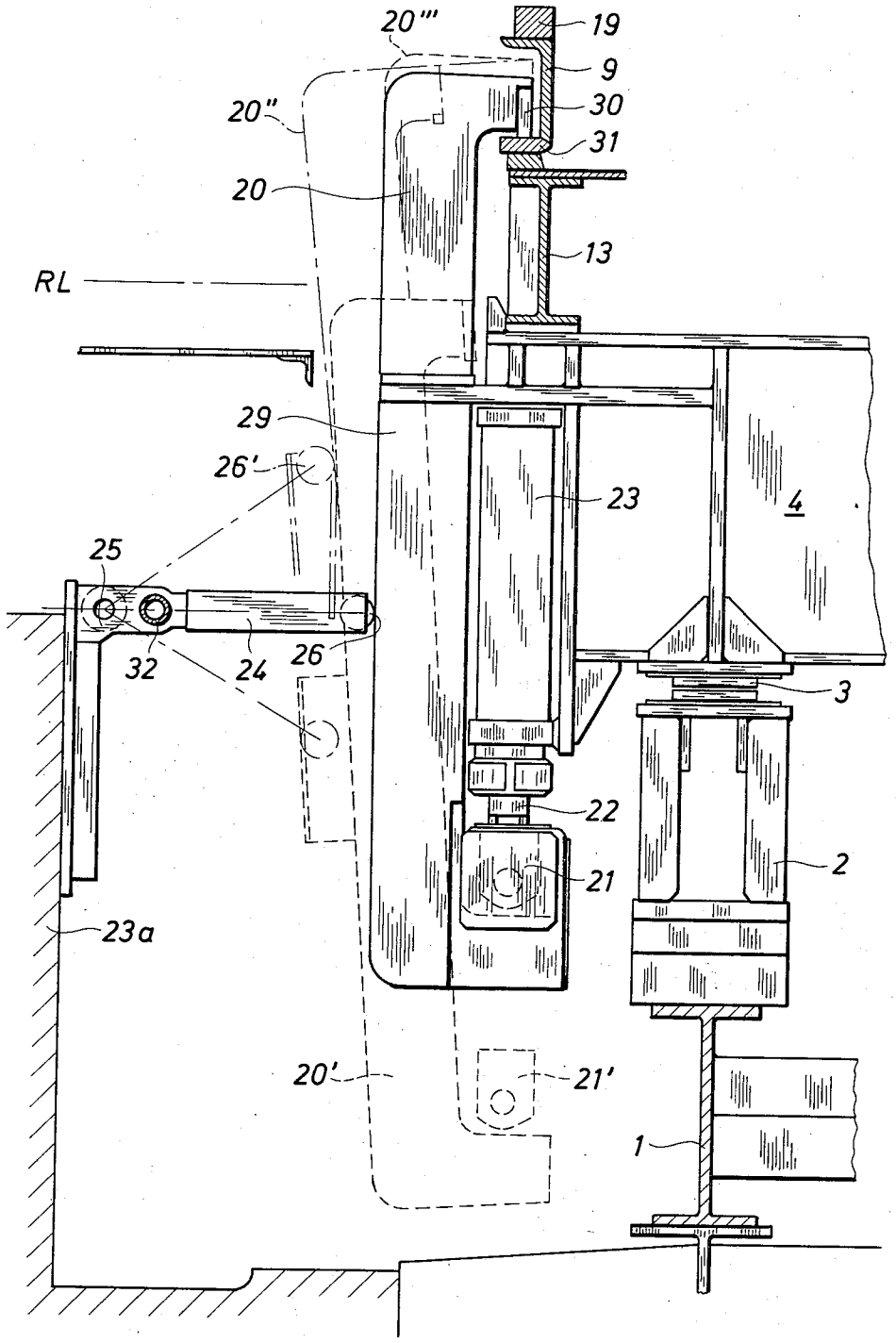


Fig. 5

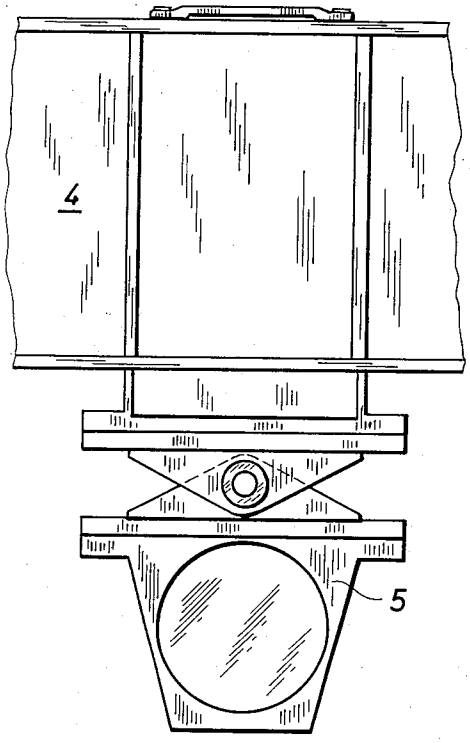
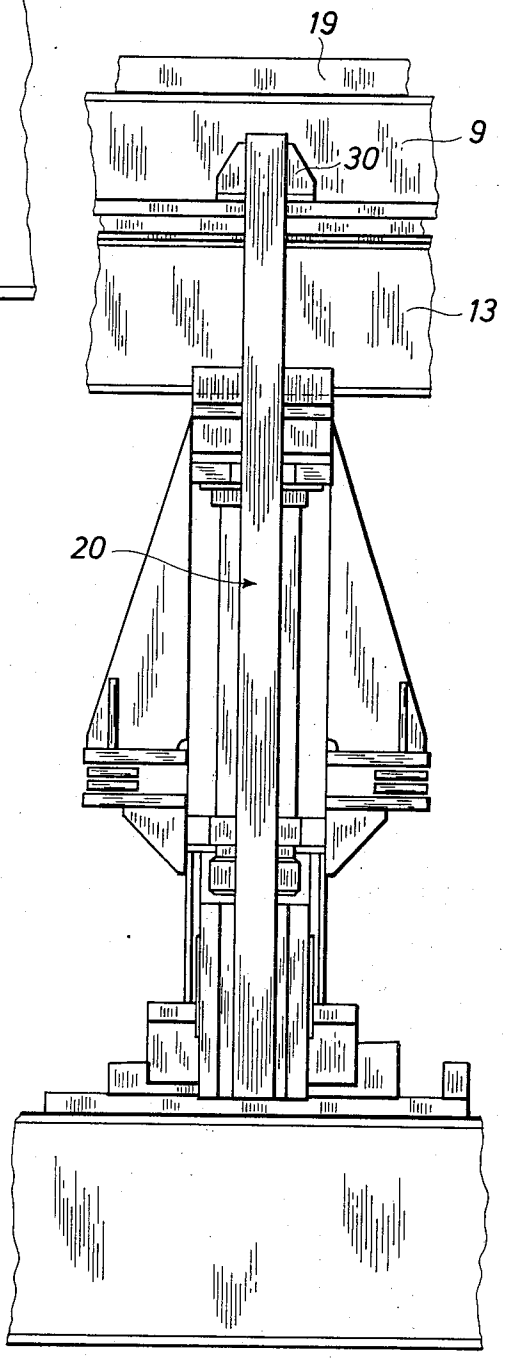


Fig. 6



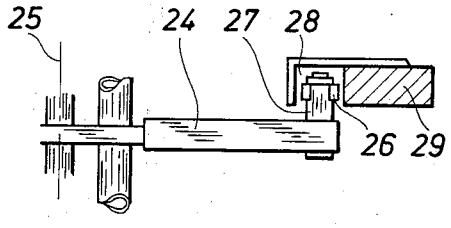


Fig. 7

VIBRATION CASTING STATION WITH SWING-IN MOLD CLAMPING HOOKS

BACKGROUND OF THE INVENTION:

The present invention relates to a casting station in an installation for making concrete components. A plurality of horizontal molds are used in such installations, which molds are conveyable past a plurality of stations such as a shuttering station, a casting station, a hardening station, a deshuttering station and a removal and cleaning station. The molds have hinged side walls which are locked in an upright tipped-up position by means of pressing and locking mechanisms. An installation of said type is disclosed, e.g., by the specification of U.S. Pat. No. 743,247 which describes molds whose hinged side walls are locked in an upright tipped-up position by means of a plurality of springs formed as clamping hooks pivotally mounted on the mold bottom.

SUMMARY OF THE INVENTION

It is one object of the invention to provide a casting station for installations of the subject type for casting concrete components subjected to vibrations at a noise level lower than hitherto possible, which is achieved by effectively clamping the mold to a casting table having vibrating means.

It is another object of the invention to provide pressing and locking means capable of automatically and effectively clamping a mold transferred to the casting station to vibration beams.

It is a further object of the invention to form the said pressing and locking mechanisms so as to be capable of effectively holding the hinged walls of the mold in an upright tipped-up position during the vibration casting.

It is yet another object of the invention to provide a mold to be used in the casting station according to the invention with hinged walls being formed so as to be capable of assuming a stable upright tipped-up position without locking means and so as to co-operate with locking and clamping means of the casting station for locking the walls in an upright position and clamping the mold to the vibrating beams during vibration casting, to thereby obviate individual locking means on all molds.

Additional objects, advantages and structural features of the casting station according to the invention will appear from the subsequent specification in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a section of an embodiment of the casting station according to the invention viewed from the side.

FIG. 2 is the section of the station illustrated in FIG. 1 viewed from above but without the casting machine shown in FIG. 1.

FIG. 3 is a cross section of a hinged side wall of a mold to be used in the casting station according to the invention.

FIG. 4 shows a clamping and pressure mechanism of the casting station according to the invention with guide means and a pressure cylinder disposed on a transverse vibration beam.

FIG. 5 is a drawing illustrating as an example only how the vibration beam of FIG. 4 may be connected to a vibrator in a manner known per se.

FIG. 6 shows the clamping hook of FIG. 4 viewed from the outer side, but without guide means.

FIG. 7 shows guide means of the clamping hook of FIG. 4 viewed from above.

The casting station of FIGS. 1 and 2 comprises a foundation frame 1 which supports through vertically adjustable brackets 2 provided with shock absorbers 3 (FIG. 4) a plurality of transverse vibration beams 4. One or more vibrators 5 are mounted underneath each vibration beam in such a manner that substantially only vertical forces can be transmitted to the beam which is reinforced at these points, as shown in FIG. 5. The casting station according to the invention is suitable for large slabs, and in this case there may, for instance, be provided several vibration beams spaced longitudinally of the casting table, and a plurality of vibrators 5 may be mounted underneath each vibration beam.

The plant uses a plurality of molds which are successively moved past various stations in advance of and following the casting station such as reinforcing and shuttering stations located in advance of the casting station and stations following same for hardening of the slab, e.g., in a steam chamber, for deshuttering purposes and for removing the slab or another concrete component, e.g., a wall element and cleaning the mold. The molds used have hinged side walls 9 supported by arms 10 which are hinged to brackets 12 extending outwardly from the mold bottom 14 reinforced by I-profiles such that the hinge axis 15 is located well outside the centre of gravity of the side wall when the latter is in the upright tipped-up position, as shown in FIG. 3, to thereby enable the molds to be guided into and away from the casting station with upright side walls without the latter being held by locking means. For the sake of clarity, the arms 10 have not been shown in FIGS. 1 and 4.

The molds 9–15 are fed to the casting place by means of a roller conveyor known per se having rollers 34 which are adjustable in the vertical direction such that when the mold has been positioned above the vibration beams, they are retractable below the lowest level assumed by the upper surface of the vibration beams during filling of the mold and vibration. After positioning the mold, a plurality of tubes 16 are introduced in a manner known per se through each end wall thereof, which tubes are arranged in and drawn by a trolley and so supported at one end that they may participate in the mold vibrations. This arrangement constitutes no part of the present invention and therefore need not be further described, and this also applies to the said roller conveyor.

The mold is filled with concrete from a casting machine 18 which travels longitudinally of the mold on running rails 19 on the upper surface of the hinged side walls. The casting machine 18 further includes compressing and vibrating means 19' to be used for working the surface of the concrete in the mold. Nor does this machine constitute any part of the present invention and therefore will not be further described here.

When the molds 9–15 have been correctly positioned on the vibration beams, its swingable side walls 9 must be locked in upright position, and according to the invention the mold and the vibration beams 4 should at

the same time be clamped together so as to operate as a unit for vibrating the concrete during pouring.

To achieve this, there is provided at either end of the transverse vibration beams **4** a pivotal and vertically displaceable clamping hook **20** of flat U-shape. Said clamping hook, which is best seen in FIG. **4**, is pivotally mounted at its lower end in a pressure head **21** provided at the end of a piston rod **22** of a vertical hydraulic power cylinder **23** rigidly connected to the end of the vibration beam **4**. A swingable arm **24** is pivotally mounted about an axis **25** on the foundation of the casting station **23***a*. The free end of said arm supports a roller **26** mounted on a transverse pin **27** and engageable with a guideway **28** provided on the outer side of the body portion **29** of the respective hook (FIG. **7**) and open at the top and below and at one side. The upper end of the clamping hook supports a pressure means **30** which, when the hook is in the position shown in FIG. **4** by fully drawn lines, is located above an outwardly protruding part **31** of the side wall **9** of the mold. A shaft **32** extends through all the swingable arms **24** at the same side of the mold spaced from the pivot axis **25** of the arm, and said shaft **32** is movable upwards and downwards by means of a hydraulic power cylinder **33** so as to cause all arms to perform identical movements.

As the mold **9–15** is transferred to the vibration beams **4**, the clamping hook **20** is in the lower position **20'** indicated by dotted lines so as to enable the mold, which is moved by the rollers **34** in the plane indicated by R L in FIG. **4**, to pass over the hook. When the mold has been positioned on the vibration beams, the clamping hook **20** is lifted by means of the power cylinder **23** and is simultaneously guided by the guideway **28** and the roller **26'** on the arm **24** which is swung out to one of the positions indicated by dash lines. When the clamping hook reaches the position **20''** indicated by dash lines, the arm **24** is swung by means of the shaft **32** and the cylinder **33** to a horizontal position, whereby the roller **26** will exert a pressure on the body portion **29** and turn the clamping hook into the upper position **20'''** indicated by dotted lines and where its pressure means **30** is located above the protruding part **31** of the side wall of the mold. The power cylinder **23** is actuated such that the pressure head **21** will exert a downwardly directed force on the clamping hook so as to cause it to move down to the position **20** indicated by fully drawn lines and where its pressure means **30** will exert a heavy pressure on the flange **31** to thereby in co-operation with the other clamping hooks hold the side wall of the mold firmly in upright position, while the mold is clamped together with the vibration beams **4**. During the subsequent filling of the mold and simultaneous vibration of the beams **4** by the vibrators **5**, the vibration beams and the mold will vibrate in unison. As the mold is not bounced on the vibration beams, and as its side walls are held rigidly against the bottom without the use of springs, the noise level during vibration is substantially lower than attainable by the methods used hitherto.

When the clamping hook **20** is in its operative position subject to pressure, the arm **24** is swung away from its centre position onto, for instance, the lower position indicated by dash lines such that no vibrations are transmitted from the clamping hook to the arm.

Upon termination of the casting operation, the clamping hook **20** is moved in the opposite direction by the guide means and the hydraulic power cylinder wherein the pressure is first relieved, whereupon the hook is lifted slightly to the position designated **20'''** and thereafter swung out by pivoting the arm **24** such that the roller **26** will exert a pull in the guideway **28** and immediately afterwards move the pressure head **21** and with that the clamping hook down to the initial position **20'**. Although it is implied in the foregoing that the clamping hook **20** is pulled outwardly by means of the roller **26**, it will be appreciated that the hook may also have such form and be mounted so as to swing by itself towards the roller, in which case the latter merely serves to urge the clamping hook inwardly from an inclined to a vertical position.

It will be appreciated that within the scope of the invention various modifications are possible, and that the casting station may be applied to any plant for making concrete slabs or other horizontally cast components where it is desired to clamp together the mold with vibration beams such that they will operate as a unit.

I claim:

1. A casting station in an installation for making concrete components comprising

a foundation frame including brackets provided with shock absorbers and supporting a plurality of transverse vibration beams whose lower surfaces are connected to at least one vibrator for producing vertical vibrations and whose upper surfaces form a support for a mold adapted to be conveyed from a preceding station over the vibration beams,

said mold having protruding part side walls hinged at their bottom and adapted to be held in a locked upright position during the concrete casting operation by means of a plurality of clamping devices,

said clamping devices being provided at either end of each vibration beam and each having a substantially U-shaped clamping hook whose lower end is pivotally mounted in a pressure head at the end of a piston rod of a power cylinder which is fastened to the ends of the vibration beam, and a guide and pressure means mounted opposite the body portion of each clamping hook on the foundation of the casting station and adapted to guide said hook when the latter is lifted by the power cylinder from a lower swungout position to an upper swung-in position wherein pressure side wall holding means on the hook is brought into position over the protruding part of a side wall by actuation of the power cylinder and said holding means is adapted to be pressed down against said protruding part of the side wall of the mold and be held in this position during casting of concrete poured from a casting machine movable along the mold.

2. A casting station according to claim **1** wherein the guide means for guiding each clamping hook includes a pivoting arm one end of which is mounted on the foundation and the opposite end of which supports a roller mounted on a pin extending laterally from the arm so as to be engageable with a guideway located on the outer side of the body of the clamping hook and open at one side and at least at one end, all pivoting arms at the same side of the mold being guided by a continuous shaft carried through all the arms spaced from their common pivot axis and connected to hydraulic lifting means or similar power means.

3. A casting station according to claim **2** wherein the pivoting arms are adapted to be swung out of engage-

ment with the guideways of the clamping hooks when said clamping hooks have been swung into their clamping position.

4. A casting station according to claim 1 wherein said hinged walls are so mounted and formed that their centre of gravity in upright tipped-up position of the wall is located so far away from the pivot axis that the wall of the mold bottom is supported in such stable state that it will remain in this position when the mold is conveyed and stacked.

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