United States Patent [19]

Pietrowiak

[11] **3,825,394**

[45] **July 23, 1974**

[54] **INSTALLATION FOR THE MANUFACTURE OF FINISHED CONCRETE COMPONENTS**

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[22] Filed: **Jan. 4, 1973**

[21] Appl. No.: **320,940**

[30] **Foreign Application Priority Data**

Nov. 24, 1972 Germany 2257768

[52] **U.S. Cl.** **425/404,** 425/425, 425/DIG. 108, 264/228

[51] **Int. Cl.** **B28b 7/00**

[58] **Field of Search** ... 264/228; 425/404, DIG. 108, 425/425

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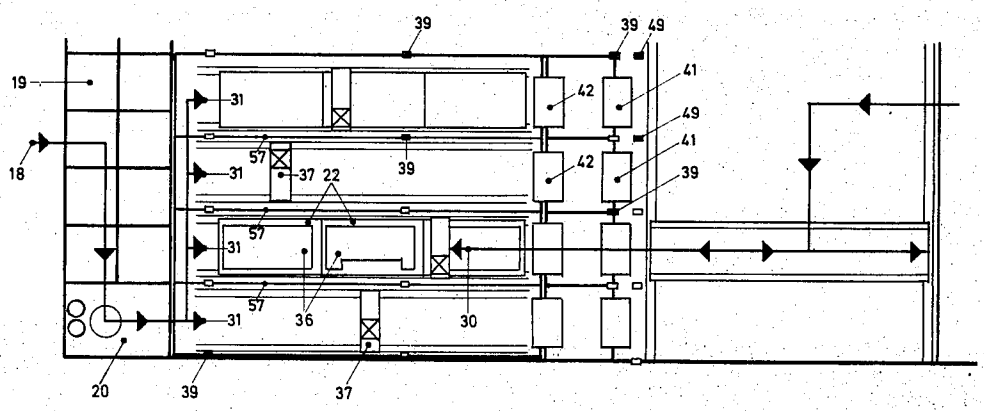
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[57] **ABSTRACT**

Installation for the manufacture of finished concrete components including a transfer crane system interconnecting a plurality of operative work stations in a predetermined work flow path traversed by transport wagons; said work stations being adapted to provide in sequence, the forming of a concrete pouring mold, positioning the mold on a wagon, forming reinforcing elements for the concrete, insertion of the elements into the mold, pouring and vibrating the concrete into the mold, hardening the concrete, and finishing the concrete in a continuous operative work pattern.

15 Claims, 6 Drawing Figures



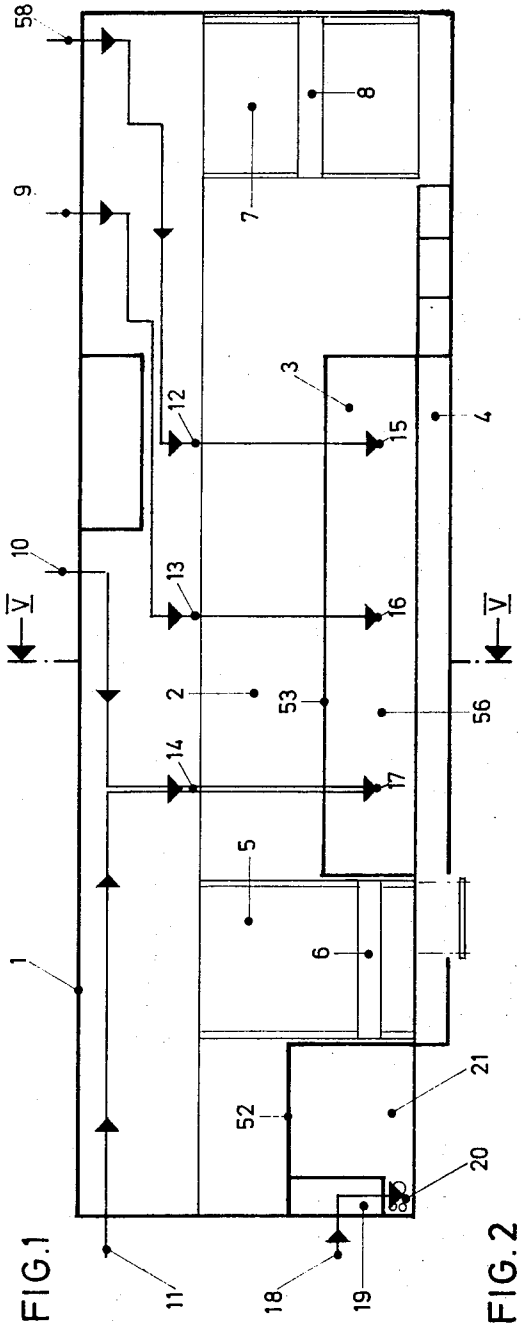

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FIG.1

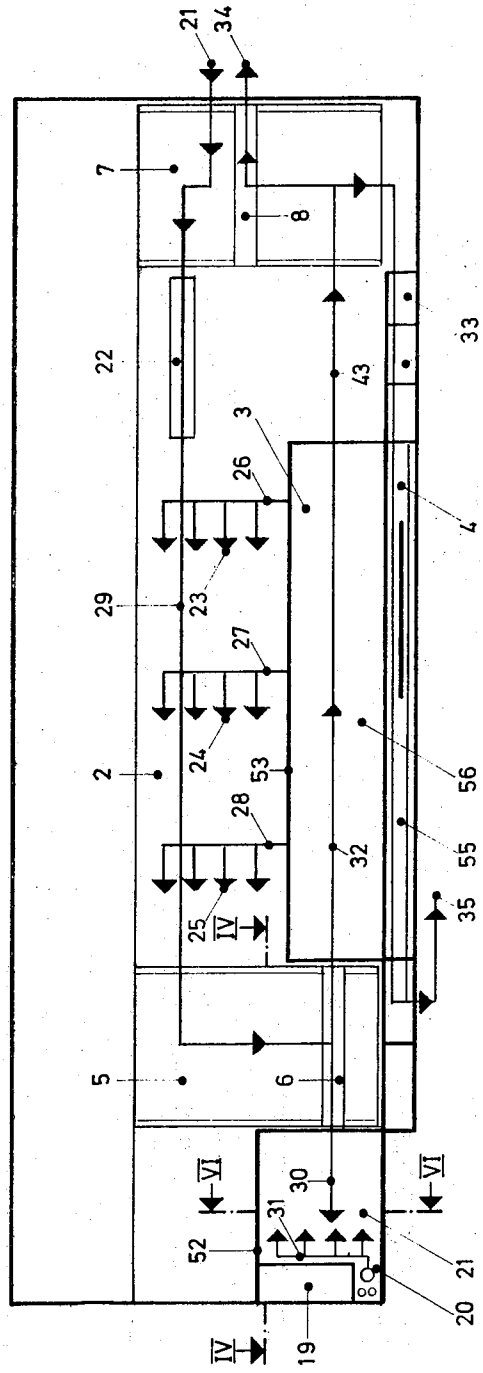

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FIG.2

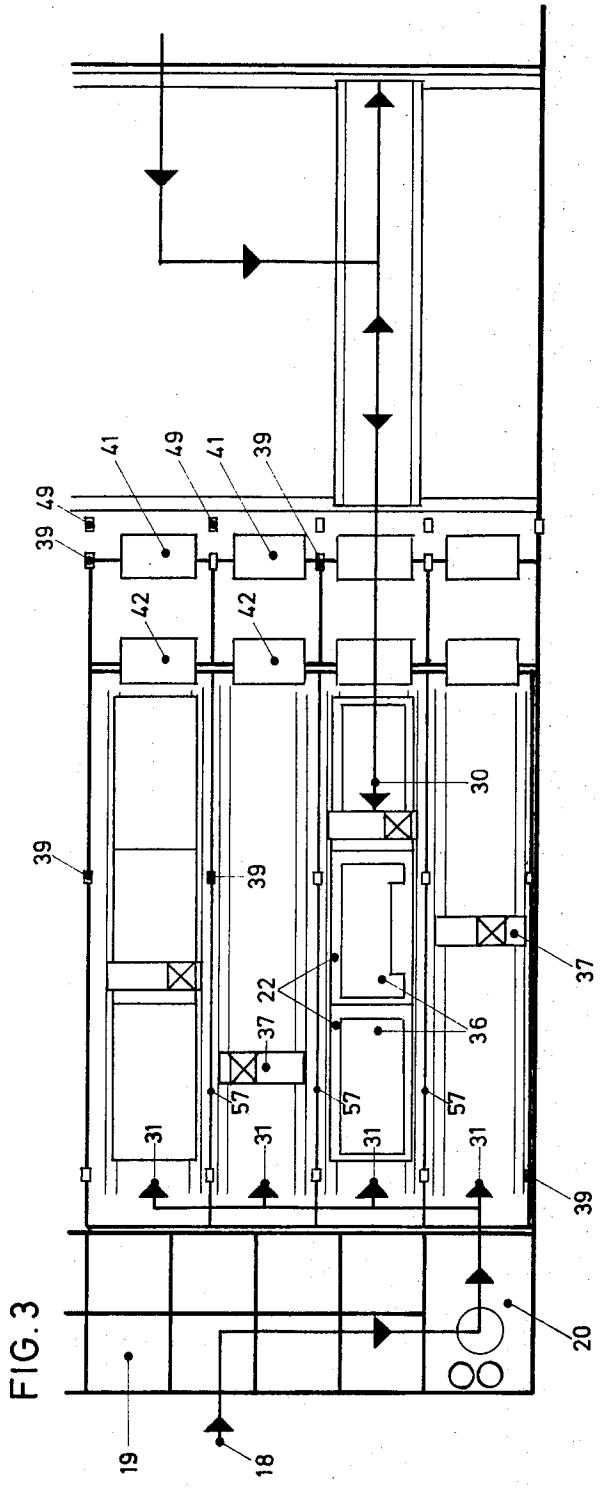

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FIG. 3

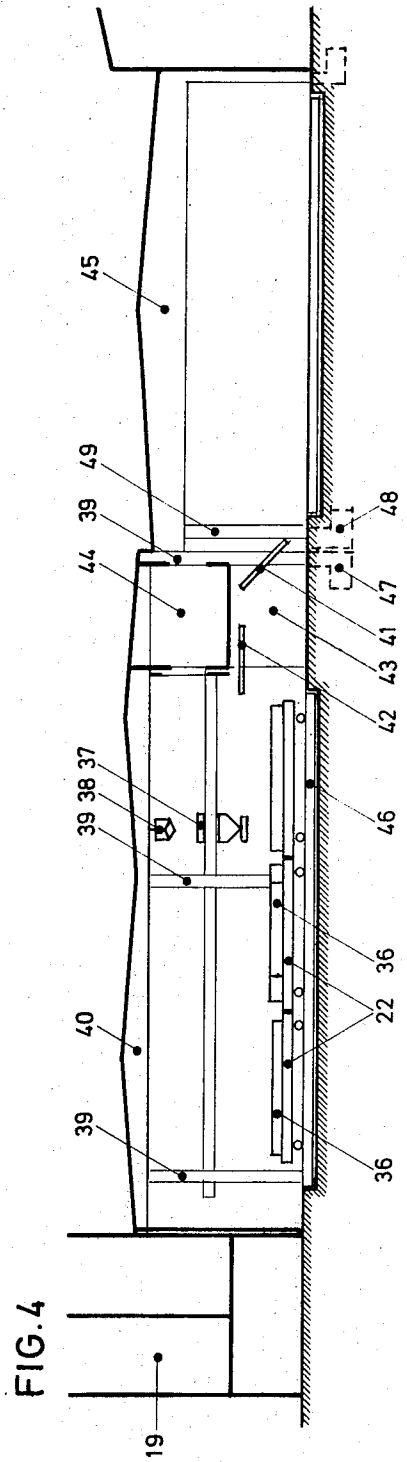

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FIG. 4

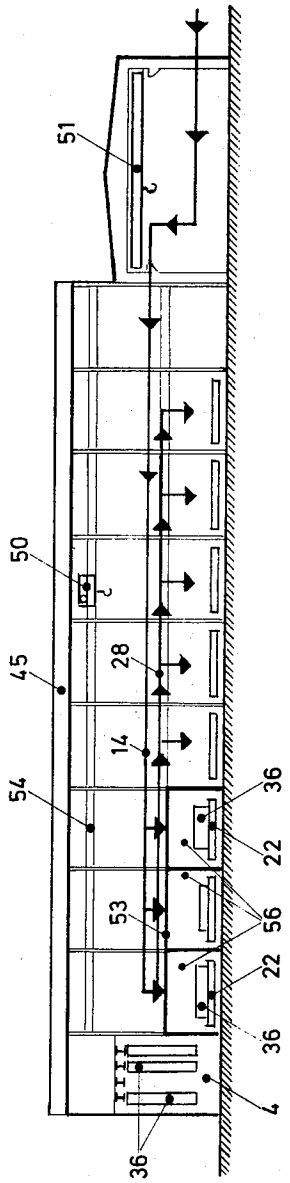


FIG. 5

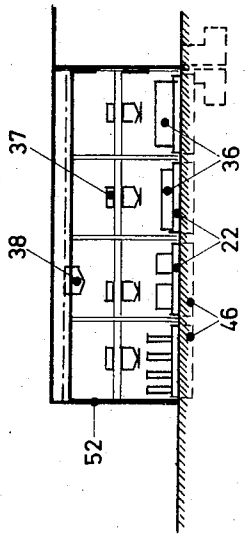


FIG. 6

INSTALLATION FOR THE MANUFACTURE OF FINISHED CONCRETE COMPONENTS

FIELD OF THE INVENTION

The present invention relates to an installation for the manufacture of finished concrete components or elements.

DISCUSSION OF THE PRIOR ART

In presently known installations concrete components are simultaneously produced at a number of operating or work stations and, in effect, from the beginning to the end of the manufacturing sequence. This requires that at each operative or work station there must be provided a form for the concrete, into which the reinforcing material is positioned, the concrete poured in, vibrated, thickened, hardened, and eventually finished through suitable artificial means. This becomes extremely cumbersome and uneconomical inasmuch as various types of concrete in varying quantities must be conveyed to different ones of the operative or work stations. Normally these type of manufacturing installations are covered by a suitable shed in which the conveyance of the materials is effected by a shed crane which is movable along the longitudinal direction of the shed and which includes a crane carriage mounted on crane bridges and being transversely movable relative thereto. The infeed sequence of the raw materials, semi-finished fabricated components, and removal of the finished concrete elements by the shed crane creates undue manufacturing delays at increased proportions of the operative work stations.

A further problem encountered in prior art installations lies in that the quantities of concrete obtainable from presently available mixers are insufficient to form a normally large finished concrete element. Consequently, the concrete must be transported toward each operating stations in a number of partial pouring quantities, since larger mixing installations are not practical inasmuch as their physical dimensions become excessively bulky and their manufacture economically prohibitive.

A further problem encountered in the prior art installations lies in that the shed cranes used must be constructed of maximum dimensions so as to be able to lift and transport the largest and heaviest finished concrete elements capable for forming in that particular installation. As a rule the shed crane is also never completely unloaded although the weight of the fresh pouring concrete being transported, the reinforcing material and the pouring form are essentially lower than the load of a large finished concrete element. Since it is designed for large loads the shed crane is of necessity relatively heavy and, consequently upon acceleration and stopping, large inertial forces must be overcome, in view of which the maximum permissible operative speed of the shed crane is relatively low. Furthermore, it is also known to utilize a plurality of shed cranes which are movable along the length of the shed, and which must similarly be dimensioned so as to be able to convey maximum loads. This creases the additional problem that these shed cranes may interfere with each other during operation. Additionally, when utilizing maximum sized shed cranes, the thereby heavier shed construction becomes relatively expensive.

The prior art installations for the manufacture of finished concrete elements or components are also subject to the further disadvantage in that the various operating stations in which reinforced-concrete components are manufactured require additional or strengthened foundations and reinforced floor plates so as to be able to receive a reinforcing installation for the manufacture of the reinforced-concrete components. The reinforcing installation must be constructed of maximum size so as to be able to allow for the production of the largest possible reinforced-concrete components. Similarly, the additional foundations and reinforced concrete plates for the above-mentioned operative work stations must be designed so as to be capable of supporting the heaviest possible loads. Consequently, these prior art installations become extremely expensive to construct. During the manufacture of smaller reinforced-concrete components the reinforcing installations are thereby only partially unloaded and furthermore, in this instance, a part of the steel concrete-reinforcing wires is wasted in view of the maximum physical dimensions of the installations.

A further drawback or disadvantage encountered in prior art installations for the manufacture of finished concrete components, in which the installations, as previously mentioned, are generally covered by a shed lies in that, since the concrete is generally vibrated or shaken at every one of the operative or work stations, this creates a plurality of sources for generating noise in the shed. Consequently, suitable measures must be taken in order to reduce the extent or level of the noise. For example, the walls and ceilings must be covered by a sound-absorbent material, or the vibrating tables used for the poured concrete must be constructed so that the noise produced thereby is reduced to and maintained at a minimum or acceptable level. Notwithstanding the employment of complex and expensive measures, these have not been able to reduce the amount of noise to a normally bearable level. In view of the foregoing, working in one of these sheds is considered as detrimental to the health of the workers and, consequently, employees must generally be compensated with supplemental or premium wages.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an installation for the production of finished concrete elements or components of the type described, which avoids drawbacks encountered in prior art installations, and which facilitates the manufacture of the concrete components in a highly efficient, in effect, a more rapid and more economical manner.

Thus, in accordance with the inventive installation for manufacturing finished concrete elements or components, the manufacture thereof is effected in wagons or transport carriages which are conveyed along a predetermined transport path extending through the installation. The carriages are conveyed in sequential order through a plurality of individual operating or work stations. Thus, at a first work station, each wagon is provided with a wood form or mold, or alternatively, at another operative work station with a suitable steel mold or form. At a further work station, reinforcing material or a reinforcing basket is positioned in the form. At the next operative station concrete is poured into the form, and the concrete is then vibrated. Subsequently, the wagons or carriages containing the con-

crete are conveyed toward another operative work station in which the concrete is artificially hardened. Finally, if required, the wagons may be conveyed to another operative work station for finish working such as, for example, washing the surface of the concrete. Consequently, the crane bridges which extend perpendicular or transverse to the transport path of the wagons no longer need be designed or dimensioned for the conveyance of the heaviest possible finished concrete components. The crane bridges are adapted to convey, respectively, the semi-fabricated materials as well as the wood forms, steel forms, reinforcing materials or baskets, concrete receptacles and the like. The operation thereof is attained in a more rapid manner as compared to a crane which is designed to convey maximum loads. Furthermore, there is no operative interference between the various crane bridges at each of the work stations. In view of the movement of the transport wagons along the transport way at right-angles relative to the transversely moving carriages on the crane bridges, a smooth frictionless work flow pattern is obtained. The manufacture of reinforced-concrete components is obtained in the inventive system on the transport wagons in the same manner as the production of finished concrete components which are not supplied with reinforcing wires or elements of any kind. Transport wagons of various types may be supplied for the different-sized reinforced-concrete components so as to provide for a proper selection thereof with respect to the foregoing so as to thereby avoid waste of portions of the reinforcing wires.

After the finished concrete components are completed in the installation, they are transported on their respective wagons toward suitable heavier lifting apparatuses, which provide for the lifting and transfer of the components from the wagons onto other transport installations, or for their complete removal.

In accordance with the inventive installation, the foregoing provides for a new concept in providing a complete and fully effective range of operative aids in manufacturing the concrete elements.

In accordance with another object of the invention, the present installation also provides for the concurrent use of contiguously positioned load wagons, constituted of at least two wagons, for the production of the largest possible finished reinforced-concrete components. These wagons may, in this instance, be each of identical and normal size, and on the principle of a modular constructional system be interconnected so as to correspond to the overall size and type of the finished concrete component being manufactured.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference is now had to the detailed description of an installation for the manufacture of finished concrete elements or components, having reference to the accompanying drawings, in which:

FIG. 1 is a schematic plan view of a manufacturing shed for finished concrete component, in which the arrow illustrates a portion of the operative flow direction;

FIG. 2 illustrates the identical plan view as shown in FIG. 1, in which the arrow indicates another portion of the direction of operative flow;

FIG. 3 is a schematic plan view, on an enlarged scale, of a sound-proofed chamber containing the operative work station for the pouring of the concrete into the forms and vibration therf;

FIG. 4 is a sectional view along line 4—4 through the sound-proofed chamber and of the transfer platform of FIG. 2;

FIG. 5 is a sectional view along line 5—5 through the shed illustrated in FIG. 1; and

FIG. 6 is a sectional view along line 6—6 through the sound-proofed chamber of FIG. 2.

DETAILED DESCRIPTION

Referring now to the drawing, and particularly FIG. 1, the concrete manufacturing and finishing shed is designated by the reference numeral 1. Within shed 1 there is provided a work flow path including three flow path sections or segments 2, 3, 4. The flow path sections 2, 3 and 4 are basically linear and extend in parallel relationships with each other. Furthermore, the work flow path sections are interconnected by means of transfer platforms 5, 6, 7 and 8, respectively. The adjustable or movable platform components are designated by the reference numerals 6 and 8.

The manufacture of the finished-concrete component 36 is effected on a transport wagon 22 which is adapted to be conveyed along the transport or work flow path. The individual work flow path sections have a plurality of transport guideways which extend in proximity to each other.

Extending across the transport work flow path sections shown in FIG. 1 are three crane bridges 54 each having transversely movable carriages 50 relative to the directions of the work flow paths. A typical crane bridge is shown more clearly and in greater detail in FIG. 5 of the drawings. At one end thereof each of the crane bridges 54 leads toward a shed crane 51 which is movable in the longitudinal direction of the shed and which also includes a transversely movable crane carriage.

Having now reference in further detail to FIG. 1 of the drawings, the shed crane 51 is adapted to receive wood at a work station 58, which may then be transported toward suitable machines so as to be worked upon. The wood material is conveyed to a station 12 in which the construction of the wood concrete pouring form or mold is effected. Furthermore, the shed crane 51 is adapted to receive steel components at a station 9 which may be worked upon and thereupon conveyed onto a station 13. At station 13, the steel components may be formed into suitable steel concrete pouring molds or forms. At a station 10 the shred crane 51 is adapted to receive suitable mesh steel material and/or reinforcing steels, to be worked upon and then conveyed as finished steel components towards a station 14. At a station 11 circular or bar steels are worked upon, which are then conveyed to station 14 so as to provide for the construction of reinforcing lining baskets for the molds or forms.

The wood forms constructed at station 12 are then conveyed to a station 15 by the crane bridges 50, 54 and positioned thereat for further utilization. The steel mold forms produced at station 13 are conveyed by means of another crane bridge 50, 54, which is located at that station, towards a station 16 for storage and further utilization. The reinforcing steel baskets formed at station 14 are adapted to be conveyed by a crane bridge 50, 54 located at that station towards a station 17 for storage and possible further utilization. The sta-

tions 15, 16 and 17 are each located on the upper surface of a concrete hardening tunnel 53. Additive materials for the concrete are conveyed from a station 18 towards an additive material silo 19, and from there towards a mixer and cement silo 20.

Having further particular reference to FIG. 2 of the drawings, the transport wagons are conveyed from a station 23 over transfer platform 7, 8 onto the first section 2 of the through extending transport flow path. The wagons are then conveyed towards an operating work station 23, at which a wood mold or form is built onto the wagon 22. The wood form is removed from station 15 with the aid of a crane bridge 50, 54 located at that station, and is then conveyed toward the corresponding wagon 22 in the direction of flow path-designating arrow 26. In the event that in lieu of a wood form it is desired that a steel form be positioned on the wagon 22, the latter is conveyed in the direction of arrow 29 toward an operating station 24. The crane bridge 50, 54 located at that station removes the required steel form from station 16 and conveys the form in the direction of arrow 27 onto its corresponding wagon. Subsequently, wagon 22 is conveyed further along the arrow 29 toward an operating work station 25. The crane bridge 50, 54 located at that station moves a reinforcing steel basket or reinforcing material for the concrete from the station 17 and conveys these along arrow 28 toward the operating station 25 in which the reinforcing basket or material then may be introduced into the form.

Having further reference to FIG. 2 of the drawings, the wagon is then conveyed by means of a transfer platform 5, 6 into a sound-proofed chamber 52, as is illustrated by arrow 30. Within the sound-proofed chamber there is located an operating work station 21 for the pouring of concrete into the form and for vibration thereof.

The operative work station 21 consists of, in accordance with FIGS. 3 and 6 of the drawing, four different parallel flow paths extending in the longitudinal direction of the shed, and which are separated from each other by means of sound-proofing walls 57. A concrete distributor 37 extends over each flow path. Across concrete distributor 37 there projects a trough conveyor 38 for the pouring of fresh concrete fed from the mixer. By means of the trough conveyor 38, the concrete distributor 37 is provided with a constant source of fresh pouring concrete. The pouring sequence for the concrete is illustrated in FIG. 2 of the drawing by means of arrow 31.

The vibrating work stations are designated with reference numerals 46 in FIGS. 4 and 7. The sound isolation or proofing is effected by covering the walls and the ceiling of the sound-proofing chamber 52 with a suitable sound-absorbent material. Additionally, the foundation structure 47 of the sound-proofing chamber 52 is also detached from the foundation structure 48 of the remainder of the shed as shown, for example, in FIG. 4. In order to, if possible, prevent the sound or noise transmission across the shed roof structure, suitable supports are provided along the dividing line between the sound-proofed chamber 52 and the remainder of the shed. The roof structure 40 of the sound-proofed chamber is supported by supports or columns 39, whereas the roof structure 45 of the rest of the shed is supported by columns 49.

The control of the work processes in the sound-proofed chamber 52 is effected from a control cabin 44, which is sound-proofed with respect to chamber 52. Below the control cabin are located two spaced gate sets 41, 42. The gate sets 41, 42 form a sound barrier whereby, during inlet and outlet conveyance of the wagon 22, no sound is transmitted from the chamber 52 into the remaining portions of the shed.

After completion of the pouring of the concrete into the form and vibration thereof, the wagons 22 are conveyed out of the sound-proofed chamber 52, and then across transfer platform 56 in the direction of arrow 32, as shown in FIG. 2, into the concrete hardening tunnel 53. An operating work station 56 for the hardening of the concrete is located in the hardening tunnel 53. As may be readily ascertained from FIG. 5, three transport flow paths in parallel adjacently spaced relationship extend through the concrete hardening tunnel 53.

After passing through the hardening tunnel, the forms on either side flow path are removed by means of crane bridges 50, 54 and positioned on platforms 43. The wagon together with the finished concrete component is then conveyed toward station 34 by means of transfer platform 7, 8, or conveyed onto third transport path section 4. Within the zone of the third transport path section 4 there is located a work station 33 at which the finished concrete component 36 is removed from the wagon and elevated into a suspended or hanging position. While in this suspended position, the formed concrete component is conveyed to an operating work station 55 for further treatment. Here, the finished concrete component may be, for example, washed so as to provide for surface-washed concrete. After the finished concrete component has been conveyed through the hanging position, it is lowered and then placed on another wagon, and conveyed towards a station 35. At station 34 and also at a station 35 there are located heavy lifting apparatuses, with the aid of which the finished-concrete component may then be lifted from the wagon and transferred to other transporting or storage facilities.

While there has been shown what is considered to be the preferred embodiment of the invention, it will be obvious that modifications may be made which come within the scope of the disclosure of the specification.

What I claim is:

1. An installation for the manufacture of finished concrete components comprising a transport crane system and a plurality of sequential operative work stations; each of said work stations being adapted for effecting predetermined manufacturing sequence including, respectively, a station for forming concrete molds, a station for forming reinforcing elements for said molds, a station for pouring concrete into said molds and for vibration thereof, a station for hardening of said concrete, and a station for effecting a finishing operation on said formed concrete components, transport means forming a flow path interconnecting each of said operative stations, a plurality of transport wagons being conveyed along said flow path between at least some of said operative stations, each of said transport wagons being adapted to sequentially receive at least a mold and poured concrete for forming a finished concrete component, said concrete being worked upon at said respective stations during conveyance therethrough on said wagons; and said transport crane system compris-

ing a plurality of crane bridges having transversely movable carriages relative to said flow path, each of said carriages being adapted to move perpendicular to the direction of said mold and concrete transport flow path across respectively each of said operative work stations.

2. An installation according to claim 1, said operative work station for imparting vibration to said concrete being positioned in a sound-proofed chamber.

3. An installation according to claim 2, said operative stations for pouring concrete and for vibration thereof being positioned at a combined operative work station within said sound-proofed chamber.

4. An installation according to claim 1, said transport flow path comprising at least two linear and contiguously extending flow path segements, said flow path segements extending in opposite parallel directions, and a common transfer platform for said transport wagons being provided adjacent the adjoining ends of said flow path segments.

5. An installation according to claim 4, said transport path segment being initially traversed by said wagons including an operative work station for positioning a wood mold onto said wagon, and an operative work station for positioning a steel mold onto a wagon, an operative work station for inserting steel-concrete reinforcing material into said mold on said wagon; said second contiguous transport path segment comprising an operative work station for artificial hardening of said concrete in said mold, said sound-proofed chamber and said operative stations for pouring of said concrete and for vibration thereof being positioned at the outlet end of said initially traversed transport path segment in alignment with said transfer platform.

6. An installation according to claim 4, said initially traversed path segment comprising a plurality of parallel extending transport paths, said sound-proofed chamber comprising a plurality of parallel extending transport path segements communicating with said first-mentioned path segements, and a plurality of said operative work stations for pouring of said concrete and for vibration thereof, one each of said work stations being associated with a respective one of said path segments, and a hardening of said concrete, said tunnel extending over a major portion of the length of said plurality of said second path segments.

7. An installation according to claim 6, comprising a storage means being located on the upper surface of said hardening tunnel and below an associated crane rail bridge, said storage means including a storage area for said wood forms, steel forms and reinforcing material; crane bridges for conveying said forms and material; and mounting work stations for said wood forms, steel forms and reinforcements being located on the surfaces of said hardening tunnel opposite to said initially traversed transport path segments below their associated crane bridges.

8. An installation according to claim 7, said crane bridges extending at the ends opposite said mounting work stations of said path segments towards a further crane bridge extending in parallel with said transport flow path, and said last-mentioned crane bridge having a transversely movable crane carriage.

9. An installation according to claim 8, including a third transport path segment extending in parallel with said second transport path segment and being contiguous to said initially traversed path segment, said third transport path segment including transfer platform means communicating with the output end of said second path segment and with the inlet end of said initially traversed path segment, said third path segment including an operative work station for finishing of said finished concrete component.

10. An installation according to claim 2, comprising a shed covering said installation, and means supporting said sound-proofed chamber including said operative work stations for pouring and vibrating of said concrete independently of the foundation of the remaining shed structure.

11. An installation according to claim 2, comprising a sound-proofed control cabin positioned within said sound-proofed chamber, said cabin comprising means for remote control operation of the operative work stations within said chamber.

12. An installation according to claim 11, said sound-proofed control cabin being located at the side of said sound-proofed chamber communicating with an associated transfer platform so as to position said control cabin in spaced relationship above the floor of said sound-proofed chamber, a pair of inlet and outlet gates for said wagons being positioned below said control cabin, said gates being in spaced relationship so as to effectively form a sound barrier.

13. An installation according to claim 10, comprising separate supports for a roof structure of said sound-proofed chamber and the remaining portion of said installation, the roof structure of said sound-proofed chamber and the roof structure of the remaining portion of said shed being supported on separate foundations.

14. An installation according to claim 1, said wagon comprising removable reinforcement material installation means for manufacturing reinforced-concrete components.

15. An installation according to claim 1, said wagons comprising removable and interchangeable post-supported molds for forming said concrete components.

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