United States Patent

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[54] **CONCRETE HOLDING MIXER**
6 Claims, 1 Drawing Fig.

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[50] **Field of Search** 259/161, 162, 164, 165, 160, 169, 170, 172, 175, 176, 177, 153, 14, 30; 214/630

[56] **References Cited**

UNITED STATES PATENTS

2,357,583	9/1944	Franco	214/630
3,038,705	6/1962	McDermott	259/175
3,185,450	5/1965	Duecy	259/172
3,526,392	9/1970	Buelow	259/161 X

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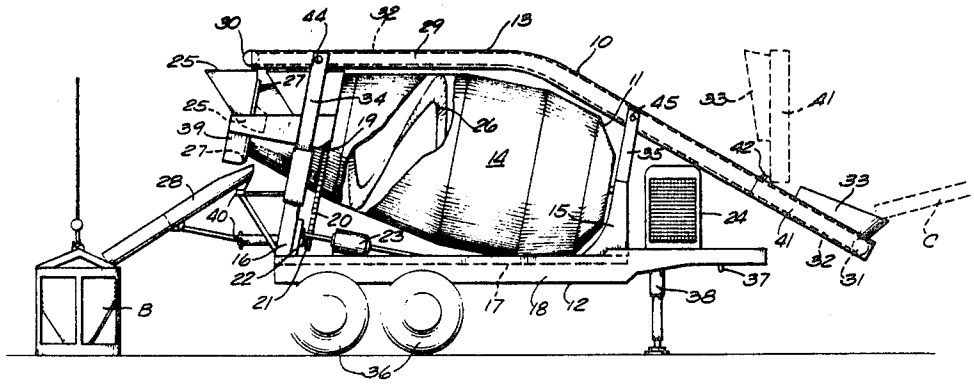
ABSTRACT: A concrete mixer is adapted for use as a temporary concrete holding drum by providing a conveyor for charging the mixer drum with premixed concrete for holding or discharge directly to the mixer discharge chute. The entire unit is transportable and the conveyor is separately demountable therefrom such that the mixer may be operated as a conventional transit mixer.



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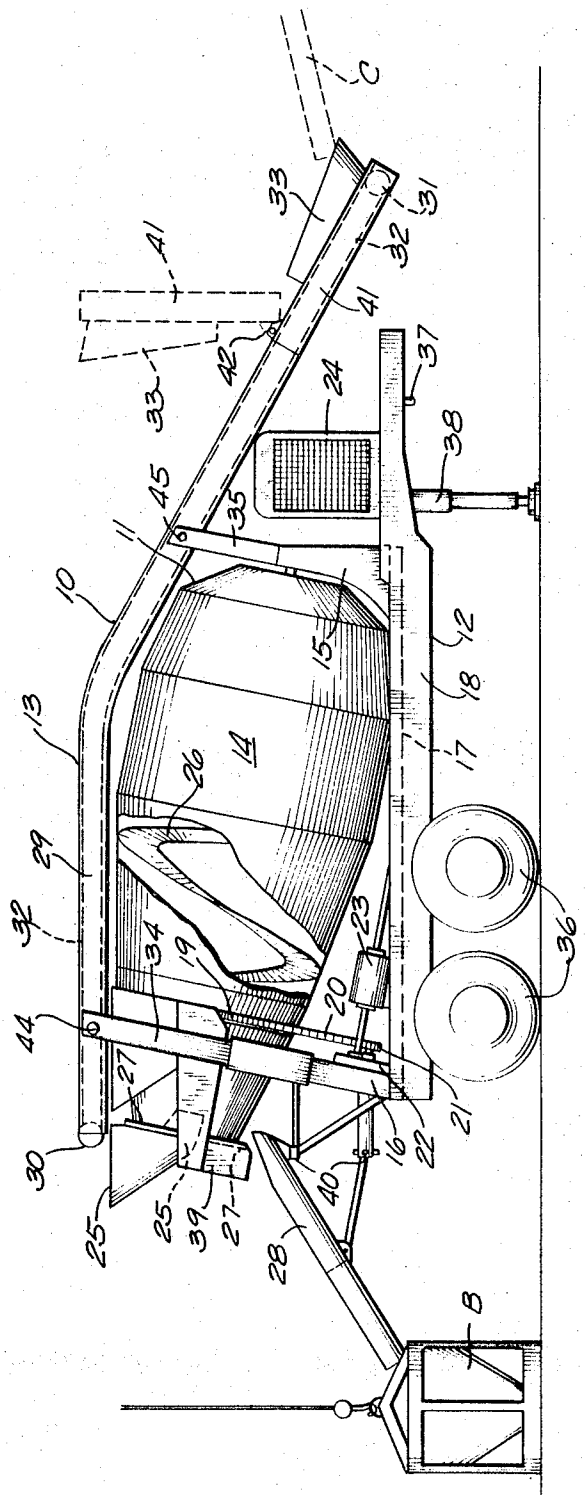

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CONCRETE HOLDING MIXER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention pertains to the art of concrete delivery and placement, and more particularly to a concrete-holding means for use intermediate the delivery of ready-mixed concrete to a construction site and its final placement. The concrete-holding means includes a concrete mixer fed by a belt conveyor and adapted to receive the supply of concrete delivered to the site, such as by truck mixers, and to accommodate surges in such supply, and to simultaneously provide a discharge of concrete for final placement either continuously or intermittently, as required.

2. Description of the Prior Art.

The supply of concrete to the location of the construction of a building or other structure is often provided by transit-type concrete mixers or, as they are more commonly known, truck mixers. The advantages of supplying "ready-mixed" concrete are well known and include elimination of on-site concrete batching and storage of raw materials.

It is often difficult, however, to coordinate the actual placement of concrete in the structure with the supply of ready-mixed concrete being delivered by a fleet of truck mixers. Thus, a slowdown or unexpected halt in the placement or pouring of concrete may cause a backup of truck mixers waiting to discharge concrete. Such a delay is very costly to the concrete supplier who is largely dependent on the number of trips each truck mixer makes. In addition, a backup of trucks can interfere with operations at the construction site and, particularly in metropolitan areas, can impede the flow of local traffic and create traffic hazards.

The rate at which concrete is being poured may, at times, exceed the delivery rate. This problem often occurs or is compounded when the truck mixers are required to be maneuvered into restricted or other difficult-to-reach positions before discharging the concrete. The result is, of course, delays in the final placement of concrete.

Various devices adapted to facilitate the handling and placement of concrete are shown in the prior art. It is, thus, known to provide a temporary storage or holding bunker which receives ready-mixed concrete from truck mixers and form which portions may be selectively withdrawn and elevated for placement. This apparatus is shown in U.S. Pat. No. 2,357,583 and was developed for use with construction methods and equipment in which elevators operating in towers erected at the job site are used to lift concrete for placement.

The above identified patent had as a primary object the solution of the problem caused by the difficulty in coordinating the delivery and final placement of ready-mixed concrete, as previously discussed. The system and apparatus disclosed therein were of limited general utility and of complex construction, and have been replaced by simpler and more rapid means of elevating concrete for placement. The problem of coordination between delivery and placement, however, has remained and no satisfactory solution has been found for use with modern methods and apparatus; and the problem is, of course, not limited to situations where delivered concrete must be elevated for placement, but exists in any construction job where the ready-mixed concrete must be poured in a place inaccessible to the truck mixer and/or where the demand may be erratic or a continuous supply critically necessary.

It is common today, in building large concrete structures of various kinds, to move concrete from the point of delivery directly to placement by means of a bucket suspended from the boom of a crane. This method has gained wide acceptance because of its versatility and the utilization of equipment commonly employed in various other operations on the construction site. Truck mixers discharge concrete directly into the bucket which generally can be filled a half dozen or more times from an average capacity mixer. The truck mixer must, therefore, await the return of the bucket each time with the consequent loss of considerable truck time. On the other hand, if the truck mixers must back or otherwise move one at a time into a restricted position to unload, as is often the case, considerable pouring time may also be lost while the empty truck is leaving and the next one is moving into position to unload.

Another commonly used means of moving concrete from the place of delivery to remote placement in a structure is a concrete pump. A concrete pump is generally fed by a relatively small hopper mounted on the unit and, as is known in the art, an uninterrupted even flow of concrete supplied to the hopper is very critical.

Belt conveyors are also often used to carry concrete to placement in remote areas of a job site. In this placement method, it is equally important to be able to maintain a continuous supply of concrete to the belt conveyor and to be able to halt the supply if final placement is stopped for any reason.

It is, therefore, apparent that the ideal delivery-placement system would include an intermediate concrete holding means wherein the supply thereto could be made completely independently of the discharge therefrom. It is also important, as is known and disclosed in the prior art, that concrete held in place for more than short periods be mixed or agitated to maintain uniformity in the mix and avoid segregation of the ingredients.

U.S. Pat. No. 3,185,450 shows a mobile apparatus adapted to receive and distribute a concrete mix. The apparatus includes a mixing skip feeding a belt conveyor which, in turn, discharges into a chute for final placement. Though designed primarily for mobile placement of concrete, this type of device could also be used as a stationary intermediary for the receipt of concrete from a truck mixer and the selective redistribution for placement either directly or by a bucket or other means. A particularly critical disadvantage, however, exists in the inability of this device, as disclosed, to simultaneously receive and discharge concrete, as required in order to avoid the costly delays described above.

A portion of the concrete batch plant shown in U.S. Pat. No. 3,446,487 includes a horizontal mixer fed by a belt conveyor. This combination provides a disclosed ability for selective or simultaneous charging and discharging with temporary holding and mixing in the horizontal drum. This mixer, however, is designed particularly for use in a batch plant, and the elaborate concrete transfer mechanism is specifically adapted for operation as part of the batching system. The horizontal mixer is, thus, not readily adaptable to operation outside the system for which it was designed. Additionally, its cost may exceed by as much as four times the cost of a mixer of the type used on a truck mixer, and its modification for limited use outside a batch plant would be economically impractical.

SUMMARY OF THE INVENTION

In the present invention, a conventional inclined axis concrete mixer provides a temporary holding and mixing station to minimize the adverse effects of unavoidable lack of coordination between the supply of ready-mixed concrete to the construction site and its final placement in the structure. Concrete is supplied to the charging hopper of the mixer by a belt conveyor extending from a substantially low level at the head end of the mixer over and in closely-spaced relation to the top of the drum, and terminating over the hopper.

One truck mixer can discharge its full load of concrete onto the conveyor without delay and move out of the way for the following truck mixer. The concrete is carried to the charging hopper of the stationary mixer, from which it is funneled into the mixer drum. The concrete may be temporarily held and mixed in the drum or simultaneously discharged by opposite rotation of the drum in a known manner.

The conventional transportable mounting of the mixer and conveyor provides necessary portability and the conveyor is demountable therefrom such that the remaining unit can be towed by a standard tractor and operated as a transit mixer.

BRIEF DESCRIPTION OF THE DRAWING

The drawing shows a side elevational view of the concrete holding mixer in its preferred embodiment mounted on a semitrailer.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawing, a portable concrete holding mixer **10** includes a conventional inclined axis concrete mixer **11** mounted on a semitrailer **12** and to which concrete is supplied by a belt conveyor **13** mounted atop the mixer **11**.

The mixer drum **14** is a frustoconical inclined axis type supported at its forward and rearward ends for rotation about its axis. The forward or head end is supported by a pedestal **15** and the rearward end by a rear upright frame member **16**. The pedestal **15** and upright frame member **16** are fixed, respectively, to the forward and rearward ends of a pair of longitudinal frame members **17** which are, in turn, secured to the trailer chassis **18**.

The drum **14** is driven by an annular drum sprocket **19** fixed to the outer periphery of the drum. A drive chain **20** interconnects the drum sprocket **19** and a drive sprocket **21**. The drive sprocket is powered through a speed reducer **22** and either a mechanical or hydraulic transmission **23** by an engine **24** mounted on the trailer chassis **18** forwardly of the pedestal **15**.

Concrete (or a batch of concrete ingredients) is supplied to the mixer drum **14** through a charging hopper **25** disposed adjacent the open rearward end of the drum. The hopper is constructed and positioned to funnel the concrete down and into the interior of the drum. As is well known in the art, the interior drum wall is provided with a spiral mixing and discharge blade **26**. When the drum is rotated in one direction, the blade carries the concrete to the closed head end of the drum, and rotation of the drum in the opposite direction moves the concrete upwardly and rearwardly where it is discharged over the lip **27** defining the open end of the drum.

A discharge chute **28** is attached by means of a vertical axis pivot **40** to the upright frame member **16** such that its upper receiving end is always positioned directly below the discharge hopper **39** and the lip **27** of the drum for the receipt of concrete discharged therefrom. The chute **28** directs the concrete by gravity either to final placement or to a receiving means such as a bucket B by which the concrete may be moved to a location not accessible for direct placement from a mixer.

The belt conveyor **13** is of common construction and includes a pair of siderails **29** between and at the ends of which are mounted the head and tail pulleys **30** and **31**, respectively. A conveyor belt **32** is trained about the pulleys **30** and **31** and operates therebetween over a series of spaced troughing idlers (not shown) in a manner well known in the art. The head pulley **30** is used to drive the belt and may, in turn, be driven by the engine **24** or a separate power source in a conventional manner. It is also known to drive the belt through the tail pulley **31**.

The head pulley **30** is positioned over the charging hopper **25** and the conveyor extends forwardly over the top of the mixer **11** and curves downwardly over the head end of the drum **14** and engine **24**. The forward charging end of the conveyor **13** lies just forwardly of the trailer chassis **18** and is provided with a receiving hopper **33** disposed sufficiently low to be reached by the chute C of a truck mixer or the like.

The conveyor **13** is secured in position at its head end by attachment of the side rails **29** to extensions **34** of the upright frame members **16** on either side of the drum. Similar vertical extensions **35** extending upwardly from the pedestal **15** rigidly support the opposite end of the conveyor. The conveyor is preferably demountably secured to the extensions **34** and **35** for reasons which will be set forth below.

The semitrailer **12** is provided with tandem dual wheels **36** at the rear and a kingpin or fifth wheel **37** at the forward end for towing attachment to a truck tractor (not shown). The forward end of the trailer may also be provided with suitable legs **38** or other means of stabilization and support when disconnected from the towing vehicle.

In operation, the portable concrete-holding mixer **10** is towed to a construction site and positioned where the receiving hopper **33** can be most readily reached by the chute C of a truck mixer delivering concrete to the job site. Ideally, the hopper **33** will be positioned such that the truck mixers can move directly to and away from the point of discharge without the necessity of backing or otherwise maneuvering into position to reach it.

The discharge end of the holding mixer **10** is conveniently located to be reached by the bucket B or other means adapted to receive concrete from the discharge chute **28**. The chute **28** may, of course, be provided with one or more extension sections, as required, and the pivotability of the chute may, in some instances, make direct final placement therefrom feasible.

A truck mixer can discharge its entire load of concrete into the hopper **33** in one continuous operation. The conveyor belt **32** carries the concrete to the charging hopper **25** through which it is funneled to the interior of the drum **14**. The drum may be rotating in either the direction for holding and mixing or the direction for discharge depending on the immediate requirements of concrete for placement. If the former, the concrete will be moved forwardly by the spiral blade **26** and accumulated in the larger and lower forward end of the drum **14**. The drum capacity is preferably greater than the capacity of the average truck mixer delivering concrete, with 9 to 10 cubic yards being a practical minimum capacity. In this manner, a halt or temporary delay in pouring will not effect any corresponding delay in the discharge of concrete from the truck mixer.

If the drum **14** is rotated in the opposite direction, the blade **26** will move the concrete upwardly and rearwardly to discharge over the lip **27** surrounding the open drum end. The rate of discharge may be varied by control of the speed of rotation in a known manner. A supply of concrete in the drum **14** ensures the availability of concrete despite a temporary halt in the supply thereto, which may be occasioned by the delivery vehicles being delayed en route or at the construction site.

The receiving end **41** of the conveyor **13**, including the receiving hopper **33**, which extends beyond the forward end of the trailer **12** is retractable for transport or to allow truck mixers or other equipment to move past as may be required for effective operation in a confined area. The receiving end may be attached by a pivot **42** to the remainder of the conveyor **13**, and may include a power-operated retracting means (not shown). A substantial portion of the conveyor, including the siderails and idlers, is, however, preferably constructed of aluminum or other lightweight materials, whereby manual retraction of the receiving end **41** is easily accomplished. The receiving end may also be designed to telescope into the remaining portion to effect retraction, in a manner known in the art.

The entire conveyor **13** is adapted to be demounted from its operative position secured to the mixer frame extensions **34** and **35**. The conveyor siderails **29** may be attached to the frame extensions **34** and **35** by means of pinned connections **44** and **45**, respectively, for rapid demounting. With the conveyor removed, the unit is a conventional semitrailer-mounted transit mixer and may be operated as such without any further modification.

Alternately, a slat conveyor or a screw conveyor, of a type well known and commonly used to convey concrete, could be used in place of the belt conveyor **13**. The mixer **11** and conveyor **13** could, as an alternate embodiment, be mounted on a standard chassis-cab unit, as mobile concrete mixers most often are. A "half-cab" would be required for this embodiment to provide space for the descending forward portion of the conveyor.

We claim:

1. In combination with a concrete mixing drum rotatable about an inclined axis with an opening at its upper end for charging and discharging materials, said drum being provided with inwardly extending spiral blades terminating at said open-

ing and a charging hopper feeding into the central portion of the drum opening interiorly of said spiral blades;

an inclined belt conveyor arranged over said drum with its inclination in the same direction as the axis of said drum, said belt conveyor having a head pulley arranged over said hopper to cause material conveyed by the belt to discharge into the hopper, and a tail pulley conveniently low to the ground to enable charging of the belt conveyor by a similar concrete mixer mounted on a delivery truck, or by other means;

and means for rotating the drum and driving the belt conveyor so that materials in the drum are discharged through the opening simultaneously with the feeding of material by the conveyor to the drum;

whereby the drum may be used to accommodate surges in supply of concrete in excess of the desired rate of discharge of concrete from the mixing drum.

2. A portable concrete mixer for temporary holding of mixed concrete delivered to a job site which comprises: a transportable frame, a power driven inclined conveyor carried by said frame and having a lower hopper disposed to receive mixed concrete from a delivery vehicle and having an upper charging hopper, an inclined discharge chute carried by said frame so that its upper end remains effectively positioned beneath said hopper and so that its lower end may be variously positioned to deliver by gravity the concrete into a receiving bucket or the like positioned within the reach of the chute, and an inclined-axis power-driven spiral-bladed concrete mixing drum carried by said frame and having its charging and discharging opening disposed to receive the concrete discharging from said charging hopper and to deliver the same to said chute as required whereby to provide temporary storage in the order of one full load of a typical delivery vehicle so that the uninterrupted supply of concrete to the job site is materially assured.

3. A portable concrete mixer unit for temporary holding of mixed concrete delivered to a job site which comprises: a vehicle including a frame, wheels for transport to and ground-stabilizing legs for stationary positioning at the job site, a concrete mixing drum supported by said frame for rotation on an inclined axis and having an upper open end at one end of the vehicle, said drum internally having spiral blades which extend to said drum opening and define a smaller central charging opening, power means carried by the vehicle and connected to said drum to rotate the latter in one direction which causes the blades to push the drum contents to the lower closed end thereof and in the other direction to push the contents toward and out of the upper open end thereof, a charging hopper for said drum carried by said frame and having its spout extending into said smaller central opening of the drum, an inclined power-driven conveyor carried by said vehicle frame and having a receiving hopper disposed at the other end of the vehicle to receive mixed concrete as from a delivery truck, said conveyor extending longitudinally over said drum and having its discharge trajectory directed into said charging hopper, and an inclined discharge chute pivotally supported by said frame on a vertical axis beneath said charging hopper and drum opening so that its upper end remains positioned to receive concrete therefrom and so that its lower end may be variously positioned to deliver by gravity the concrete into a receiving bucket or the like positioned within reach of the chute.

4. The unit of claim 3 wherein the conveyor includes parallel frame extensions which support the receiving hopper beyond the end of the vehicle frame and said receiving hopper and the projecting portion of the conveyor are retractable as required for transport or to allow trucks to move past the end of the unit.

5. The invention of claim 3 wherein the vehicle comprises a conventional semitrailer.

6. The invention of claim 3 wherein the conveyor is demountable from said vehicle frame such that the unit may be used to deliver concrete as in the manner of a truck mixer.