Aug. 30, 1960 L. G. HILKEMEIER 2,950,906

CONCRETE MIXER

Filed July 1, 1957 2 Sheets-Sheet 1

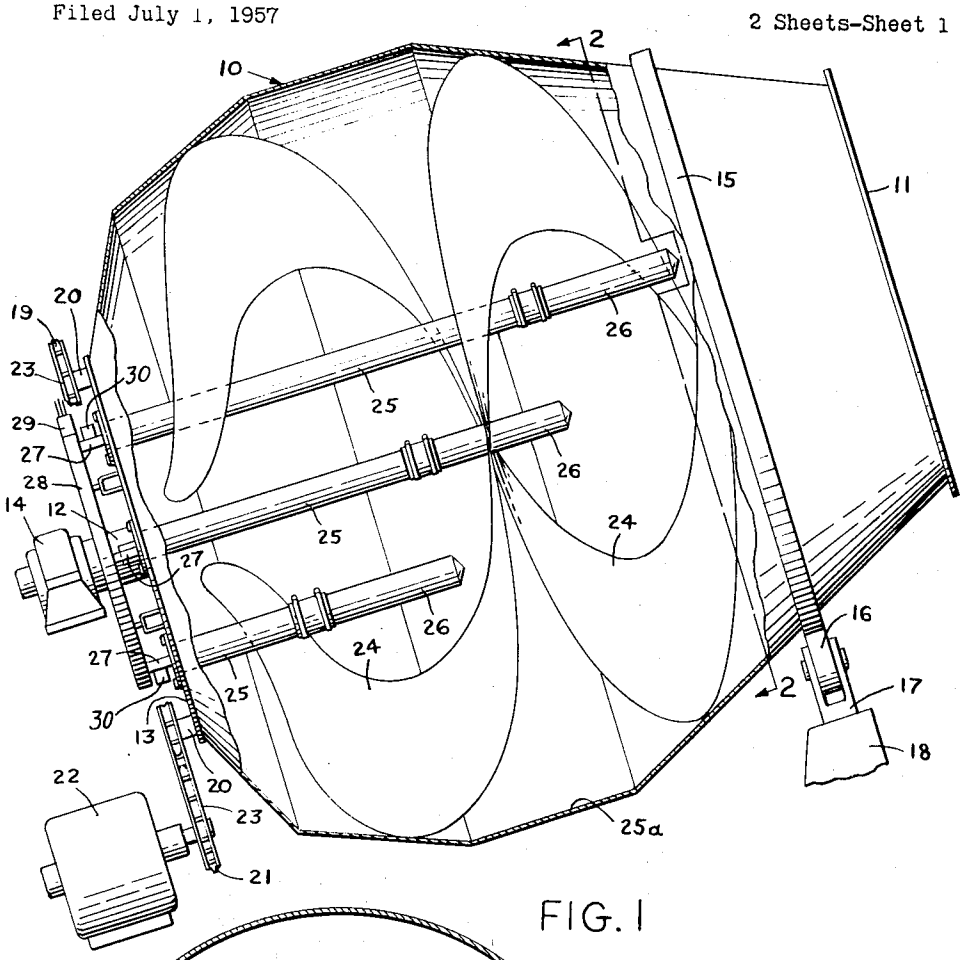


FIG. 1

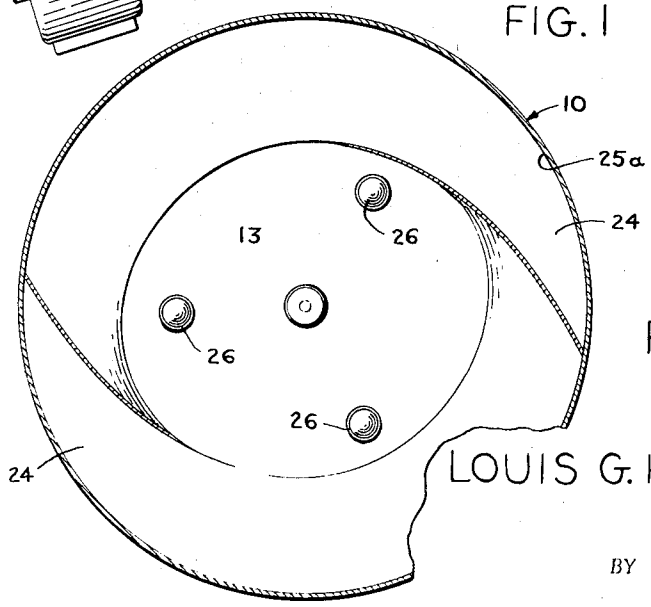


FIG. 2

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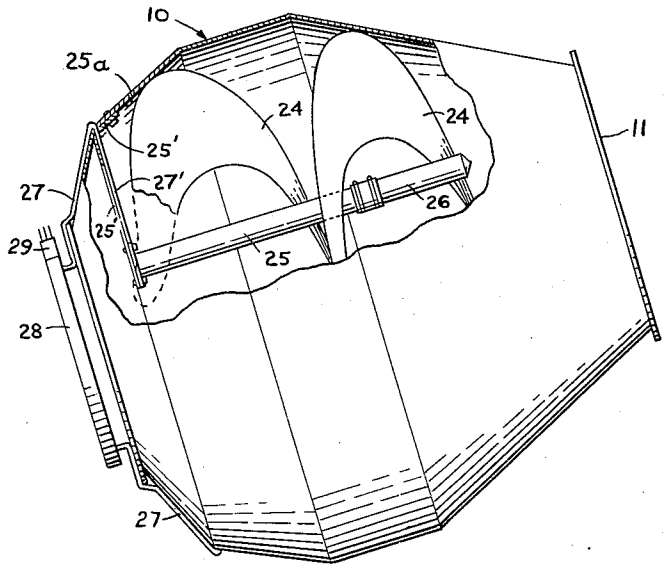


FIG. 3

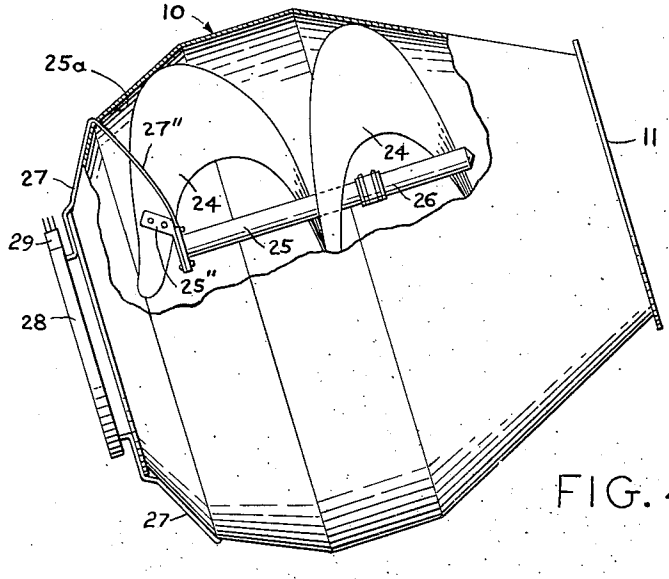


FIG. 4

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United States Patent Office 2,950,906
Patented Aug. 30, 1960

2,950,906

CONCRETE MIXER

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Filed July 1, 1957, Ser. No. 669,382

6 Claims. (Cl. 259—161)

The present invention relates to concrete mixing and more particularly to the mixing of concrete in a rotatable drum.

This application is filed as a continuation-in-part of the application having the Serial Number 479,777 and filed on January 4, 1955, now abandoned.

A strong concrete is obtained by mixing the ingredients that go into making up the finished product until a relatively solid mass or homogeneous mixture is obtained. This homogeneous mixture results in a strong concrete because it does not contain voids or crevices between the particles which reduce the strength thereof. In order to obtain this homogeneous mixture the component materials which comprise the finished concrete, namely, aggregate (stone), sand, cement and water must be thoroughly mixed to eliminate the voids between the particles. The voids exist between the particles because of the non-uniform size of the aggregate, sand, and cement particles which is characteristic of a bulk material. Thus, when the aggregate, sand, and cement are placed in a rotatable drum or vessel, the particles thereof interfere with one another in the sense that a portion of the non-uniform surfaces of two adjacent particles in contact with each other maintain other portions of these same two particles out of contact with each other. Because of his phenomenon, an air space or void exists between the remaining surface portions of the particles. This particle interference increases the time required to thoroughly mix the above-mentioned bulk materials and results in excessive wear on the drum shell and mixing blades disposed therein.

In accordance with the present invention, a rotatable drum having a mixing area formed therein and means for charging and discharging material to be mixed in the mixing area which means comprises an end opening. The rotatable drum is provided with means for mixing and discharging the materials charged therein comprising blades mounted therein. The drum is also provided with vibration means to reduce particle interference and decrease the time required to produce a homogeneous concrete mixture. The particle interference is reduced because the oscillating motion produced by the vibration means acts on the bulk materials while they are being tumbled, lifted, and rotated by the drum to permit the smaller particles to fill the voids between the larger particles. Thus, the mixing is accomplished in a relatively short period of time and excessive wear on the drum and blades is avoided.

The present invention further provides a rotatable drum having vibration means therein for readily discharging low slump or stiff texture concrete therefrom due to vibration of the drum and blades by said means.

The invention will be better understood from the following description when considered in connection with the accompanying drawings forming a part thereof and in which:

Figure 1 is a vertical view of a rotating drum, partly broken away, embodying the present invention.

Figure 2 is a section taken on line 2—2 of Figure 1.

Figure 3 is a vertical view of a rotating drum, partly broken away, embodying another form of the present invention.

Figure 4 is a view similar to Figure 3 showing still another form of the present invention.

Referring to the drawings, in Figure 1 the reference numeral 10 designates a cone-shaped mixing drum having its axis inclined to the horizontal and provided with an opening 11 in the upper or elevated end thereof. A trunnion 12 is secured to drum end wall 13 and is rotatably supported in a bearing support 14. Bearing support 14 is secured to a base not shown. The upper or elevated end of the drum is provided with an external track or ring 15 supported on rollers, one roller 16 of which is shown, carried by bearing members 17 fixed to a base 18. The lower end of the drum is provided with a sprocket wheel 19 fixed on the outside of the drum adjacent end wall 13 by struts 20 connected to said wall.

Another sprocket wheel 21 is positioned in alignment with the lower end of wheel 19 and carried on the shaft of an electric motor 22. Electric motor 22 is adapted to rotate in either direction and is secured to a base not shown. The drum is rotated by motor 22 through an endless chain 23 carried on sprocket wheels 19 and 21. A plurality of spirally extending blades 24 are disposed on the side walls 25*a* of the drum and extend inwardly therefrom. When motor 22 is rotated or operated in one direction to rotate drum 10 in one direction, spiral blades 24 propel or convey the drum contents upwardly over the inclined bottom of the drum and out through opening 11 while operation of the motor and drum in the opposite direction conveys the drum contents downwardly in the drum toward end wall 13.

Electrically operated vibrators 26 are positioned within the drum in spaced relation to inner edge of blade 24 and as shown in Figure 2 of the drawings extend into the mixing area substantially parallel to the direction the materials are moving during the charging and discharging operation. It will be understood that while the preferred form of this invention illustrates the vibrators as disposed substantially parallel to the longitudinal line of movement of the materials to be mixed that such vibrators could also be disposed at some angle transverse to this line without departing from the scope of the present invention.

Vibrators 26 are supported by tubular conduit means shown as pipes 25 secured to end wall 13. Vibrators 26 are spaced equidistant from the central axis of the drum and from one another and are positioned longitudinally of the drum unequal distances from wall 13. Electric current is supplied to the vibrators through cables 27 having one end connected thereto and the other end extending through pipes 25 and connected to a collector ring 28 carried on trunnion 12. Brush means 29 are provided to maintain contact with the upper periphery of ring 28 and supply current to ring 28 from a source, not shown.

In some instances it is desirable to utilize only one or two of the vibrators 26. Thus, an electrical switch 30 having "off-on" positions for opening and closing the electrical circuit of the vibrators 26 is connected into the circuit and mounted on the upper and lower cables 27 of Figure 1.

In operation, when the component materials that go to make up concrete are introduced into the drum, motor 22 is placed in operation to rotate the drum, and current is supplied to one or more of the vibrators 26 to cause them to vibrate. The rotation of the drum and the arrangement of blades 24 disposed therein causes the bulk material ingredients to be tumbled, lifted and

rotated to mix with one another. The vibrators oscillate these tumbled, lifted and rotated particles and the smaller particles of sand and cement fill the voids between the larger aggregate particles. Thus, the present invention reduces particle interference and results in the production of a homogeneous mass or mixture of concrete in a short period of time.

When the direction of rotation of the motor is reversed, the drum rotation is reversed and the spiral blades propel or convey the drum contents upwardly over the inclined bottom of the drum and out through opening **11**. Vibrators **26** oscillate against the inner ends of the blades and drum and permit a plastic flow of stiff texture concrete through the drum opening.

The forms of the invention shown in Figures 3 and 4 differ from the embodiment shown in Figure 1 only in the location of the point at which the vibrators **26** are fixedly mounted within the drum **10**. Taking only one vibrator **26** for illustration purposes, it being understood that the other vibrators are similarly mounted, in Figure 3 it is shown that the pipe **25** supporting the vibrator **26** is secured to a bracket **25'** which in turn is secured to the drum side wall **25***a* as distinguished from the drum end wall as shown in Figure 1. Also in Figure 3 a transmission means shown as cable **27'** is carried by bracket **25'**.

In Figure 4, the pipe supporting bracket **25''** is secured to the inner periphery of the spiral blade **24**. Electric current is supplied to the vibrator through a transmission means shown as cable **27''** having an end communicating with the vibrator and extending through pipe **25''** and communicating at the other end with ring **28** carried on trunnion **12**.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown, but that they may be widely modified within the invention defined by the claims.

What is claimed is:

1. In combination, a rotatable mixing drum having a mixing area formed therein, said drum having means for charging materials to be mixed into said mixing area and for discharging the mixed materials from said mixing area, means in said drum for mixing and discharging the materials passed to said mixing area, and at least one oscillating element connected to the drum to extend into the mixing area for oscillating the materials when the drum is in mixing operation.

2. In combination a rotatable mixing drum having a mixing area formed therein, said drum having means for charging materials to be mixed into said mixing area and for discharging the mixed materials from said mixing area, blade means in said drum for mixing and discharging the materials passed to said mixing area, a bracket connected to said drum, an oscillating element mounted on said bracket to extend into said mixing area for oscillating the materials when the drum is in mixing operation and an electric transmission means carried by said bracket to communicate said oscillating element with a source of electric current for the operation of said oscillating element.

3. In combination, a rotatable mixing drum having a mixing area formed therein, said drum having means for charging material to be mixed into said mixing area and for discharging the mixed materials from said mixing area, blade means in said drum for mixing the materials passed to said mixing area, and at least one oscillating element mounted in the mixing area of said drum inwardly of the inner edge of said blade means for oscillating the materials when the drum is in mixing operation, said oscillating element supportably carried by the inner edge of said blade means.

4. In combination a rotatable mixing drum of the inclined axis type having a mixing area formed therein, said drum having an end opening for passing materials into the mixing area and for discharging materials therefrom, means for mixing the materials charged into said mixing area including, spirally arranged blade means disposed on the inner wall of said drum operable to convey material to be mixed from said end opening to said mixing area when the drum is rotated in one direction and to convey material from said mixing area to said end opening when the drum is rotated in the opposite direction, and at least one oscillating element for oscillating materials during the mixing operation connected to the drum and disposed to extend into the mixing area.

5. In combination a rotatable mixing drum of the inclined axis type having a mixing area formed therein, said drum having an end opening for passing materials into the mixing area and for discharging materials therefrom, means for mixing the materials charged into said mixing area including spirally arranged blade means disposed on the inner wall of said drum operable to convey material to be mixed from said end opening to said mixing area when the drum is rotated in one direction and to convey material from said mixing area to said end opening when the drum is rotated in the opposite direction, a bracket connected to said drum, an oscillating element mounted on said bracket to extend into said mixing area for oscillating the materials when the drum is in mixing operation and an electric transmission means carried by said bracket to communicate said oscillating element with a source of electric current for the operation of said oscilating element.

6. In combination a rotatable mixing drum of the inclined axis type having a mixing area formed therein, said drum having an end opening for passing materials into the mixing area and for discharging materials therefrom, means for mixing the materials charged into said mixing area including spirally arranged blade means disposed on the inner wall of said drum operable to convey material to be mixed from said end opening to said mixing area when the drum is rotated in one direction and to convey material from said mixing area to said end opening when the drum is rotated in the opposite direction, at least one oscillating element mounted in the mixing area of said drum inwardly of the inner edge of said blade means for oscillating the materials when the drum is in mixing operation, said oscillating element supportably carried by the inner edge of said blade means.

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