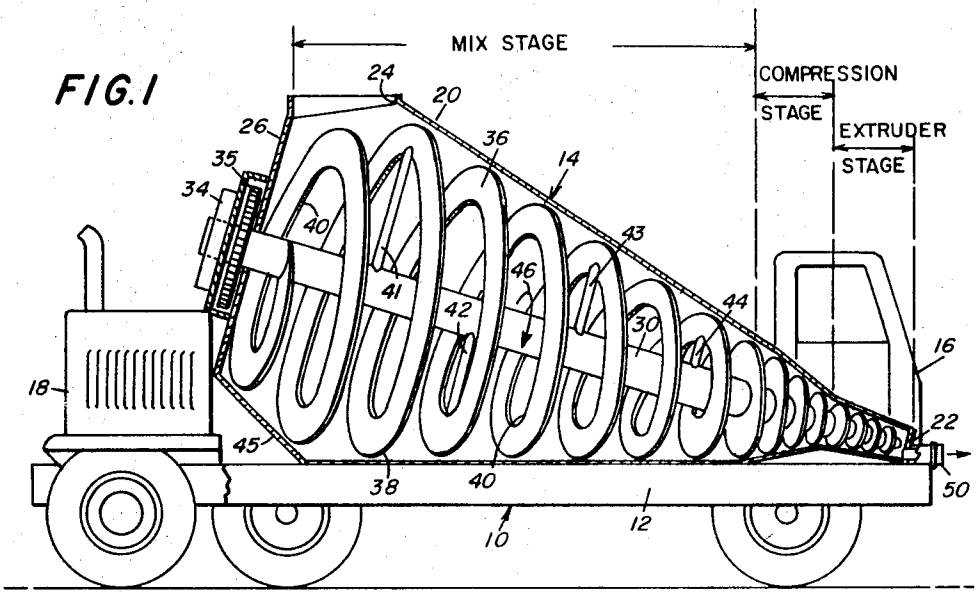
Sept. 20, 1971 B. I. KADER 3,606,277

# TRANSIT-MIX CONCRETE TRUCK

Filed Sept. 22, 1969 2 Sheets-Sheet 1

FIG. 1



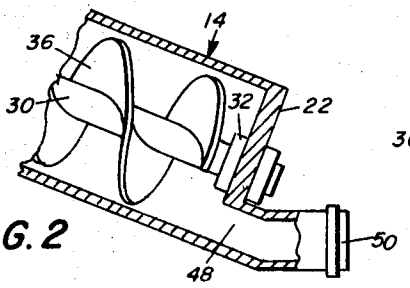




FIG. 2

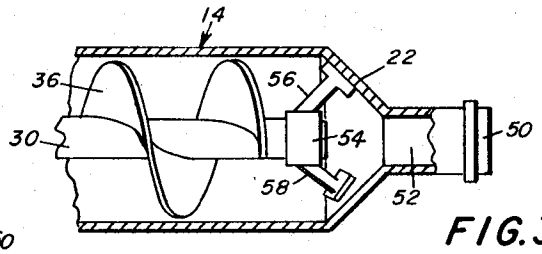



FIG. 3

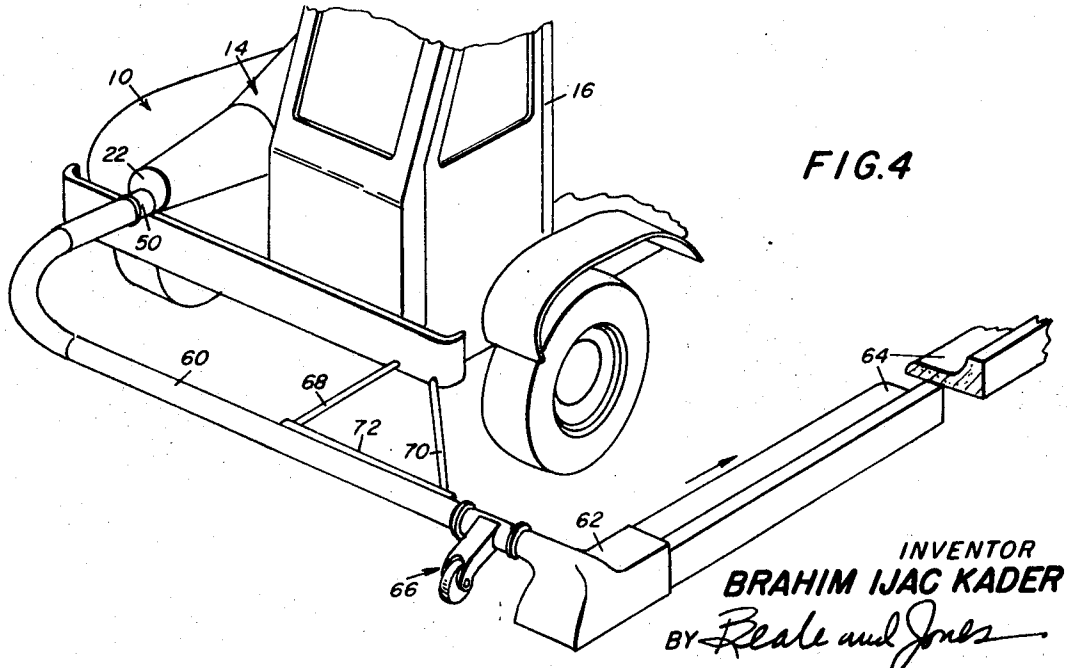



FIG. 4

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TRANSIT-MIX CONCRETE TRUCK

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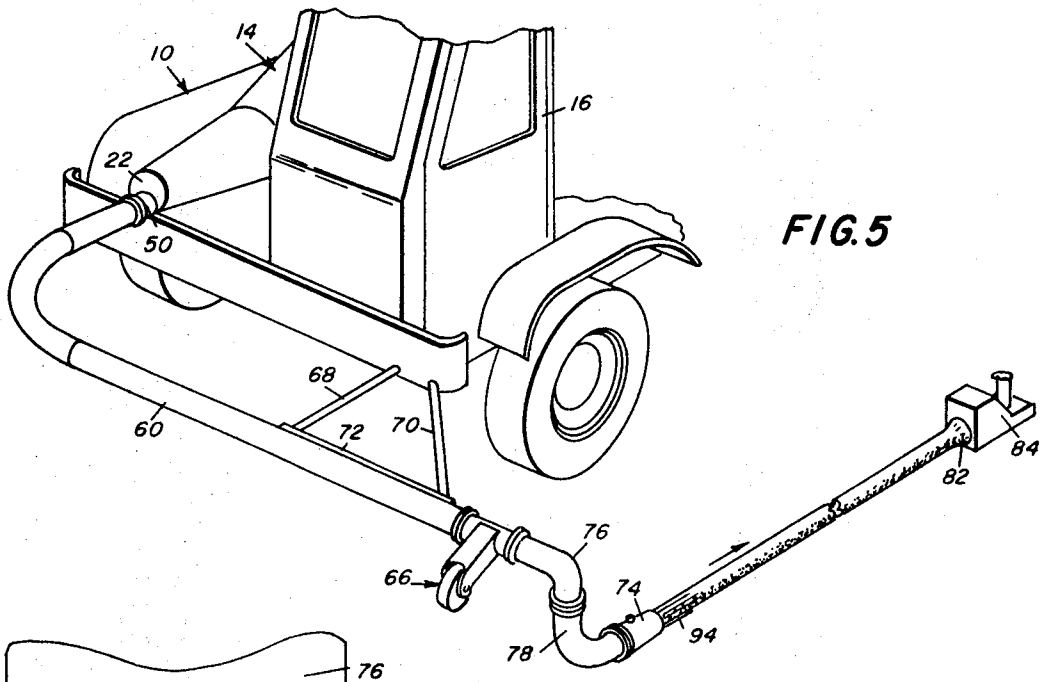



FIG. 5

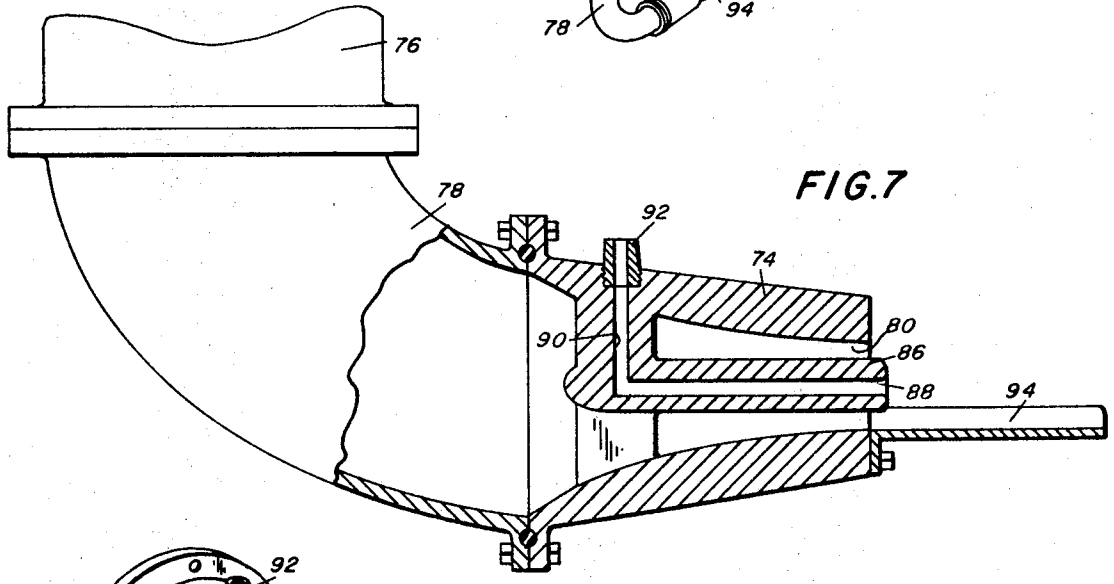



FIG. 7

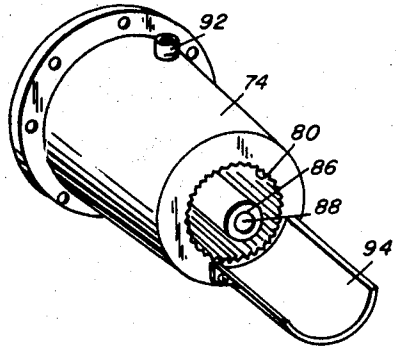



FIG. 6

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3,606,277

# TRANSIT-MIX CONCRETE TRUCK

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Filed Sept. 22, 1969, Ser. No. 859,821
Int. Cl. B28c 7/16
U.S. Cl. 259—169 17 Claims

## ABSTRACT OF THE DISCLOSURE

A transit-mix concrete truck is disclosed which utilizes a stationary mixing drum in which is located a rotatable conical helix screw. The screw is coaxial with the drum and has substantially the same diameter as the inner diameter of the drum, with the screw and the drum both being tapered to form truncated cones. The screw is constructed in three stages, the first stage having a large average diameter and coarse pitch for mixing concrete. This large diameter screw tapers toward the second stage which is of smaller average diameter and finer pitch to compress concrete during delivery. The third stage, which is smallest in diameter and finest in pitch, serves as an extrusion stage which provides sufficient pressure to extrude concrete through an orifice and into a delivery line. Rotation of the spiral screw in one direction causes the concrete to move toward the rear of the drum, forcing it to spill over the inner edges of the screw for mixing and agitating. Rotation of the screw in the opposite direction causes the concrete to be moved into the compression and extrusion stages at the front of the drum for subsequent conveyance under pressure to a suitable distribution head.

## BACKGROUND OF THE INVENTION

The present invention relates, in general, to an improved transit-mix concrete truck or trailer, and more particularly to a transit mix truck which is capable of delivering mixed concrete under pressure for delivery through a suitable pipe to a remote location.

Transit-mix concrete trucks are commonly used at the present time to deliver mixed concrete to construction sites, where the concrete is emptied from the mixing drum into wheelbarrows or the like for hand delivery to the desired location of use. Since most mixer trucks discharge the mixed concrete by gravity flow into a chute or container, serious problems of transportation is presented when the point where the concrete is to be poured is located at a distance from the location of the truck, particularly where labor is scarce.

Many attempts have been made to overcome this problem, and numerous conveyors, motor-driven wheelbarrows and similar devices have been developed in an attempt to find a simple, convenient, economical and easily-handled system for facilitating the conveyance of mixed concrete to its place of use from a mixer truck. One method that has been developed in the continuing search for a solution involves the use of conveyor belts, either singly or in series, extending from the location of the discharge chute at the mixer truck to the area where the concrete is to be used. Complex systems of stationary and movable conveyors have been designed in order effectively to deliver concrete to the required site, but such systems are not entirely satisfactory since they are expensive to buy and maintain, are difficult to handle, and where the concrete is to be carried vertically a considerable distance, are very difficult to set up in a manner which permits the quick and efficient transportation of the mixed concrete. Further, these conveyor systems are generally not easily maneuverable, and thus are not economical when concrete must be delivered to continuously changing locations at a building site. Further, in such a situation it is often necessary



to provide additional handling of the concrete by wheelbarrow or motorized carts even after delivery by conveyor, and thus the problem discussed above is not really eliminated.

Another mode of transporting mixed concrete from a transit mix truck to the desired site location is the concrete pump. This is generally a separate, truck-carried unit having a hopper adapted to receive concrete by gravity flow from a transit mixer and pump it through suitable pipelines to the area of use. Such units utilize heavy duty hydraulic pumps which squeeze the concrete from the receiving hopper into the delivery pipe, and require complex control mechanisms, valves, and the like for regulating the flow of the concrete. Although satisfactory for many purposes, and in many situations an improvement over the conveyor systems, such concrete pumps are expensive to buy and to maintain, and require that two machines be present on a job, one machine to provide the concrete, and the other to pump it to the desired site. This increases the cost of pouring the concrete, and thus may not be justified for many jobs.

Thus, in spite of the numerous attempts to provide an economical, fast and convenient method of delivering concrete from a mixer truck to a job site, where the concrete is actually to be used, none of the prior art machines or methods have been capable of carrying out these functions, and much research is being done to develop new machines and equipment that will efficiently handle mixed concrete.

## SUMMARY OF THE INVENTION

In order to overcome the difficulties experienced with prior methods of concrete delivery, the present invention provides a transit-mix concrete truck which incorporates, and is itself, a concrete pump, whereby concrete can quickly and easily be transported to the point of use from the mixer truck. This eliminates the requirement for extensive conveyor systems and for separate pumping machines, and permits fast and economical delivery of mixed concrete to a desired location. Not only does the present system provide an economical method of delivery of large amounts of concrete to major construction sites, but makes the delivery of concrete in small quantities, to jobs that would normally be difficult to reach, economical and practical by eliminating the necessity for using hand or motor-driven wheelbarrows. Thus, the present device not only saves a considerable amount of time in delivery of concrete, but saves the expense of hiring additional labor to handle wheelbarrows or motorized carts for the delivery.

The transit-mix machine of the present invention comprises a large drum container which is generally in the form of a truncated cone which tapers down to a small diameter where it is adapted to receive an extrusion nozzle. Within the drum, which is stationary, is a rotatably mounted conical helix ribbon screw having an outer diameter which tapers in accordance with the taper of the drum. The outer diameter of the screw is in close tolerance to the inside diameter of the drum, and may include a wiper insert to seal the gap between the screw and the drum. The screw has a relatively coarse pitch at this point, and is in the form of a ribbon, the width of which extends toward the axis of the drum. Spaced support arms carry the screw on a centrally located shaft which extends along the axis of the drum. The shaft is reversibly driven by a suitable engine, whereby the screw may rotate in one direction to mix the concrete and may rotate in the opposite direction to carry the concrete out of the drum. The largest part of the drum is taken up with the first, or mixer, stage of the screw, which tapers toward a second, or compression, stage. The second stage

of the screw may have a different degree of taper, or conical angle, and encompasses the transition of the screw from a ribbon form to a fin-like form. The screw is pitched at this point to produce a compressive force on the material when it is rotating in a direction to carry the concrete out of the drum; when reversed, it moves the material back toward the rear of the drum for mixing by the first stage.

At the extrusion end, or front, of the drum, the screw has its third stage which is smallest in diameter and finest in pitch, and which may also have a different conical angle than the preceding stages. This stage of the screw is solid, and is designed to maintain the compression pressure developed in the second stage whereby the concrete may be extruded through a suitable extrusion nozzle or orifice and into a suitable pipe or flexible line for delivery to the area where the concrete is to be used. The extrusion pressure generated by the machine of this invention permits the use of extrusion heads or dies at the far end of the conveying pipeline. The die restricts the flow of material to insure proper viscosity and density, and may produce formed concrete of any desired configuration. Such extrusion heads may be an integral part of the total system of the present invention, and serve to increase the effectiveness and efficiency of the present invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and additional objects, features, and advantages of the present invention will best be understood and appreciated from the following detailed description of a preferred embodiment thereof, selected for purposes of illustration and shown in the accompanying drawings, in which:

FIG. 1 is a diagrammatic illustration of the basic principle and structure of the mixer of the present invention, with the mixer drum cut away to show the helical screw arrangement;

FIG. 2 is an expanded view of one form of the extruder stage of the mixer shown in FIG. 1;

FIG. 3 illustrates a possible modification of the extruder stage of the device of FIG. 1;

FIG. 4 illustrates one way in which the extruder section can be used to feed mixed concrete through a pipeline to an area of use;

FIG. 5 illustrates another extruder section that may be used with the machine of FIG. 1;

FIG. 6 is a detailed perspective view of the extruder head illustrated in FIG. 5; and

FIG. 7 is a cross-sectional view of the extruder head of FIG. 6.

## DESCRIPTION OF PREFERRED EMBODIMENTS

Turning now to a detailed consideration of the drawings, reference is made to FIG. 1 wherein the numeral **10** indicates in general an improved transit mix truck, constructed in accordance with the principles of the present invention, for the mixing of concrete and its delivery under pressure to a job site. The truck body itself may be of any conventional design, preferably of the multi-axle type having a support frame, or bed, indicated generally at **12** which serves as a platform for receiving the mixer drum **14**. A suitable cab **16** will be provided at the forward end of the truck, as is conventional, while the truck engine **18** may be located, for example, at the rear of the truck for convenience in providing a power takeoff for operating the mixer. As has been indicated, the particular arrangement of the truck is not material to the present invention, as long as it provides a suitable platform for transporting the mixer drum in the manner well known in the art.

Referring now to the mixing drum which constitutes the major feature of the present invention, the drum **14** consists of an outer shell or housing **20** which is securely mounted on the truck **10**. The drum housing is generally shaped in the form of a truncated cone, with the large end, or base end, being located, in the illustrated embodiment, at the rear of the concrete truck **10** and tapering down toward the cone apex, or discharge end, located at the front of the truck. As illustrated, the conically shaped drum housing preferably is mounted on the truck with the outside surface resting on the truck frame **12** so that the axis of the drum is inclined downwardly toward the discharge end **22** at the forward end of the truck. At the uppermost portion of the enlarged end of the drum housing is an opening **24** which forms the hopper into which materials to be mixed may be poured. As illustrated, the charging hopper is located at the rearward end **26** of the drum housing.

Mounted within the stationary drum housing **20** and located along the axis thereof is a rotatable shaft **30** extending from the discharge end **22** of the drum housing through the rearward end **26** thereof. As illustrated in FIG. 2, the discharge end of the shaft **30** may be mounted in a suitable thrust bearing **32** which may be securely mounted in the discharge end **22** of the drum. The bearing **32** supports shaft **30** for rotation and provides axial thrust support so as to hold the shaft in position when it is rotating in either direction. The base end of the shaft is similarly mounted in a rear thrust bearing diagrammatically indicated at **34**, the rear thrust bearing being suitably mounted on the base **26** of the drum to support the shaft for rotation and to prevent axial motion of the shaft during its rotation in one direction or the other. It will be noted that the shaft **30** may be journalled in the rearward end **26** of the drum housing by suitable means to prevent escape of the material being mixed into the bearing area.

Also located at the rear of the drum is a suitable drive mechanism for the shaft which is adapted for connection to the power take off provided on engine **18**. This connection may be in the form of a chain drive connected to a suitable toothed pulley **36** splined or otherwise fastened to shaft **30** for rotation therewith. It will be apparent, of course, that other drive modes may be used, as, for example, directed gear drive, and that such alternative forms are within the scope of the present invention.

Carried by the shaft **30** is a helical mixing screw which is spaced from the shaft throughout the majority of its length and which has an outer diameter which varies along the shaft in accordance with the shape of the conical drum housing. The mixing screw is indicated at **36** and is in the form of a helical ribbon, or blade, which forms a continuing spiral adjacent the inner surface of the drum from the rearward end of the drum to the discharge end. The outer periphery **38** of the conical helix screw **36** is in close tolerance with the inner surface of the drum housing whereby upon rotation of the mixing screw about axial shaft **30** the outer periphery of the screw defines a cone-shaped figure substantially identical to the inner surface of the drum housing **20**. The inner edge **40** of the helical blade is spaced from the shaft **30**, but gradually approaches the shaft, the inner edge defining a cone-shaped figure parallel to the inner drum surface. This inner edge meets the shaft in the pump section of the drum **14**, to be described, and is contiguous with the shaft in that section to form a solid screw.

The mixing screw **36** is supported on the shaft **30** for rotation therewith by means of a plurality of mounting arms, some of which are diagrammatically illustrated at **41**, **42**, **43**, and **44**. The ribbon-shaped mixing screw **36** is arranged with its widest dimension generally radially disposed with respect to the axis of shaft **30**, whereby the turns of the conical helix form fins, or blades which serve to agitate, mix, and transfer the concrete within the drum housing. To insure effective operation of the mixing screw **36**, a wiper insert may be provided at its outer periphery **38** to seal the tolerance gap between this outer periphery and the inner surface of drum housing **20**. It will be apparent that the wiper insert, as well as the mixing screw and the drum housing, will be made of materials

that will not be contaminated by the mixtures to be handled by the transit mixer.

The thrust bearings **32** and **34** at either end of the shaft **30** preferably will be axially adjustable to permit the mixing screw **36** to be moved toward the small end of the conical drum housing as the outer periphery of the mixing screw becomes worn through continued operation thereby assuring a continuing close tolerance between screw **36** and drum housing **20**. This adjustment simplifies maintenance of the transit mixer drum **14**, and reduces the need for costly dismantling of the device to replace worn parts.

It will be seen that the mixer drum **14**, which includes both the drum housing **20** and the conical helix mixing screw **36**, is constructed in three general stages. The major portion of the mixing drum is taken up by the mix stage, encompassing the rearward portion of the mixer drum where the housing and mixing screw are of greatest diameter. In the mix stage, the pitch of the mixing screw is relatively coarse, and thus the axial distance between adjacent turns of the helix is relatively great. Throughout the length of this first stage, the mixing screw is in the form of a ribbon spaced from the axial shaft **30**, and adjacent the inner surface of drum housing **20**. This arrangement of the ribbon screw permits thorough mixing of the materials placed in the drum **14** when the shaft **30** is rotated in a direction to cause material within the housing to move rearwardly. This mixing direction of shaft rotation is indicated by arrow **46**, and when the shaft **30** is so rotated, material is moved toward the rearward end **26** of the mixing drum. Continued rotation of the shaft in a mixing direction causes material in drum **14** to spill over the inner edge **40** of the ribbon mixing screw **36**, and the resultant tumbling and movement of the material agitates and mixes it thoroughly.

It will be noted that in the illustrated embodiment the drum housing incorporates a small portion having a reverse taper, as indicated at **45**. This reverse taper accommodates the hopper opening **24**, and requires a reduction in the diameter of the corresponding portion of the mixing screw. In general, however, the large diameter mix stage tapers down toward the second, or compression stage, which is of smaller average diameter and shorter axial length than the first stage. The conical angle of the drum housing, or the angle between the cone apex and its axis, may vary in this stage from that of the mix stage, and thus the conical shape defined by the outer periphery of the mixing screw **36** may also vary. As illustrated in the figure, the conical angle increases so that the degree of taper toward the shaft increases to reduce the diameter sharply in this stage. In this compression stage, the nature of the mixing screw changes from that of a ribbon, or blade spaced from the shaft to a solid fin arrangement contiguous with the shaft, so that there is no spacing between the inner edge **40** of the fin and the shaft **30**. The pitch distance of the mixing screw at this stage is also reduced from that of the mix stage. During rotation of shaft **30** in the mixing direction indicated by arrow **46**, this compression stage serves only to move any material therein back toward the rear of the drum to be mixed by the first stage, and does not serve a compressing function.

The third and final stage of mixer drum **14** is the extruder portion, which is nearest the apex of the cone defined by the drum, smallest in diameter and finest in pitch of the three stages. The conical angle, or degree of taper, of this portion may vary from that of either of the preceding stages, and in the illustrated embodiment the conical angle is considerably smaller than that of either the mix or compression stages. Thus, the third stage has only a slight taper which is designed to produce the desired discharge characteristics for the mixed concrete. Again, the mixing screw **36** is solid at this stage. Upon rotation of shaft **30** in the mixing direction of arrow **46**, the third stage does not operate as an extruder, but serves to pull material away from the discharge orifice **48** (FIG. 2) and move it toward the compression stage and thence to the mix stage. Preferably, the tolerance between the periphery of the mixing screw and the interior surface of drum housing **20** is such that the screw will actually draw a slight vacuum at the discharge orifice, whereby material in the discharge orifice or the discharge line connected thereto will be drawn into the mix drum so that, under correct conditions, the line will be purged.

Upon completion of the mixing operation in the mix stage, that is, when the mixed concrete conforms to the standards required by ASTM–C94–67, Table A–1, the concrete may be discharged from the drum through the discharge orifice. This is accomplished by reversing the direction of rotation of shaft **30**, as by means of suitable gears connected to the power drive mechanism **35**. When this occurs, the material in the mix stage of the drum will be moved toward the compression stage by the mixing screw **36**, thus feeding the mixed concrete into the compression stage. Because of the increased conical angle and the reduced spacing between adjacent turns of the mixing screw, the concrete will be compressed and forced into the third or extruder stage. The extruder stage maintains the pressure built up in the compression stage and feeds the material under pressure through a discharge orifice **48** (FIG. 2) and through a nozzle **50** into a suitable discharge line to be described. The compression stage and the extruder stage thus function as a pump to deliver the mixed material under pressure to a desired location, and may together be referred to as a pump stage. It will be apparent that the velocity of the material delivered through the orifice will be dependent upon the pitch of the third stage of the mixing screw, the rotational speed of shaft **30**, and the diameter of the delivery line. The surface contact between the mixing screw and the material to be discharged may, in a typical machine, vary in range from a minimum total of 150,000 pounds in the mix stage to a maximum total of 250,000 pounds pressure in the compression and extruder stages, for a mean average pressure in the mixing drum of 11.5 pounds per square inch on the mixing screw.

FIG. 3 illustrates a modified form of the discharge end of the mixing drum **14**. In this case, the discharge end **22** is arranged to provide the discharge orifice **52** approximately coaxial with the shaft **30** to provide a more efficient delivery of the material from the extruder stage. To permit this arrangement, the forward end of shaft **30** is supported at a location spaced inwardly from the discharge end of the mixer drum. This may be accomplished by mounting a suitable thrust and support bearing **54** on spaced support arms **56**, **58** which are in turn mounted on drum housing **20**, as at the discharge end **22**. Other suitable means for mounting and supporting shaft **30** will be apparent to those skilled in the art, the illustrated mountings of FIGS. 2 and 3 being merely diagrammatic.

As illustrated in FIG. 4, the material extruded from mixing drum **14** by the rotation of shaft **30** and mixing screw **36** is fed through discharge nozzle **50** into a suitable discharge line **60** for transfer to a desired site. The discharge line may be flexible or solid, depending upon the particular application, and preferably will be made up in sections which may be connected together to form a delivery line of any desired length. The discharge line is provided with suitable couplings for connection to the discharge nozzle **50**, and the sections preferably will be of a length suitable for convenient handling and storage. By providing a discharge line approximately 12 inches in diameter, the pumping action of the compression and extruder stages of the mixer drum will be sufficiently great to deliver material under pressure for a vertical distance of approximately 600 feet or approximately 850 feet in a horizontal direction, thus facilitating delivery of concrete to construction sites that are normally inaccessible to transit mixer trucks. For assistance in handling and supporting the delivery line or for lifting it vertically for

placement in an upper story of a building, a hydraulically operated A frame and pole type crane may be attached to the transit mix truck **10**. The crane may fold or collapse in either a scissor or telescoping action to provide compactness while not in use.

Since the concrete delivered by the transit mix truck of the present invention is delivered under pressure, it is particularly suited to use with an extrusion head or die which may be provided to shape the material being discharged from the end of the delivery line **60**. The discharged material would then conform to the shape of the extrusion head, and by this means various concrete structures such as curbs and pipes may be quickly and conveniently formed. Such an extrusion head is illustrated in FIG. 4 at **62** and is shown as extruding concrete in the configuration of a curb and gutter **64**. The extrusion head **62** may effect the extrusion of the curb and gutter section at a continuous rate by means of a system of rollers that screed the material into the desired shape, feeding rebar into the extruded curb and gutter section as it is being placed. This die may incorporate a curing compound dispenser that coats the curb and gutter as the last roller passes to give the final shape. As illustrated, the extrusion head may be mounted on suitable rollers or wheels **66** and may be carried at the end of rigid pipe sections fastened by suitable support arms **68**, **70** and **72** fastened to the mixer truck frame or bumper. The support arms hold the extrusion head **62** in a fixed position with respect to the truck **10** so that the curb and gutter **64** may be extruded into place as the truck is driven slowly forward in a line parallel to the desired location of the gutter.

Another suitable extrusion head (not illustrated) may be of a configuration to extrude a slab of desired thickness and width in a continuous extrusion that may be coupled with the curb and gutter die or may be separately used. Such a die may be provided with means for embedding a continuous wire mesh and/or conduit into the slab and preferably would incorporate both the roller screed and the curing compound applicator as described with respect to the curb and gutter die.

A third die form is illustrated in FIG. 5 at **74**. Here again, the die is supported by means of rollers **66** which carry the end of the discharge line **60**, and again the discharge line may be rigidly attached to the front end of the transit mix truck so that the die **74** can be moved by driving the truck. The die **74** is designed to extrude a continuous pipe of inside and outside diameters determined by the die configuration. In this case, the pipe is to be located below the ground surface, and thus connection is made to the discharge line **60** by way of elbow connections **76** and **78**. The die **74** is shown in detail in FIGS. 6 and 7 in order to illustrate the manner in which the concrete pump of the present invention may be used to extrude desired forms and configurations. Thus, the use of an extrusion head may be considered to be a part of the system of the present invention. The die may be provided with a corrugated surface **80** so as to produce serrated exterior walls for the extruded pipe. As is known in the extrusion arts, the particular configuration of the die may be varied so as to provide a non-concentric inside diameter, to provide ribs to reinforce the wall of the extruded pipe, and the like. The pipe which is formed from the material pumped through the discharge line **60** and extrusion head **74** is provided at its start with a flared end **82** (FIG. 5). This pipe end is sealed by a suitable cover **84** that is fixed in position so as to provide an air-tight seal for the interior of the pipe.

A mandrel **86** is provided within and generally concentric to the extrusion head **74** and serves to define the interior diameter of the pipe. This mandrel contains a central passage **88** which is connected by way of opening **90** (FIG. 7) in the extrusion head to a vacuum line fitting **92**. This fitting permits withdrawal of air from the interior of the extruded pipe and may serve to provide a warning or alarm in the event of an imperfection in the extrusion. Thus, any holes that might be formed in the pipe would cause a loss of vacuum which may be measured to actuate a suitable alarm. The vacuum also serves to draw moisture from the inside pipe wall to encourage an accelerated cure of the extruded pipe material. If desired, the die may incorporate a fiber feed system that will serve to embed reinforcing fibers into the pipe. A lip or shelf **94** may be provided at the bottom of the extrusion head to provide temporary support for the extruded pipe configuration.

In operation, then, the transit mix truck **10** is charged by means of hopper **24** with material which is to be mixed, for example, for the production of concrete, and the internal mixing screw **36** is rotated in the direction of arrow **46** to agitate this material. The mixing may be carried out while the truck **10** is in transit to the site where the material being mixed is to be used. Upon completion of the mixing and agitating, a suitable discharge line is connected to discharge nozzle **50**, the opposite end of the line being positioned at the delivery area. As has been explained, an extrusion head of desired configuration may be connected to the end of the discharge line for formation of concrete extrusions of desired configuration. The mixing screw **36** is then reversed so that material within the mixing drum is forced toward the pump at the discharge end thereof. The material is fed into the compression stage of the pump section, where the pressure on the concrete is increased to a desired level. The concrete is then delivered to the extruder stage by which it is pumped under pressure into the discharge line for delivery to the desired site. The strong pumping action of the mixing screw in the extruder stage permits delivery of concrete at areas remote from the truck location at a velocity dependent upon the pitch of the mixing screw and the rate of rotation thereof.

Upon delivery of the desired amount of concrete, or upon emptying of the mixing drum **14**, the direction of rotation of the mixing screw may again be reversed so that the extruder stage will exert a vacuum on the discharge line to draw undelivered material back into the mixing drum, thus purging the line. The delivery line may then be disconnected from the discharge nozzle.

The mixing drum **14** may incorporate a recirculator system for cleaning the drum after completion of the delivery of a load of concrete. This system may consist of a suitable connector for attachment to the discharge nozzle and a line which may lead back to the upper part of the drum in the area of hopper **24**. Water may then be fed into the drum from a reservoir tank to clean the system, and the pumping action of the extruder stage will permit recirculation of this water through the drum under pressure. The system and the drum may then be purged prior to recharging the system.

Although the present invention has been described in terms of preferred embodiments thereof, it will be apparent to those skilled in the art that numerous modifications and changes may be made without departing from the true spirit and scope thereof. Thus, for example, the particular dimensions of the mixing screw and the proportions of the mixer, compression, and extrusion stages of the drum may be varied in accordance with proper design procedures. Alternative forms of the mixing screw are also contemplated; for example, the screw could be made up of solid fins extending from the shaft, with large spaced openings in the fins permitting material in the mixer stage to be pressed through the fins for mixing. Additionally, it may be desired to arrange the shaft in sections that are separately driven, so that a higher velocity discharge could be obtained. Although the present system is shown as being mounted upon a transit mix truck, it will be apparent that it could be carried on a suitable trailer or other vehicle and that the particular method of mounting it thereon will be conventional. Further, the drive mechanism for rotating the mixer screw can be

varied from the structure diagrammatically illustrated herein.

I claim:

1. An improved transit mix system for mixing materials and for delivering the mixed materials to a desired site location comprising:

(a) a housing including a conical shaped mixing section and a conical shaped pumping section;

(b) means for charging said housing with materials to be mixed;

(c) mixing and pumping screw means mounted for rotation within said housing, said mixing and pumping screw means cooperating with and dividing said housing into said mixing and pumping sections;

(d) drive means for rotating said screw in said mixing section in a selected first and second direction, whereby said materials will be mixed as said screw means is rotated in said first direction and said mixed materials will be conveyed to said pumping section as said screw means is rotated in said second direction.

2. The transit mix system of claim 1, wherein said mixing and pumping screw means are mounted on a unitary shaft.

3. The transit mix system of claim 1, wherein said housing is a non-rotatable drum and said screw means forms a conical helix within said housing, the periphery of said screw means generally conforming to the shape of said housing, a portion of said screw means located in said mixing section of said drum having openings therethrough to permit portions of said materials being mixed to pass through said screw means as the screw is rotated in said first direction, thereby permitting the materials to be thoroughly mixed.

4. The transit mix system of claim 3, wherein said portion of said screw means located in said mixing section of said housing comprises a blade in the form of a continuous ribbon, the outer periphery of said ribbon defining a conical helix within and adjacent the inner surface of said housing, said blade being generally radially disposed.

5. The transit mix system of claim 4, wherein said blade is supported by a rotatable shaft coaxial with said housing, said blade being spaced from said shaft in said mixing section but being contiguous with said shaft in said pumping section.

6. The transit mix system of claim 5, wherein the pitch of said conical helix screw decreases from said mixing section to said extruder means.

7. The transit mixing system of claim 5, wherein said conical helix screw is in close tolerance to the inner surface of said housing, whereby said extruder means functions as a discharge pump to discharge mixed material when said screw rotates in said second direction, and functions as a suction pump when said screw rotates in said first direction to purge said pumping section.

8. The transit mixer of claim 7, wherein said mixing drum is mounted on a truck bed, and said mixed, material is concrete.

9. The transit mix system of claim 3, wherein said pumping section of said housing includes an extruder means, said extruder means including a portion of said screw means in close tolerance with the inner surface of said housing, whereby the rotation of said screw means in said second direction produces a continuous discharge of said mixed materials under pressure.

10. The transit mix system of claim 9, wherein said pumping section of said housing further includes a compression means between said mixing section and said extruder means comprising a portion of said screw means in close tolerance with the inner surface of said housing, whereby the rotation of said screw means in said second direction causes said mixed materials to be compressed while being conveyed from said mixing section to said extruder means.

11. The transit mix system of claim 10, wherein said portion of said screw means located in said mixing section of said housing comprises a blade in the form of a continuous ribbon, the outer periphery of said ribbon defining a conical helix within and adjacent the inner surface of said housing, said blade being generally radially disposed.

12. A transit mix system of claim 11, wherein said blade is supported by a rotatable shaft coaxial with said housing, said blade being spaced from said shaft in said mixing section but being contiguous with said shaft in said pumping section.

13. The transit mix system of claim 1, wherein said pumping section of said housing includes an extruder means, said extruder means including a portion of said screw means in close tolerance with the inner surface of said housing, whereby the rotation of said screw means in said second direction produces a continuous discharge of said mixed materials under pressure.

14. The transit mix system of claim 13, wherein said pumping section of said housing further includes a compression means located between said mixing section and said extruder means comprising a portion of said screw means in close tolerance with the inner surface of said housing, whereby the rotation of said screw means in said second direction causes said mixed material to be compressed while being conveyed from said mixing section to said extruder means.

15. The transit mix system of claim 1, further including a discharge line connected to said pumping section of said housing adapted to receive said mixed material from said housing and conveying said mixed material to said desired site location.

16. The transit mix system of claim 15, further including extrusion die means connected to said discharge line, said material being delivered to said site location through said extrusion die for on site shaping thereby.

17. The transit mix system of claim 16, further including means for moving said extrusion die during delivery of said material through said die.

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