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(72) Inventors; and

(71) Applicants : **GOKHALE, Amit, Arun** [IN/IN]; C/o Mr. J.D. Apte, Bunglow No 19, Vaikunth Bunglows, Sindhi Society, Near Vivekananda Polytechnic Chembur Mumbai 400 071 (IN). **GOKHALE, Anand, Arun** [IN/IN]; C/o Mr. J.D. Apte, Bunglow No 19, Vaikunth Bunglows, Sindhi Society, Near Vivekananda Polytechnic Chembur Mumbai 400 071 (IN).

(74) Agent: **MOHAN, Dewan**; R.K. Dewan & Company, Trade Mark & Patent Attorneys, Podar Chambers, S.A. Brelvi Road, Fort, Mumbai 400 001 Maharashtra (IN).

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(57) Abstract: A compact concrete producing and transporting equipment (10) mounted on the chassis of a vehicle is disclosed wherein a weighing hopper is adapted to weigh discrete solid constituents stored in a plurality of silos provided in a storage space (12). A conveyer belt is adapted to receive the solid constituents from the weighing hopper and transport the same to a concrete mixer (28). The concrete mixer (28) is adapted to receive liquid constituents from a plurality of tanks (30). The power required for the operation of the various parts is provided with the help of drive mechanisms operated with the help of the power take-off shaft of the vehicle through an alternator. The present invention helps in providing fresh concrete whenever required and also helps in reducing the cost of concrete. The present invention helps in reducing the cost of maintenance of the concrete producing equipments.



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A COMPACT CONCRETE PRODUCING AND TRANSPORTING EQUIPMENT

FIELD OF INVENTION

The present invention relates to an apparatus for production of concrete.

In particular, the present invention envisages an apparatus for production and transportation of concrete for construction purpose.

DEFINITION

In this specification, the following term have the following definition as given alongside. These are additions to the usual definitions expressed in the art.

“Positive weight gain” is defined as a phenomena of weighing in which increase in the weight of material to be measured is calculated.

BACKGROUND OF THE INVENTION

Concrete is a construction material composed of cement as well as other cementitious materials such as fly ash, slag cement, aggregate comprising a coarse aggregate such as gravel, limestone, or granite along with a fine aggregate such as sand and chemical admixtures. The word concrete comes from the Latin word "concretus" (meaning compact or condensed).

Concrete solidifies and hardens after mixing with water due to a chemical process known as hydration. Water reacts with cement, which helps in

bonding the other ingredients of concrete together, eventually creating a stone-like material. The first major concrete users were the Egyptians in around 2,500 BC and the Romans from 300 BC. The oldest known surviving concrete is to be found in the former Yugoslavia and is believed to have been laid in 5,600 BC.

With the passage of time, concrete has been increasingly used for the construction of pavements, pipe, architectural structures, foundations, motorways/roads, bridges/overpasses, parking structures, brick/block walls, footings for gates, fences and poles and a numerous other purposes.

Presently, concrete is produced by batching the ingredients and thereafter mixing the ingredients in a mixing plant installed at a particular location. The mixed ingredients are transported to the construction site in rotating concrete transit mixers mounted on commercial transport vehicles.

Some vehicles are mounted with volumetric mixers but due to volumetric proportioning of limited ingredients and improper mixing, the volumetric type of mixers has limited applications.

However, the construction industry across the world utilizes the concrete, the ingredients of which are batch on a positive weight based batching system in a stationery plant. The concrete is produced by homogeneous mixing of the various ingredients in various types of mixers like reversible drum, single/ twin shaft, planetary or pan type mixers.

The conventional system of batching and mixing of the various ingredients of the concrete requires investment in dump trucks for transporting stones from stone quarry to a place near the site of construction. Again, a huge investment is required for installation of stationary plants for mixing all the ingredients of concrete except water. Further, the vehicle and the mixer are operated by two separate engines which increase the use of fuel to run the engines and hence leading to an increase in the cost of the concrete.

Several attempts have been made to manufacture a mobile concrete production plant.

Accordingly, **United Kingdom patent number GB 2032290** discloses a mobile mixer and ready-mixed mortar delivery system mounted on a mobile truck. The mobile mixer and ready-mixed mortar delivery system enables the ingredients of the mortar to be supplied in correct proportions at a central mixing plant where from they are delivered to a construction site in usable condition with no further mixing required by on-site operatives. **United Kingdom patent number GB 2032290** includes a mixing chamber in which a rotatable mixing screw causes mixing of the ingredients of the mortar. The mixing screw is driven by a hydraulic motor powered by a power-take-off of the vehicle engine. **United Kingdom patent number GB 2032290** also includes a high level water tank mounted at a front of the truck to supply water to the mixing chamber via a valved conduit. One major disadvantage of the present invention is that the mobile mixer and ready-mixed mortar delivery system of **United Kingdom patent number GB 2032290** does not carry out the actual weighing and batching of the raw materials on positive weight basis and the raw materials are batched earlier

by a separate central mixing plant. Further another disadvantage of **United Kingdom patent number GB 2032290** is that it needs a separate diesel engine to power the mixing screw as the capacity of the mixer goes up. Even for small capacity, the above said equipment uses a hydraulic pump driven by the truck PTO. Further another disadvantage of **United Kingdom patent number GB 2032290** is that it mixes the previously batched material with water using a mixing screw, which has to be driven in forward and reverse direction for mixing and discharging respectively. However, the discharge function is not complete unless the mixing screw axis and the bottom of the chamber are inclined towards the discharge tube. This may result in running down of the cement slurry while mixing in forward direction and result in improper mixing. However, if the screw axis and bottom of the mixing chamber are made perfectly horizontal, the screw even in reverse direction needs assistance from the tipping action to discharge the mixed material. In other words, it needs to be mounted on a special tipper vehicle, where the tipping action of which assists the discharge. Further, the required quantity of the ingredients is batched at central plant before leaving for the site, hence does not allow the production of different grades of mortar for different purposes.

Again, **United States Patent 5730523** discloses a portable concrete plant adapted to be transported on a single transporting vehicle to a construction site with the help of a tractor via a transmission which supplies power to an electric generator and a hydraulic pump mounted on the vehicle. The electric generator and the hydraulic pump are adapted to rotate a rotating drum for mixing concrete. The transporting vehicle further includes containers for storing of various ingredients required for production of concrete. A

concrete pump is provided for dispensing the concrete from the rotating drum. A computer is used to controls the various containers and scales so as to vary the proportions of the various ingredients in order to produce concrete of varying strength. One big disadvantage of the **United States Patent number 5730523** is that it has to be installed on a flat trailer bed and is driven by a tractor truck. Therefore, the equipment cannot be used as a regular transport mean for carrying concrete in narrow lanes and crowded city traffic. Another disadvantage of the **United States Patent number 5730523** is that it needs a hydraulic as well as an electrical drive in order to operate the mixing drum and concrete pump and Conveyors respectively. The hydraulic drive is taken from the PTO of the Tractor truck's transmission for operating the mixing drum and concrete pump. However, since this power is not sufficient to operate the conveyors, it needs a separate generator mounted on the trailer which not only increases the weight of the machine, but also increases the capital and running maintenance cost. Again, **United States Patent number 5730523** is very bulky equipment with a larger turning radius because of the length of the vehicle and it is difficult to maneuver in city traffic. Also due to the weight and size of the equipment, the fuel consumption is more. Again, one more disadvantage of the equipment is the mixing in a rotating drum, which increases the cycle time considerably because of higher no. of rotations required to achieve a homogeneous mix compared to Pan type mixer. Also the drum mix is not well accepted by the Industry because of mixing based on gravity rather than a force full mixing in a pan type mixer. This reduces the output of the equipment considerably.

United States Patent Number 4577805 discloses an agricultural mixing and grinding machine includes a frame with a driven shaft adapted to be driven by a PTO shaft connectable to a tractor. A plurality of bins is provided to contain different feed material to be ground and/or mixed and a grinding unit mounted adjacent to one end of the bins. The materials in the bins are discharged into a confluence with the help of metering augers extending longitudinally beneath the bins. The metering augers are operated by means of D.C. electric motors which derive power from an A.C. generator driven by the PTO shaft. One disadvantage of **United States Patent Number 4577805** is that weighing of the materials is not based on positive weight basis principle and depends upon metering system. Another big disadvantage of **United States Patent Number 4577805** is that it cannot be employed for the purpose of manufacturing construction quality concrete as it is specifically designed for agricultural use.

United States Patent Number 6286987 discloses a cement mixing truck that utilizes a system and a method for controlling speed of an engine of the cement mixing truck. The internal combustion engine of the cement mixing truck is used to provide power to a concrete mixing drum mounted on the cement mixing truck. The cement mixing truck includes a power take off (PTO) assembly that includes an output shaft connected to a drum motor controller for providing power to a drive motor in order to rotate the concrete mixing drum at variable speeds. One disadvantage of **US Granted Patent 6286987** does not include separate compartments for carrying different aggregates and water required for preparing a concrete mixture and the required weight of the aggregates are mixed in the central batching and mixing plant in required proportion and carried to the site. Thus, the

equipment is designed only for transporting the previously batched material to the site and not for production of concrete by batching on weight basis. Further, another disadvantage of **United States Patent Number 6286987** weighing of the aggregates is not based on the principle of positive weight gain. Furthermore, **United States Patent Number 6286987** the concrete mixing drum is driven by the hydraulic and mechanical energy provided to the drum motor from the PTO and hence does not include the use of electrical energy. Overall **United States Patent Number 6286987** is basically related to controlling the engine RPM driving a cement mixer and is not related to production of concrete.

United States Patent Application Number 20070257392 discloses an apparatus for manufacturing concrete mounted on a vehicle for transporting the apparatus to a construction site and manufacturing concrete on-site. The apparatus of **United States Patent Application Number 20070257392** includes a plurality of separate containers adapted to store components required for preparing concrete and a tank for storing water, a weighing means for determining weight of at least one of the components, a mixer for mixing the components together and dispatching mixed concrete, and a delivery means for dispensing components from their respective containers and conveying components to the mixer. The rate of delivery of components by the delivery means is dependent on the weight of the at least one component determined by the weighing means and the particular supply of mixed concrete required from the mixer. One biggest disadvantage of **United States Patent Application Number 20070257392** is that the equipment does not actually weigh the raw materials but depends upon the rate of delivery which again depends upon the known weight of at least one

ingredient. Another disadvantage of **United States Patent Application Number 20070257392** is that it is completely dependent upon the processor for the accuracy of the proportion of ingredients and cannot be operated in manual mode in case of processor failure. Another very big disadvantage of **United States Patent Application Number 20070257392** is that it cannot operate on a surface having even 5 % inclination because of the delivery rate system. In such a case, the machine has to be operated on volumetric basis which is not a desirable method of producing widely acceptable concrete. One more disadvantage of the **United States Patent Application Number 20070257392** is that the processor is connected to the weighing as well as delivery means. The processor continuously adjusts the required proportion of the ingredients by controlling the rate of delivery or in other words the opening of the gate. This is a combination of loss in weight based batching with a volumetric batching system. The apparatus for manufacturing concrete does not include a PTO assembly to mechanically drive an alternating current generator or alternator or any other auxiliary equipment mounted on the vehicle. Furthermore disadvantage of the **United States Patent Application Number 20070257392** is that it carries out the mixing of ingredient in a mixing auger in a continuous flow. The mixing auger is always open at the discharge end and cannot mix the materials as efficiently as a horizontal Pan type mixer, which is provided with a closed discharge gate during mixing. One more disadvantage of the **United States Patent Application Number 20070257392** is that it has to be filled with a front end loader only unless it is provided with a feeding belt connected with a separate power source. Another disadvantage of **United States Patent Application Number 20070257392** is that due to the negative (loss in weight) weighing system, the raw materials cannot be fed continuously

while the plant is producing concrete. In this case the processor cannot decide the rate of delivery unless and until the feeding is over.

United States Patent Application Number US2002001255 discloses a portable concrete plant powered by an internal combustion engine is attached to a truck for producing ready mix concrete proximate to a location where the ready mix concrete is used. The portable concrete plant includes storage regions for storing components used in the ready mix concrete. The storage regions of the portable concrete plant include weight cells monitored by a computer control system to ensure accurate delivery of the components. The portable concrete plant further includes conveying systems for conveying the components from the storage regions to a slurry mixer and from the slurry mixer to a system discharge port. The internal combustion engine further preferably includes a high output AC alternator operably connected thereto to power the operations of electrically powered components on the portable concrete plant. One disadvantage of **United States Patent Application Number US2002001255** is that it uses a separately installed an internal combustion engine for driving the various parts. Further, **United States Patent Application Number US2002001255** uses the principle of negative weight for weighing the various components of ready mixed components. One more disadvantage of **United States Patent Application Number US2002001255** is that it again uses a trailer frame which is pulled or towed by a tractor truck. This limits the utility of the equipment as a concrete transportation vehicle in congested city traffic. Secondly the bulky size and high weight makes it difficult to maneuver in narrow lanes and city areas. One more disadvantage of the **United States Patent Application Number US2002001255** is that the cost of production

per cubic meter is very high due to the high connected load and separate diesel engine. Another drawback of **United States Patent Application Number US 2002001255** is that due to the negative weighing system or weighing by loss in weight, the raw materials cannot be fed continuously while the plant is producing concrete.

The above mentioned prior art is operated by the use of separate engines for running the vehicle and the various parts and weighing is carried out by negative or dynamic weighing. The above mentioned prior art further requires a trailer and tractor truck arrangements and high connected loads which render the prior art unable in transporting raw material in congested city areas.

Thus, there was felt a need for an equipment for batching, mixing and transportation of concrete which can overcome the drawbacks of prior art.

OBJECT OF THE INVENTION

An object of the present invention is to provide a compact concrete batching, mixing and transportation equipment which enables in transportation, mixing and production of concrete by weighing ingredients at the site.

Another object of the present invention is to provide an equipment for batching, mixing and transportation which is cost effective.

Still another object of the present invention is to provide an equipment which is easy to operate.

Further an object of the present invention is to provide an equipment which is easy to maintain.

Yet another object of the present invention is to provide a produce fresh concrete in situ.

Still another object of the present invention is to minimize the various stages involved in re-handling of ingredients.

Further an object of the present invention is to reduce the cost of production of concrete.

An additional object of the present invention is to provide an equipment which is compact.

An added object of the present invention is to provide an equipment which is simple in construction.

Further an object of the present invention is to provide an equipment which is efficient in operation.

Still another object of the present invention is to provide an equipment which is capable of producing different grades of concrete.

Yet another object of the present invention is to reduce the power required to produce concrete.

Still another object of the present invention is to provide a portable equipment for transportation and production of concrete which is easy to transport in congested traffic and narrow lanes.

Further another object of the present invention is to provide a concrete producing and transporting equipment which operates on the principle of positive weight.

An additional object of the present invention is to provide an equipment which is powered by the engine of a vehicle on which the equipment is mounted.

An added object of the present invention is to provide an equipment which eliminates the use of external source of power.

Still an object of the present invention is to provide an equipment which reduces the use of man power.

Another object of the present invention is to provide an equipment that can supply same quantity of concrete as an equivalent capacity transit mixer mounted on equivalent capacity single rigid commercial truck.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a compact concrete producing and transporting equipment characterized in that there is provided a rigid vehicle adapted to mount said equipment on the chassis for holding and transporting of concrete constituents and mixing of the concrete constituents and said equipment comprises:

- a. a storage space having a plurality of silos provided with a conduits means having discharge port at the operative lower end of each of said silos, each of said silos adapted to store at least one discrete solid constituent;

- b. at least one tank for storing liquid constituents, each of said tanks having a controlled discharge outlet;
- c. a concrete mixer adapted to receive and mix said weighed solid constituents and said liquid constituents;
- d. weighing means located operatively below said storage space, said weighing means adapted to receive said solid constituents from each of said silos and dispense weighed quantity of each of said solid constituents;
- e. at least one liquid dispensing means for controlled dispensing of measured quantity of liquid constituents to said concrete mixer;
- f. conveying means adapted to convey adapted to receive said solid constituents to said concrete mixer;
- g. a control system co-operating with a plurality of drive mechanisms adapted to control the discharge of the solid constituents through said discharge ports, said liquid dispensing means and operation of said concrete mixer;
- h. an alternator adapted to convert mechanical drive into electrical energy for operating and supplying power to said drive mechanisms; and
- i. a power take-off shaft connected to the engine transmission of said vehicle to drive said alternator.

Typically, each of the silos is provided with a cover.

Typically, the discharge ports are pneumatically operated.

Typically, at least one of the discharge ports is provided with gates.

Typically, at least one of the discharge ports is provided with screw conveyors.

Typically, the discharge ports are provided with belt conveyors.

Typically, the solid constituents are selected from a group consisting of stones or gravels, fine particles, cement and fly ash, said stones or gravels are of various sizes, said fine particle includes stone dust or river sand.

Typically, the silos containing cement and fly ash are provided with at least one screw conveyor adapted to deliver cement and fly ash to said weighing means.

Typically, the weighing means is suspended from a plurality of load cells.

Typically, the weighing means include a weighing hopper adapted to weigh and dispense said solid constituents to the conveying means, said weighing hopper is provided with a pneumatically operated valve adapted to open at a predetermined weight of the solid constituents.

Typically, the conveying means include said weighing means adapted to weigh said solid constituents.

Typically, the weighing means is adapted to weigh the solid constituents by positive weight gain.

Typically, the conveying means is of slippage free rubber.

Typically, the conveying means is of 3 or 4 ply and 600 mm to 1000 mm in width.

Typically, the conveying means is provided with cleats or ribs.

Typically, the conveying means is inclined at an angle adapted to provide a high discharge height of said concrete mixer.

Typically, the concrete mixer is provided with at least one discharge gate and discharge chute.

The compact concrete producing and transporting equipment as claimed in claim 1, wherein said conveying means and said weighing means is enclosed within a framework.

Typically, the conveyer belt and said weighing hopper is supported on said framework.

Typically, the equipment is provided with a protective cover on all sides.

Typically, the equipment is open on all sides.

Typically, the concrete mixer is selected from a group consisting of a horizontal rotary mixer, auger, reversible drum, single shaft and twin shaft mixer, said concrete mixer being provided with a movable discharge gate adapted to be operated by means of a cylinder.

Typically, the solid constituents are filled in said silos with the help of loading conveyors integral with said equipment.

BRIEF DESCRIPTION OF THE FIGURES

Other aspects of the invention will become apparent by consideration of the accompanying drawing and their description stated below, which is merely illustrative of a preferred embodiment of the invention and does not limit in any way the nature and scope of the invention.

Figure 1 illustrates an embodiment of the compact concrete producing and transporting equipment in accordance with the present invention;

Figure 2 illustrates another embodiment of the compact concrete producing and transporting equipment in accordance with the present invention;

Figure 3 illustrates a storage space of the compact concrete producing and transporting equipment in accordance with the present invention;

Figure 4 illustrates a weighing hopper of the compact concrete producing and transporting equipment in accordance with the present invention;

Figure 5 illustrates a conveyer belt of the compact concrete producing and transporting equipment in accordance with the present invention;

Figure 6 illustrates a concrete mixer of the compact concrete producing and transporting equipment in accordance with the present invention;

Figure 7 illustrates a cover for the concrete mixer shown in figure 6 in accordance with the present invention;

Figure 8 illustrates a water tank of the compact concrete producing and transporting equipment in accordance with the present invention;

Figure 9 illustrates the vehicle for mounting the compact concrete producing and transporting equipment;

Figure 10 illustrates a framework of the compact concrete producing and transporting equipment in accordance with the present invention; and

Figure 11 illustrates a flow diagram of the operation of drive mechanisms of the compact concrete producing and transporting equipment in accordance with the present invention.

Figure 12 illustrates the system diagram illustrating a control system connected to the various drive mechanisms.

DETAILED DESCRIPTION

The invention will now be described with reference to the accompanying drawings which do not limit the scope and ambit of the invention. The description provided is purely by way of example and illustration.

Referring to the accompanied drawings, a compact concrete producing and transporting equipment, in accordance with this invention is generally indicated by the reference numeral (10) and is particularly shown in **figure 1** of the drawing.

The compact concrete producing and transporting equipment (10) comprises a storage space (12), a weighing means, a conveying means, a concrete mixer (28) and a control system (36A). The compact concrete batching and mixing assembly (10) is adapted to be operated at the site of construction.

The storage space (12), shown in **figure 3**, comprises a plurality of silos (14a), (14b), (14c), (14d), (14e) and (14f) separated from each other by

means of a plurality of partition walls. Each of the silos (14a), (14b), (14c), (14d), (14e) and (14f) at the operative upper end is covered with the help of a lid (16). Each of the silos (14a), (14b), (14c), (14d), (14e) and (14f) are covered by separated lids (16). Alternatively, the storage space (12) is provided with a common lid. The compact concrete producing equipment (10) of the present invention is adapted to store a plurality of discrete solid constituents in each of the silos (14a), (14b), (14c), (14d), (14e) and (14f). The solid constituents comprise stones or gravels of 20 mm size and 10 mm size, fine particles such as stone dust, fine particles, cement and fly ash. The fine particles comprise river sand or crushed sand. The stones of 20 mm size, the stones of 10 mm size, the fine particles, the cement and fly ash are separately stored in the silos (14a), (14b), (14c), (14d), (14e) and (14f). The storage capacity of the storage space (10) is such that the total quantity of the concrete constituents that can be stored is sufficient to produce at least 5 cubic meter of concrete of any grade. The operative lower end of at least four of the silos (14a), (14b), (14c), (14d), (14e) and (14f) containing the stones of 20 mm size, the stones of 10 mm size, fine particles and river sand are each provided with a conduit means having a pneumatically operated discharge ports (not shown in figure) in order to allow the solid constituents to flow from the respective silos onto the weighing means. The discharge port (not shown in figure) includes a gate or a belt conveyor. The cement and fly ash of the solid constituents separately contained in two of the silos (14a), (14b), (14c), (14d), (14e) and (14f) are provided with screw conveyers (not shown in figure) for leading the cement and the fly ash into the weighing hopper (20). A drive mechanism (D1), illustrated in **figure 11**, is adapted to operate the gates (not shown in figure) and the screw conveyers (not shown in figure) of the silos (14a), (14b), (14c), (14d), (14e) and (14f).

Alternatively, the screw conveyors of the silos (14a), (14b), (14c), (14d), (14e) and (14f) containing the fly ash and cement are driven by separate drive mechanism (D2) and a drive mechanism (D3) respectively. The drive mechanism (D1) comprises a first electrical motor driving the air compressor so as to control the opening and closing of the gates of the silos (14a), (14b), (14c), (14d), (14e) and (14f) containing the stones of 20 mm size, the stones of 10 mm size, fine particles and river sand. The screw conveyors of each of silos (14a), (14b), (14c), (14d), (14e) and (14f) containing cement and fly ash are driven by drive mechanisms (D2) and (D3) respectively. The solid constituents are filled in said silos (14a), (14b), (14c), (14d), (14e) and (14f) with the help of loading conveyors (not shown in figure) integral with the compact concrete producing and transporting equipment (10).

The weighing means is adapted to weigh each of the solid constituents from the storage space (12) with the help of a plurality of load cells. In one embodiment of the compact concrete producing and transporting equipment (10), the weighing means includes a weighing hopper (20), shown in **figure 4**. The weighing hopper (20) is typically funnel shaped having a continuously narrowing cross-section so as to form an inlet at the broad end (22a) and an outlet at the narrow end (22b). The weighing hopper (20) is suspended with the help of at least four electronic load cells (not shown in figure) attached to the broad end (22a) of the weighing hopper (20). The weighing hopper (20) is adapted to weigh the quantity of the solid constituents by the principle of positive weight gain. The application of the principle of positive weight gain results in the use of load cells of smaller size as compared to the load cells applicable in case of use of the principle of

loss in weight. The load cells (not shown in figure) provided are such that they are shock proof and are provided with locking arrangements in order to protect the load cells (not shown in figure) during transit. At the narrow end (22b), the weighing hopper (20) is provided with a pneumatically operated valve (24) adapted to open at a preset weight of the solid constituents so as to discharge the weighed quantity of the solid constituents onto the conveyer belt (26). The valve (24) of the weighing hopper (20) is operated by the drive mechanism (D1) which is also used for operating the gates of the silos (14a), (14b), (14c) and (14d). Alternatively, the valve (24) of the weighing hopper (20) is operated by a separate drive mechanism (not shown in figure). The solid constituents are discharged on the conveying means in batches of preset quantity as per the on site requirement. The size of each batch is typically 0.25 or 0.3 cubic meter capacity. In an alternate embodiment, the weighing hopper (20) can be dispensed with a conveying means and the conveying means is adapted to receive, weigh and convey each of the solid constituents from the storage space (12) by positive weight gain using a plurality of load cells.

The conveying means includes a conveyer belt (26), shown in **figure 5**. In one embodiment, the conveyer belt (26) is located operatively below the weighing hopper (20). The conveyer belt (26) is a continuous belt joined at both ends so as to form a ring. The conveyer belt (26) is supported with the help of a plurality of pulleys (not shown in figure) located at predetermined positions. The conveyer belt (26) is typically of slippage free rubber or ribbed or cleated so as to ensure smooth movement of the weighed and batched solid constituents on the conveyor belt (26) to the concrete mixer (28). The conveyor belt (26) is typically of 3 or 4 ply rubber and typically

has a width of 600 mm to 1000 mm. The conveyer belt (26) is operated with a conveyer drive mechanism (D4), shown in **figure 11**. The conveying means is inclined at an angle adapted to provide a high discharge height of said concrete mixer (28).

The concrete mixer (28), shown in **figure 6**, is adapted to receive the weighed and batched solid constituents through the conveyer belt (26) and at least one liquid constituent. The liquid constituents comprise water and at least one chemical additive. A preset quantity of water and chemical additive, stored in a water tank (30), shown in **figure 8**, and an additive tank (29) respectively, is required added to the solid constituents in the concrete mixer (28) with the help of a pump (not shown in figure) and a piping system (not shown in figure). The water tank has a capacity typically of 1100 liters which is sufficient for production of at least 5 cubic meter of concrete. The water tank is operated with a drive mechanism (D6) and the additive tank (29) is operated with the help of a drive mechanism (D7). The concrete mixer (28) is provided with a cover (27), shown in **figure 7**, a discharge gate and a discharge chute (31). The discharge gate is adapted to be operated by means of a cylinder (not shown in figure). The concrete mixer (28) is provided with a mixer element (32) located inside the concrete mixer (28) which enables in mixing the solid constituents and the liquid constituents so as to form concrete of the required grade. The concrete mixer (28) typically has a capacity of producing 250 to 300 liters of concrete. The concrete mixer (28) is operated with the help of a drive mechanism (D5), shown in **figure 11**, comprising a motor (not shown in figure) and related components. The concrete mixer (28) is selected from a group comprising a

horizontal rotary mixer, auger, reversible drum, single shaft and twin shaft mixer.

The compact concrete producing equipment (10) is mounted on the chassis (33) of a vehicle (34), shown in **figure 9**. The power required for the operation of the compact concrete producing equipment (10) is obtained with the help of an alternator (36), shown in **figure 9**, which is connected to a power take-off shaft (25) of the engine-transmission shaft (23) of vehicle (34) by means of connectors such as belts and pulley arrangement, knuckle joint and the like. The power take-off shaft (25) is auxiliary to the main engine-transmission (23) which provides drive to the wheels (19) of the vehicle (34). The power take-off shaft (25) works independent of the engine-transmission shaft (23) and can receive power when the power take-off shaft (25) is engaged with the main gear of the engine-transmission (23). Hence, the power take-off shaft (25) can be operated even when the vehicle (34) is in motion. A pneumatic actuator (not shown in figure) is provided in the driver's cabin of the vehicle (34) for engaging and disengaging the auxiliary power take-off shaft (25) of the vehicle (34) with the alternator (36). The actuator (not shown in figure) used is typically a pneumatically operated clutch type system. The air pressure required for the operation of the pneumatic actuator (not shown in figure) is obtained from the brake system of the vehicle (34). The alternator (36) is connected to the motors of all the drive mechanisms (D1), (D2), (D3), (D4), (D5), (D6) and (D7). The compact concrete producing equipment (10) can be operated while the vehicle (34) is in transit as well as at site.

A framework (38), shown in **figure 10**, is mounted on the chassis (33) of the vehicle (34) in order to support the conveyer belt (26) on the operatively lower side of the framework (38). The storage space (12) is mounted on the operatively upper sided of the framework (38) distal from the chassis (33) such that the weighing hopper (22) is enclosed within the framework (38). The compact concrete producing equipment (10) is externally covered on all sides by means of covering (40) for enclosing the various parts of the compact concrete producing equipment (10), shown in **figure 1**. The covering (40) is typically of fiber. Alternatively, the compact concrete producing equipment (10) is without the covering (40), shown in **figure 2**.

A control system (36A) shown in **figure 12**, is adapted to control the operation of the drive mechanisms (D1), (D2), (D3) (D4), (D5), (D6) and (D7). The control system (36A) further enables in setting the quantity for the solid and the liquid constituents of each batch depending on the grade of concrete required for various purposes. The control system (36A) has two modes of operation, namely, automatic mode of operation and a manual mode of operation. In the automatic mode of operation, the control system (36A) can automatically control the number of batches required, the operation of the drive mechanisms (D1), (D2), (D3) (D4), (D5), (D6) and (D7) and sets the quantities for the solid and the liquid constituents. The manual mode of operation is activated in the case of incorrect operation of the PLC in the automatic mode. The control system (36A) is typically a programmable logic controller (PLC) and is adapted to store data of each batch. The control system (36A) can communicate with a printer so as to print the stored the data if necessary. The control system (36A) includes a control panel having a weighing indicator, an emergency switch, a cycle

start button and a trip indicator. The quantity of the solid and the liquid constituents required for various grades of concretes are stored in the control system (36A). On selecting the grade of the concrete required for a particular purpose, the compact concrete producing equipment (10) produces the required grade of concrete.

TECHNICAL ADVANTAGES AND ECONOMIC SIGNIFICANCE

The product as described herein above offers several advancements over similar products disclosed in the prior art. The compact concrete producing equipment helps in producing cement at the site of construction. The present invention is simple in construction and is easy to operate. Further, the present invention is compact in construction. The compact concrete producing equipment enables in storing the constituents required for the production of concrete in a vehicle and helps in producing fresh concrete at the site of construction. The compact concrete batching and mixing assembly enables in storing the constituents required for the production of concrete in a vehicle and helps in producing fresh concrete at the site of construction. The present invention weighs the stones or gravels and fine particles with an accuracy of 97% and cement and fly ash with an accuracy of 99 %. The present invention weighs the stones or gravels and fine particles in more accurately in comparison with the general tolerance limit prevalent in the industry.

The compact concrete producing equipment of the present invention is powered by the engine of the vehicle carrying the equipment. As the constituents of the concrete are loaded and mixed on the vehicle, the

constituents are not required to be delivered to the site of construction separately and hence reduces the cost of the concrete and hence the cost of construction. The present invention requires one operator for operating the compact concrete batching and mixing assembly and hence helps in reduction in the cost of manpower involved in the production of concrete. The cost involved in the usage of retarders is eliminated as fresh concrete can be produced at the site of construction. The present invention enables in combining the activities of production and transportation of concrete and hence eliminates the use of bulky equipments like stationary concrete batching and mixing plants, diesel generator sets, transit mixers and dumpers thereby saving huge amount of money and reducing emissions.

While considerable emphasis has been placed herein on the components and component parts of the preferred embodiments, it will be appreciated that many embodiments can be made and that many changes can be made in the preferred embodiments without departing from the principles of the invention. These and other changes in the preferred embodiment as well as other embodiments of the invention will be apparent to those skilled in the art from the disclosure herein, whereby it is to be distinctly understood that the foregoing descriptive matter is to be interpreted merely as illustrative of the invention and not as a limitation.

CLAIMS:

1. A compact concrete producing and transporting equipment characterized in that there is provided a rigid vehicle adapted to mount said equipment on the chassis for holding and transporting of concrete constituents and mixing of the concrete constituents and said equipment comprises:
 - a. a storage space having a plurality of silos provided with a conduits means having discharge port at the operative lower end of each of said silos, each of said silos adapted to store at least one discrete solid constituent;
 - b. at least one tank for storing liquid constituents, each of said tanks having a controlled discharge outlet;
 - c. a concrete mixer adapted to receive and mix said weighed solid constituents and said liquid constituents;
 - d. weighing means located operatively below said storage space, said weighing means adapted to receive said solid constituents from each of said silos and dispensing weighed quantity of each of said solid constituents;
 - e. at least one liquid dispensing means for controlled dispensing of measured quantity of liquid constituents to said concrete mixer;
 - f. conveying means adapted to convey adapted to receive said solid constituents to said concrete mixer;
 - g. a control system co-operating with a plurality of drive mechanisms adapted to control the discharge of the solid

constituents through said discharge ports, said liquid dispensing means and operation of said concrete mixer;

- h. an alternator adapted to convert mechanical drive into electrical energy for operating and supplying power to said drive mechanisms; and
 - i. a power take-off shaft connected to the engine transmission of said vehicle to drive said alternator.
2. The compact concrete producing and transporting equipment as claimed in claim 1, wherein each of said silos is provided with a cover.
 3. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said discharge ports are pneumatically operated.
 4. The compact concrete producing and transporting equipment as claimed in claim 1, wherein at least one of said discharge ports are provided with gates.
 5. The compact concrete producing and transporting equipment as claimed in claim 1, wherein at least one of said discharge ports are provided with screw conveyors.
 6. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said discharge ports are provided with belt conveyors.
 7. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said solid constituents are selected from a group consisting of stones or gravels, fine particles, cement and fly ash, said stones or gravels are of various size, said fine particle includes stone dust or river sand.

8. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said silos containing cement and fly ash are provided with at least one screw conveyor adapted to deliver cement and fly ash to said weighing means.
9. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said weighing means is suspended from a plurality of load cells.
10. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said weighing means include a weighing hopper adapted to weigh and dispense said solid constituents to said conveying means, said weighing hopper is provided with a pneumatically operated valve adapted to open at a predetermined weight of the solid constituents.
11. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said conveying means include said weighing means adapted to weigh said solid constituents.
12. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said weighing means is adapted to weigh the solid constituents by positive weight gain.
13. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said conveying means is of slippage free rubber.
14. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said conveying means is of 3 or 4 ply and 600 mm to 1000 mm in width.

15. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said conveying means is provided with cleats or ribs.
16. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said conveying means is inclined at an angle adapted to provide a high discharge height of said concrete mixer.
17. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said concrete mixer is provided with at least one discharge gate and discharge chute.
18. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said conveying means and said weighing means is enclosed within a framework.
19. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said conveyer belt and said weighing hopper is supported on said framework.
20. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said equipment is provided with a protective cover on all sides.
21. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said equipment is open on all sides.
22. The compact concrete producing and transporting equipment as claimed in claim 1, said concrete mixer is selected from a group consisting of a horizontal rotary mixer, auger, reversible drum, single shaft and twin shaft mixer, said concrete mixer being provided with a movable discharge gate adapted to be operated by means of a cylinder.

23. The compact concrete producing and transporting equipment as claimed in claim 1, wherein said solid constituents are filled in said silos with the help of loading conveyors integral with said equipment.

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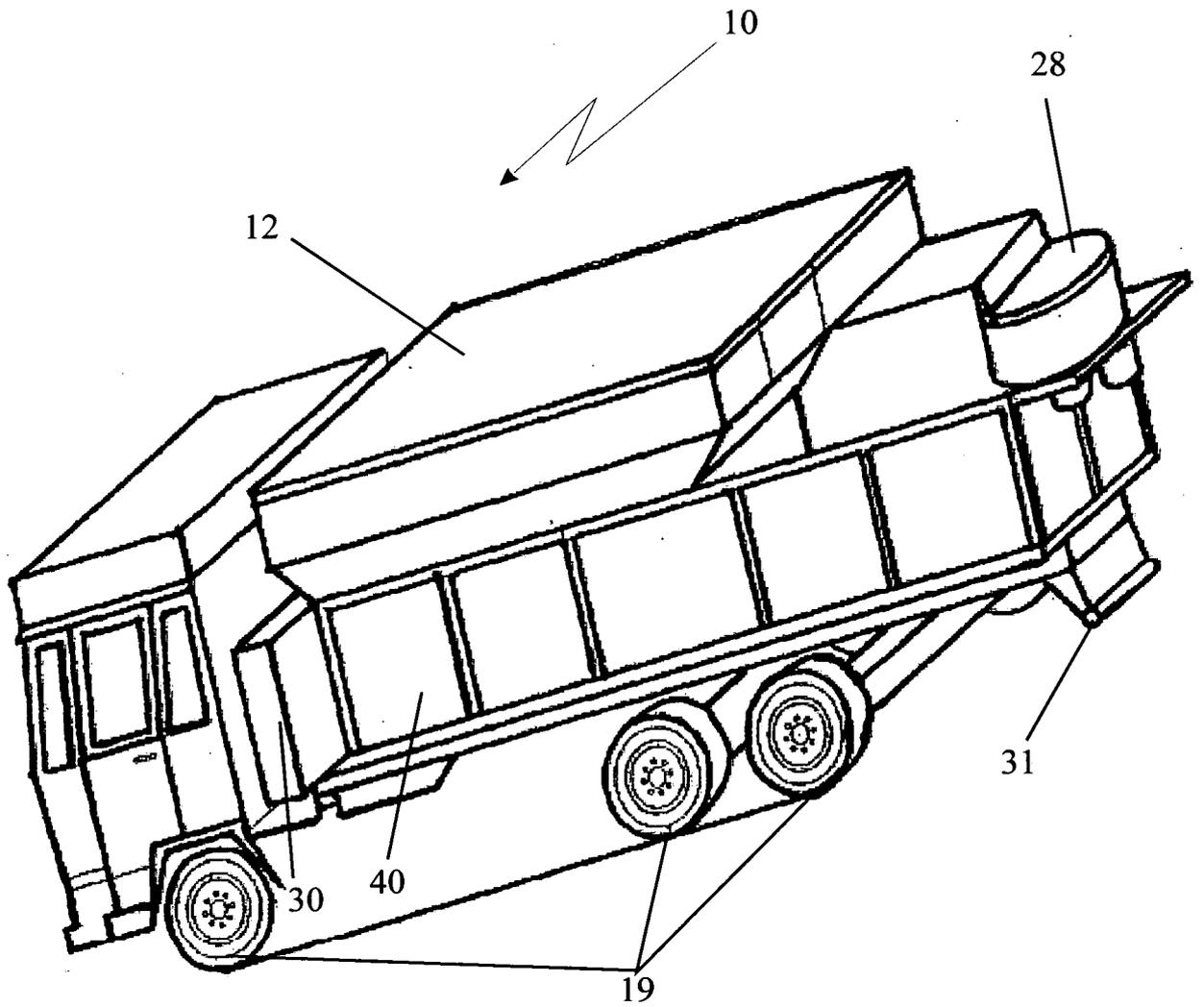


FIGURE 1

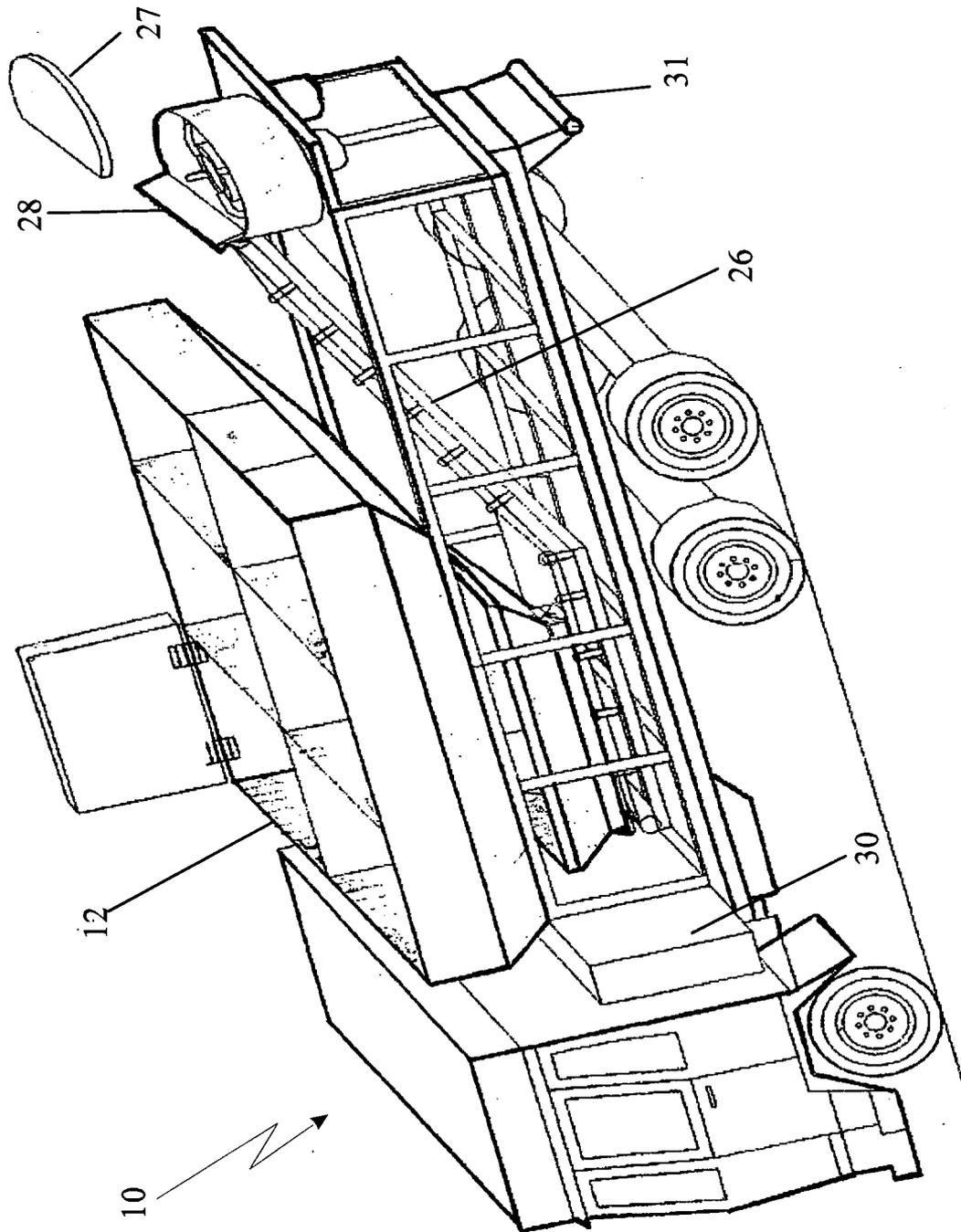


FIGURE 2

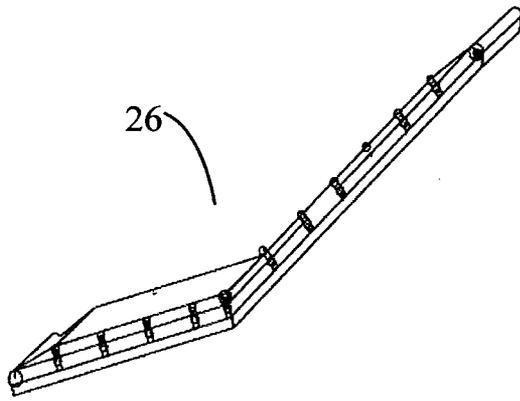


FIGURE 5

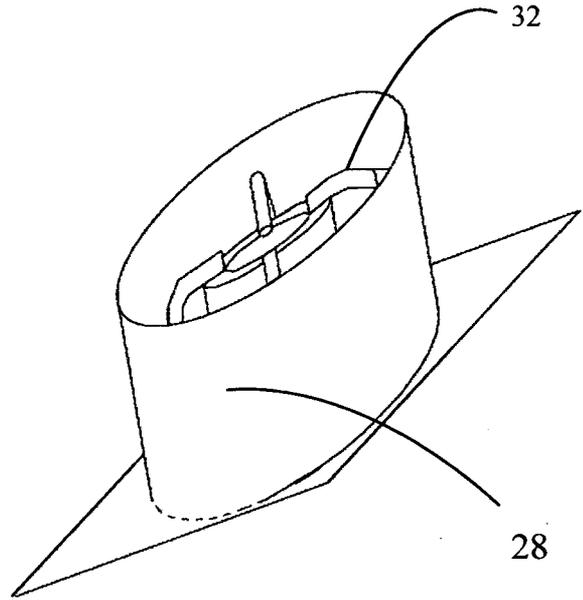


FIGURE 6

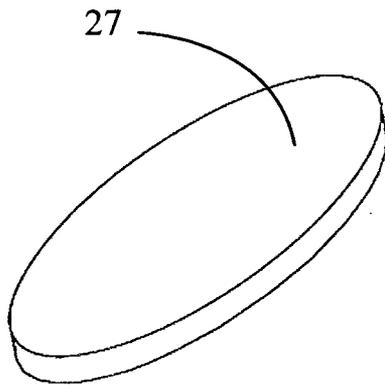


FIGURE 7

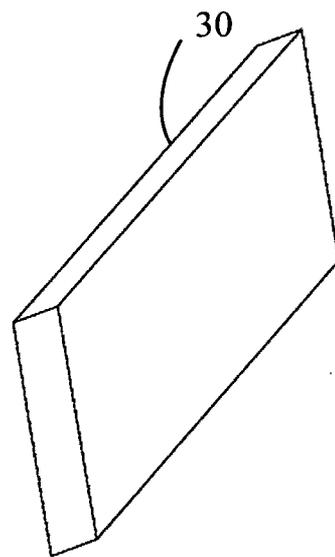


FIGURE 8

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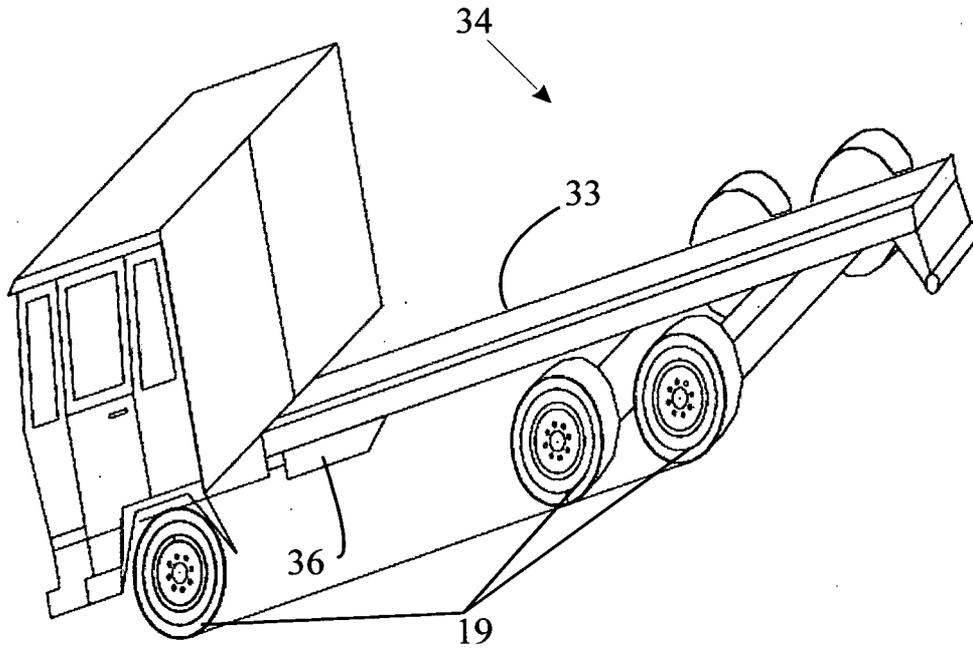


FIGURE 9

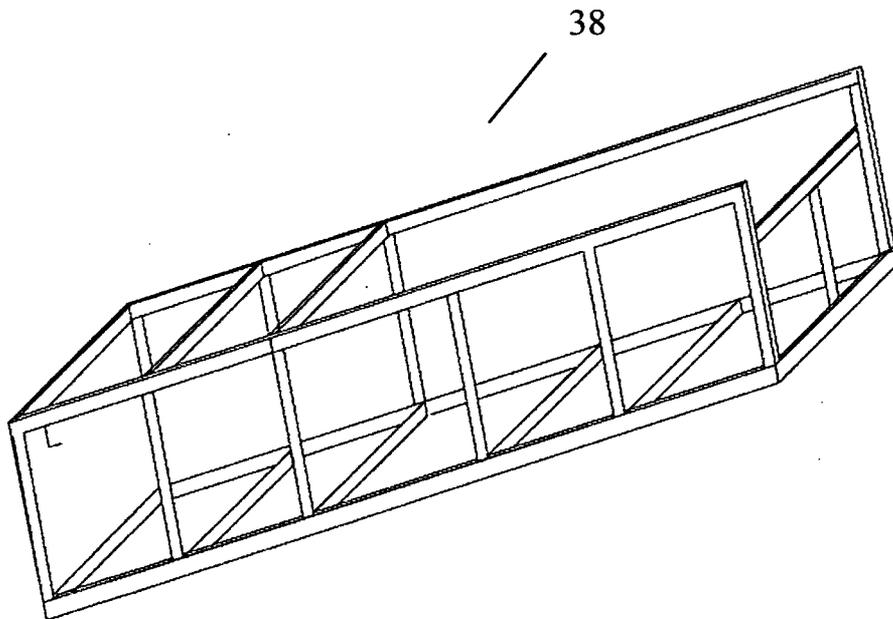


FIGURE 10

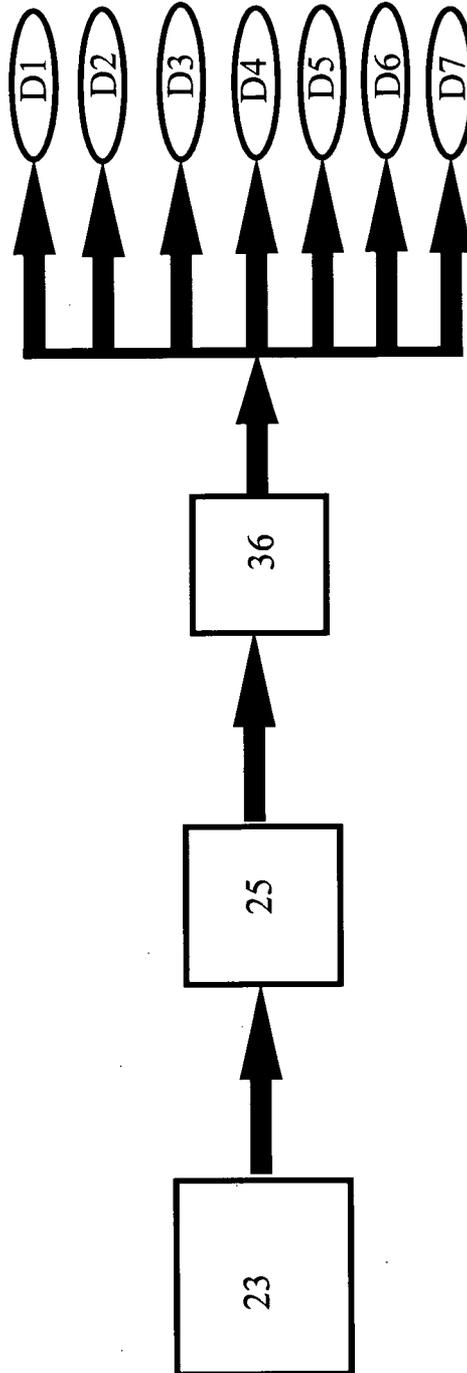


FIGURE 11

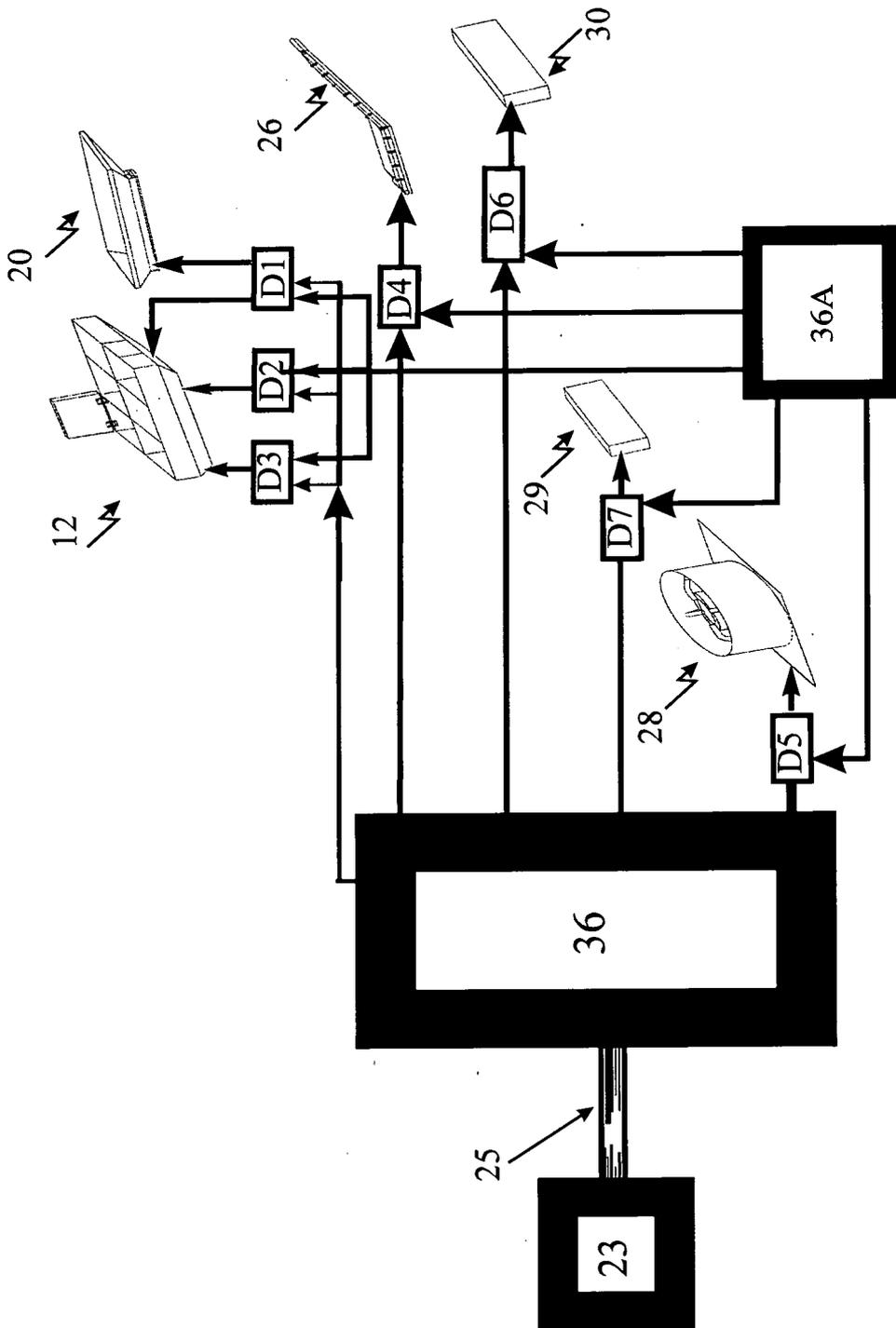


FIGURE 12