

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
8 January 2009 (08.01.2009)

PCT

(10) International Publication Number
WO 2009/005378 A2

(51) International Patent Classification:
B28C 7/04 (2006.01) **B28C 9/04** (2006.01)

(21) International Application Number:
PCT/PH2008/000007

(22) International Filing Date: 4 July 2008 (04.07.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1-2007-000267 4 July 2007 (04.07.2007) PH

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(81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA,
CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE,
EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID,
IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK,
LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW,
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TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM,
ZW.

(84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL,
NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG,
CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to the identity of the inventor (Rule 4.17(i))*
- *of inventorship (Rule 4.17(iv))*

Published:

- *without international search report and to be republished
upon receipt of that report*

(54) Title: A MOBILE CONCRETE BATCHING PLANT

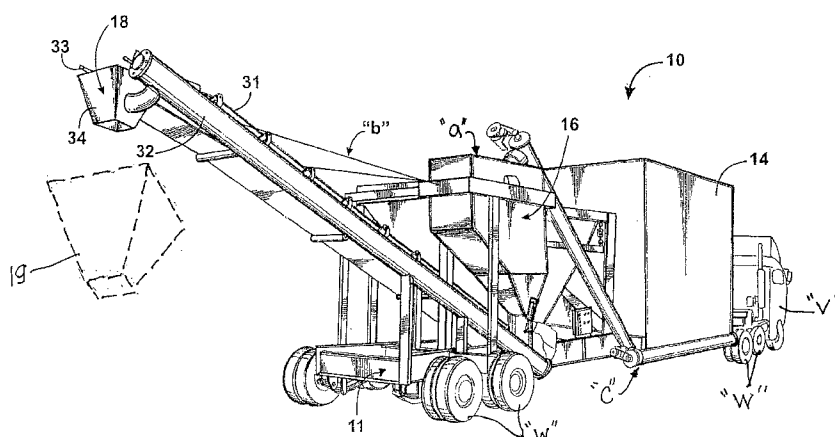


FIG. 1

(57) Abstract: The present invention relates to a mobile concrete batching plant comprising a main frame supporting assembly being detachably connected to a transport means; a water tank being supported at the lower rearward portion of said main frame supporting assembly, a cement silo being supported at the upper rearward portion of said main frame supporting assembly and spacedly disposed on top of said water tank, a cement weigh batcher and a suspended aggregate weigh batcher being supported at the forward portion of said main frame supporting assembly, means to convey cement material from said cement silo into said cement weigh batcher, weight controlling means being operationally connected to said cement weigh batcher and said aggregate weigh batcher, and distribution means to convey and batched feed cement materials, aggregates and water to a material mixing means to constitute a proportionate concrete mix.

S P E C I F I C A T I O N

A MOBILE CONCRETE BATCHING PLANT

5 TECHNICAL FIELD

The present invention relates in general to concrete batching systems, but more particularly to improvements concerning mobile concrete batching plants.

10 BACKGROUND OF THE INVENTION

Heretofore, most features of existing mobile concrete batching plants are poorly designed and constructed and as consequence, greatly affect the efficiency of said existing mobile concrete batching plants and consequently, production costs, processes and the quality of the concrete mix product.

Some of the major drawbacks caused by the poor design and constructional features of these existing mobile concrete batching plants are the following:

- 20 1. Set-up time is required before operations can commence on site.
2. Additional expenses is incurred from setting-up the batching plant.
- 25 3. The use of negative-loading, particularly in the loading of aggregate materials which required pre-loading and greatly impedes the transport of the batching plant to the construction site.
4. Cement silo and water tank capacity is very small.
- 30 5. Water is sourced in the construction site and not preloaded in the batching plant, which is problematic for sites without water.
6. Existing mobile concrete batching plants needs to be elevated due to height problems.

7. The need of a ramp for positioning bulk carriers during the distribution, feeding and mixing of materials.

5 8. Existing mobile concrete batching plants are not provided with an effective maneuverability area for the movement of bulk carriers at the distribution portion thereof.

SUMMARY OF THE INVENTION

10 The present invention seeks to overcome the shortcomings of the prior art by providing a mobile concrete batching plant that has no set-up time and can immediately be made operational on site.

15 The primary object of the present invention is to provide a mobile concrete batching plant having an aggregate weigh batcher that allows the positive-loading of aggregate materials. (gravel and sand) in the construction site, and thus need not be preloaded, this makes the batching plant lighter and easier to move
20 compared to existing mobile concrete batching plants.

Another object the of the present invention is to provide a mobile concrete batching plant provided with a cement silo and water supply tank that is shaped to save space and provide optimum "counter weight effect."
25 Further, the cement silo and water supply tank will allow excess cement material and water respectively to be easily discharged before transporting from construction site.

Another object the of the present invention is to
30 provide a mobile concrete batching plant with a cement silo capacity of at least 1,400 bags, which is almost twice the capacity of cement silos of existing batching plants.

Still, another object the of the present invention is to provide a mobile concrete batching plant with a steady supply of water from a water source provided on the batching plant. This eliminates the problem of water sourcing during concrete mixing on the construction site.

Another object of the present invention is to provide a mobile concrete batching plant which features a distribution means extending at a substantial angle and distance from the front portion of the mobile batching plant in order to provide an effective maneuvering space for bulk carries during the distribution of the cement/aggregate materials and water at the forward portion thereof.

Another object of the present invention is to provide a mobile concrete batching plant that is very easy to operate and is featured with components that is easy to clean and maintain.

Still, another object of the present invention is to provide for a mobile concrete batching plant that is most economical to manufacture using locally available materials and technology.

These and other objects and advantages of the present invention will become apparent upon a reading of the ensuing detailed description taken in conjunction with the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a right front perspective view showing the present invention for a mobile concrete batching plant;

Figure 2 is a left front perspective view thereof;

Figure 3 is a right side view thereof;

Figure 4 is a left side view thereof;

Figure 5 is top view thereof;

Figure 6 is an isolated perspective view showing in detail the cement silo and the water supply tank;

Figure 7 is a cross sectional view of figure 6;

Figure 8 is an isolated detailed view of the cement weigh batcher with the screw conveyor;

Figure 9 is an isolated view of the aggregate weigh batcher including its weighing system;

Figure 10 is an end view of the aggregate weigh batcher showing structure of the mechanical door and associated belt conveyor;

Figure 11 is a detailed view of the distribution means;

Figures 12a and 12b show the perspective views of the control panel used in the present invention; and

Figure 13 is a detailed view showing the trailer footing of the supporting assembly of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Before describing the preferred embodiments of the invention in detail, it is to be understood that the phraseologies and terminologies used herein are for the purposes of description and should not be regarded as limiting.

Referring now to the different views of the drawings, wherein like reference numerals designate the steps, components or elements throughout the ensuing enabling description, there is shown the present invention for a mobile concrete batching plant designated generally as 10.

Referring now particularly to figures 1 to 5 of the drawings, mobile concrete batching plant 10 according to the present invention comprises of a main frame supporting assembly 11 having a chassis 12 provided at

the rearward end portion 11a thereof and adapted to be detachably connected to a transport means "V" and having transport wheels W preferably provided at the forward portion of the main frame supporting assembly 11; a water supply tank 13 being supported at the lower rearward portion of the main frame supporting assembly 11 and a cement silo 14 being supported at the upper rearward portion of main frame supporting assembly 11 and spacedly disposed on top of the water supply tank 13 by a space 15.

Further comprising the mobile concrete batching plant 10 is a cement weigh batcher 16 being supported at the forward portion "a" of the main frame supporting assembly 11, means "C" to convey cement material from the cement silo 14 into the cement weigh batcher 16, and an aggregate weigh batcher 17 being also supported at the forward portion of the main frame supporting assembly 11 in a suspended manner and disposed substantially adjacent to the cement weigh batcher 16.

Still, further comprising the herein invention for a mobile concrete batching plant 10 as shown again in figures 1 to 5, is a distribution means 18 provided at the forward end portion "b" of the mobile concrete batching plant 10 to convey and feed batched cement materials, aggregates and water to a material mixing means 19 to constitute a proportionate concrete mix. Preferably, the material mixing means 19 may be a mixer-loaded transport vehicle 19a or a mixer-loaded rigid structure 19b.

To control and provide a measuring index on the weight/volume of the cement material being positively loaded on the cement weigh batcher 16, a weight-volume controlling means 20 (see figure 12b) is provided on the main frame supporting assembly 11 and is operationally

connected to the cement weigh batcher 16. Likewise, the weight/volume of aggregate materials, preferably suitable and correct proportions of mixed gravel and sand, which are also positively loaded on the aggregate weigh batcher 17 are also controlled and measured by the weight-volume controlling means 20 which is also operationally connected thereto.

Furthermore, in accordance with the invention, the cement weigh batcher 16 and the aggregate weigh batcher 17 are both provided with a weighing indicator means 21 provided on the outer surface portions to facilitate the instant viewing access thereof and are electronically connected to the weigh-volume controlling means 20. For instance, as shown in figure 9, the weigh indicator means 21 for the aggregate weigh batcher 17 comprises of main frame 21a, an LCD 21b being supported on the main frame 21a and on the aggregate weigh batcher 17 preferably by means of an attaching device 21c.

Referring again to figures 4, 6 and 7 of the drawings, water supply tank 13 is generally triangular in shape and extends throughout the longitudinal orientation of the lower rearward portion of the main frame supporting assembly 11. Furthermore, water supply tank 13 occupies more than half the total area of the lower rearward portion of the main frame supporting assembly 11 and is provided with water inlet port 13a and outlet port 13b as shown in figures 6 and 7.

Referring again to figure 7, a novel and inventive feature of the invention concerns the shape of the cement silo 14 and water supply tank 13 and the orientation of the cement silo 14 in relation to the water supply tank 13, whereby the space 15 formed between the water supply tank 13 and the cement silo 14 is inclined. More specifically, the cement silo 14 occupies a space of the

total area of the lower rearward portion 11b of the main frame supporting assembly 11 adjacent to the water supply tank 13. Secondly, the cement silo 14 has a downwardly inclined bottom wall 14a extending from an abbreviated side wall 14b and up to the one side wall 14c of the cement silo 14. A cement outlet port 14d is formed at the downward portion of the bottom wall 14a side wall 14c in direct communication with the interconnecting conveyor 28. A top wall 14e is also formed to completely define the cement silo structure of the present invention

In accordance with the present invention, the inclined bottom wall 14a allows the cement material to be easily and efficiently conveyed to the cement outlet port 14c and up to the conveyor 28. Furthermore, the present cement silo 14 features a large capacity volume to accommodate the total volume equivalent to at least 1,400 sacks of cement material which is at least twice the volume capacities of existing mobile concrete batching plants. As further shown in figure 7, the water supply tank 13 is formed by an inclined top wall 13c and vertical and horizontal walls 13d and 13e while A water pump W is installed from water and connected to the water supply tank 13. In addition, the shape of the water supply tank 13 particularly the inclined top wall 13c follows the inclination of the bottom wall 14a to the define the inclined space 15. The corresponding shapes and reciprocating arrangement of the cement silo 14 and water tank 13 saves space and provides equalizing and counter weight for the entire batching plant.

Referring again to figure 6, cement silo 14 is provided with a cement-loading pipe 22 and cement breather pipe 23 at the rear portion thereof. The loading of cement material to the cement silo 14 is carried out by means of air-loading the cement material through the

inlet portion 22a of the cement-loading inlet pipe 22 in which the cement material is conveyed into the cement silo 14 and at the same time the pipe breathers 23 acting as the pressure releasing port while the air-loading is being commenced.

As further shown again in figures 6, water hose 24 is provided on the water inlet port 13a to facilitate the loading of water into the water supply tank 13 prior to transporting the batching plant 10 to the construction site.

Referring again to the drawings, particularly figures 1 and 3, weigh batcher 16 which is provided and supported at the forward portion "a" of the main frame supporting assembly 11 comprises of a cement hopper 16a, having an open top and bottom portions 16b and 16c, a bottom closure 16d in direct communication with the open bottom portion 16c and an actuating means "A" to control the opening and closing movement of the bottom closure 16d. The actuating means "A" is electrically connected to the main controlling panels "P" (where the weight-volume controlling means 20 is also disposed and positioned) provided on the main frame supporting assembly 11 as shown in figure 8.

And likewise, as shown in figure 4, 9 and 10, the aggregate weigh batcher 17 in accordance with the present invention is also provided and supported at the forward portion "a" of the main frame supporting assembly 11 substantially adjacent to the cement weigh batcher 16. Referring to figure 4, aggregate weigh batcher 17 comprises of an aggregate hopper 17a, having an open top and bottom portions 17b and 17c, a bottom closure 17d in communication with the open bottom portion 17c and an actuating means "A" to control the opening and closing movement of the bottom closure 17d. The actuating means

"A" is electrically connected to the main controlling panels "P" (where the weight-volume controlling means 20 is also disposed and positioned) provided on the main frame supporting assembly 11 as shown in figures 11 and 11a.

Although existing types of conventional actuating means and devices known to persons skilled in the art may be used to activate the movement of the bottom closures 16d and 17d, it is preferred that the actuating means "A" to control the opening and closing movement of the bottom closures 16d of the cement weigh batcher 16 and the bottom closure 17d of said aggregate weigh batcher 17 is a pneumatically-operated actuator which is easily controlled by the main controlling panels P.

In accordance with the present invention as shown in figure 9, the aggregate weigh batcher 17 is suspended with respect to the main frame supporting assembly 11 by a suspending means 25 which is provided and further interconnected between the upper edges 17e of the aggregate hopper 17a and a supporting post members 11a provided on the forward portion "a" of the main frame supporting assembly 11. At least four (4) suspending means 25 is provided on each corner of the main frame supporting assembly 11 via the supporting post members 11a provided thereon.

Referring again to figure 9, suspending means 25 comprises of a sensor device 26 suspended and supported by a pair of opposed hooks 27a and 27b provided on the upper edges 17e of the aggregate hopper 17a and the supporting post members 11a provided on the forward portion "a" of the main frame supporting assembly 11. The sensor device 26 is electrically connected to the weight-volume controlling means 20 and weighs indicator means 21

to relay weight data as the aggregates (gravel or sand or a proportional mixture thereof) are positively loaded on the aggregate hopper 17a.

In accordance with the present invention, the means
5 "C" to convey and positively load cement material from the cement silo 14 into the cement weigh batcher 16 is shown in figures 1,3 and 5. Means "C" comprises of a first cement material conveyor 28 being interconnectedly provided along the outer side portion of said cement silo
10 14, a second cement material conveyor 29 upwardly extending from the first cement material conveyor 28 in a feeding relation with the open top portion 16b of said cement weigh batcher 16, a transfer conduit 30 interconnecting the first and second cement material
15 conveyors 28, 29 and a first prime mover P1 being connected to first and second material conveyors 28, 29. Preferably, a screw-type conveyor is used for first and second material conveyors 28, 29 which by convention can effectively convey the cement material to the cement
20 weigh batcher 16.

The cement weigh batcher 16 is also provided with weighing indicator means (not shown) provided on the outer surface portion to facilitate the instant viewing access thereof and is electronically connected to the
25 weigh-volume controlling means 20. The weighing indicator means is similar to the weighing indicator means 21 of the aggregate weigh batcher 17.

To convey and feed batched feed cement materials, aggregates and water to a material mixing means 19 to
30 proportionately to form a concrete mix, the distribution means 18 is provided and shown in detail in figures 1 to 5.

Distribution means 18 according to the present invention comprises of a batched aggregate feeding

conveyor belt 31 being provided in direct communication with the bottom closure 17d of the aggregate weigh batcher 17, a second prime mover P2 being engagedly connected to the aggregate feeding conveyor belt 31, an
5 upwardly extending batched cement feeding conveyor 32 being provided in direct communication with the bottom closure 16d of said cement weigh batcher 16, a water supply line 33 connected from the water outlet port 13b and extending therefrom to the water supply tank 13. To
10 hold the discharge end portions of said aggregate feeding conveyor belt 31, cement batch feeding conveyor 32 and the water supply line 33 together in a cooperative discharging mode a supporting means 34 is provided at the end portion of the distribution means 18.

15 As shown in figure 10, aggregate feeding conveyor belt 31 comprises of an endless belt 35 inclinedly supported at the forward portion of main frame supporting assembly 11, a plurality of spaced apart upper rollers 36 and spaced part lower roller 37.

20 Referring now to figure 11, supporting means 34 is mounted at the forward end portion of the aggregate feeding conveyor belt 31 and is defined by an abbreviated spout having sidewalls 34a, and an open top and bottom portions 34b and 34c. The discharge end of the aggregate
25 feeding conveyor belt 31 is in communication with the open top 34b, while the discharge end of cement feeding conveyor 32 and the water supply line 33 is directed through opposed sidewalls 34a. The batched cement material, aggregates and water is conveyed at the same
30 time through the supporting means 34 and into the material mixing means 19. The supply of proportionate amount of water from the water supply tank 13 is metered.

Another inventive and novel feature of the present invention is that the distribution means 18 extends at a

substantial angle and distance from the front portion of the main frame supporting assembly 11 to provide an effective maneuvering space for the material mixers at the forward portion thereof during loading operations.

5 Consequently also, the increase length complimented by a greater inclination allows greater heights to be achieved between the supporting means 34 and the ground directly beneath it. This makes it unnecessary to elevate the batching plant and use ramps therefore, which is common
10 for existing batching plants but which require a lot of set-up time and costs.

Before the mobile concrete batching plant 10 of the present invention is transported to the construction site, the water supply tank 13 and cement silo 14 is
15 first pre-loaded in accordance with the procedure as previously explained. The transport means is secured to the chassis 12 located at the rear portion of the batching plant 10. In operation, the main frame supporting assembly 11 is stationed and fixed to a
20 location on the construction site after its transport by means of a retractable footing 38 as shown in figure 13.

The aggregate materials (gravel and sand) are now positively-loaded on the aggregate weigh batcher 17 by means of a pay loader, while cement material is loaded on
25 the cement weigh batcher 16 to determine the required volume of cement an aggregate materials. Together with the metered amount of water the materials are conveyed to the material mixing means 19 via the distribution means 18. This is unlike prior art or existing mobile concrete
30 batching plants where the aggregate weigh batchers are preloaded before brought to the site but water is not. Construction sites that do not have ready water supply would require a batching plant which carries water. Thus, this invention's novel and inventive feature is the

capacity to preload water. On the other hand, for construction site where aggregates are readily available, there is no need to preload the aggregate weigh batcher. Thus, another novel and inventive feature of this invention is the positive-loading of the aggregate weigh batcher on the construction site, which do not require preloading of aggregates. This makes the mobile batching plant light and easier to transport.

The present invention also provides for a process for producing a concrete mixture using a mobile concrete batching plant. The herein process comprising the active steps of loading a predetermined total volume of cement material into a cement silo of a concrete batching plant, supplying water into a water tank of a concrete batching plant, transporting the mobile concrete batching plant to a construction site, loading aggregate materials to an aggregate weigh batcher of a concrete batching plant in a predetermined weight, loading cement material conveyed from said cement silo to a cement weigh batcher of a concrete batching plant in a predetermined weight, conveying batched cement material and batched aggregates simultaneously with water to a material mixing apparatus.

The amount and volume of the loaded aggregates and cement is measured by a weight-volume controlling means connected to the cement weigh batcher and the aggregate weigh batcher provided on the forward portion of the mobile concrete batching plant.

Additional advantages and modifications of the present invention will readily occur to those skilled in the art in view of these teachings. The present invention in its broader aspects is not limited to the specific details, representative contrivances, and illustrative example of the mobile concrete batching plant shown and described herein. Accordingly, various

modifications may be made without departing from the spirit and scope of the novel features and general inventive concepts as defined in the appended claims and their equivalents.

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CLAIMS:

1. A mobile concrete batching plant comprising:

a main frame supporting assembly being detachably connected to a transport means;

5 a water supply tank being supported at the lower rearward portion of said main frame supporting assembly;

a cement silo being supported at the upper rearward portion of said main frame supporting assembly and spacedly disposed on top of said water supply tank;

10 a cement weigh batcher being supported at the forward portion of said main frame supporting assembly;

means to convey cement material from said cement silo into said cement weigh batcher;

15 an aggregate weigh batcher being supported at the forward portion of said main frame supporting assembly in a suspended manner;

weight-volume controlling means provided on said main frame supporting assembly and being operationally connected to said cement weigh batcher and said aggregate weigh batcher; and

20 distribution means being interconnected to said cement weigh batcher, aggregate weigh batcher and water tank to convey and batched feed cement materials, aggregates and water to a material mixing means to constitute a proportionate concrete mix.

25 2. A mobile concrete batching plant according to claim 1, wherein said cement weigh batcher comprising a cement hopper having an open top and bottom portions, a bottom closure and actuating means to control the movement of said bottom closure.

30 3. A mobile concrete batching plant according to claim 1, wherein said aggregate weigh batcher comprising an aggregate hopper having an open top and bottom

portion, a bottom closure and actuating means to control movement of said bottom closure.

4. A mobile concrete batching plant according to claims 1 or 3, further comprising a suspending means
5 electronically connected to said weight-volume controlling means, said suspending means is further interconnected between the upper edges of said aggregate hopper and said main frame supporting assembly.

5. A mobile concrete batching plant according to
10 claims 4, wherein said suspending means comprising a sensor device being suspended and supported by a pair of opposed hooks being provided on the upper edges of said aggregate hopper and supporting post members provided on the forward portion of said main frame supporting
15 assembly.

6. A mobile concrete batching plant according to claims 1 or 2, wherein said means to convey cement material from said cement silo into said cement weigh
batcher comprising a first cement material conveyor being
20 interconnectedly provided along the outer side portion of said cement silo, a second cement material conveyor upwardly extending from said first cement material conveyor in a feeding relation with the open top portion of said cement weigh batcher, a transfer conduit
25 interconnecting said first and second cement material conveyors and a prime mover being connected to said first and second conveyors.

7. A mobile concrete batching plant according to claims 1 or 2, wherein said cement weigh batcher further
30 comprising a weighing indicator means electronically connected to said weigh-volume controlling means.

8. A mobile concrete batching plant according to claims 1 or 2, wherein cement material from said cement silo is positively-loaded on said cement weigh batcher.

9. A mobile concrete batching plant according to claims 1 or 3, wherein said aggregate weigh batcher further comprising a weighing indicator means electronically connected to said weight-volume
5 controlling means.

10. A mobile concrete batching plant according to claims 1 or 3, wherein aggregate material is positively-loaded on said aggregate weigh batcher.

11. A mobile concrete batching plant according to
10 claim 2, wherein said actuating means to control the movement of said bottom closure of said cement weigh batcher is defined by a pneumatically-operated actuator.

12. A mobile concrete batching plant according to
15 movement of said bottom closure of said aggregate weigh batcher is defined by a pneumatically-operated actuator.

13. A mobile concrete batching plant according to claims 1, 2 or 3, wherein said distribution means comprising a batched aggregate feeding conveyor belt
20 being provided in direct communication with the bottom closure of said aggregate weigh batcher, a prime mover being connected to said aggregate feeding conveyor belt, an upwardly extending batched cement feeding conveyor being provided in direct communication with the bottom
25 closure of said cement weigh batcher, a water supply pipe extending and connected from said water supply tank, and supporting means to hold the discharge end portions of said aggregate feeding conveyor belt, cement batch feeding conveyor and water supply line together in a
30 cooperative discharging mode.

14. A mobile concrete batching plant according to claim 13, wherein said material mixing means is a mixer-loaded transport vehicle.

15. A mobile concrete batching plant according to claim 13, wherein said material mixing means is a mixer-loaded rigid structure.

5 16. A mobile concrete batching plant according to claim 13, wherein said distribution means extends at a substantial angle and distance from the front portion of said main frame supporting assembly to provide an effective maneuvering space at the forward portion thereof.

10 17. A mobile concrete batching plant according to claim 1, wherein said space formed between said cement silo and said water tank is inclined and that said cement silo occupies a space in rear portion of said main frame supporting assembly adjacent to said water tank.

15 18. A mobile concrete batching plant according to claim 17, wherein said cement silo has a top wall, abbreviated side wall, side wall and an inclined bottom wall extending downwardly from said abbreviated side wall, and a cement outlet port formed at the downward
20 portion of said bottom wall and said side wall in direct communication with said conveyor.

19. A mobile concrete batching plant according to claim 18, wherein said inclined bottom wall of said cement silo allows the cement material to be easily and
25 efficiently conveyed to the cement outlet port and up to said conveying means.

20. A mobile concrete batching plant according to claim 1, wherein said water supply tank is triangular in shape and extends throughout the longitudinal orientation
30 of the lower rearward portion of the main frame supporting assembly.

21. A mobile concrete batching plant according to claim 20, wherein said water supply tank is formed by an inclined top wall and vertical and horizontal walls,

whereby said inclined top wall follows the inclination of the bottom wall of said cement silo to the define said inclined space and provide for space efficiency and counter weight.

5 22. A mobile concrete batching plant according to claim 1, wherein said cement silo is provided with cement-loading inlet pipe and cement breather pipe at the rear portion thereof.

10 23. A mobile concrete batching plant according to claim 1, wherein the supply of water is metered from said water tank to said distribution means.

24. A process for producing concrete mixture using a mobile concrete batching plant comprising the steps of:

15 loading a predetermined total volume of cement material into a cement silo of a concrete batching plant;

supplying water into a water tank of a concrete batching plant;

transporting said mobile concrete batching plant to a construction site;

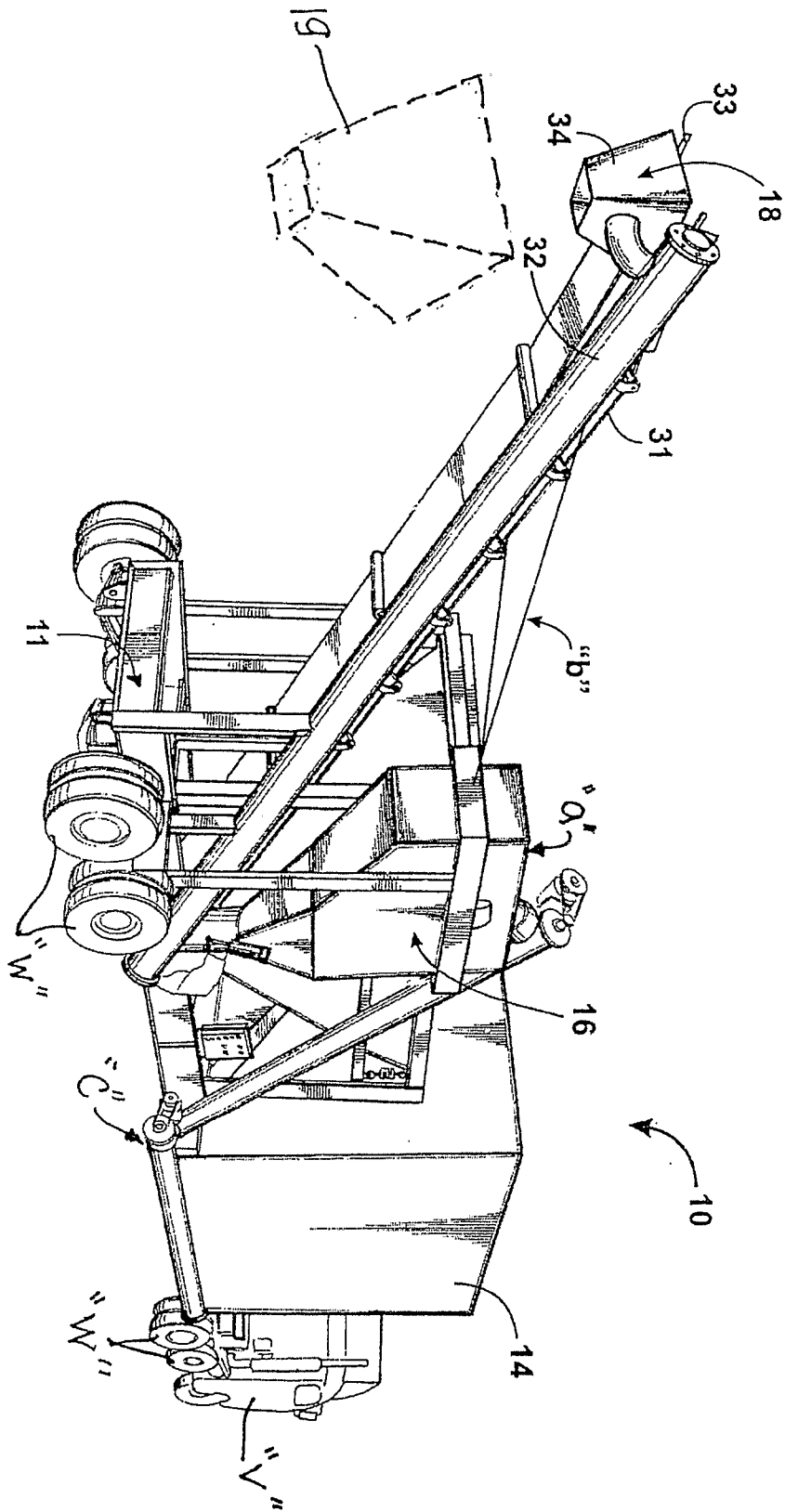
20 loading aggregate materials to an aggregate weigh batcher of a concrete batching plant in a predetermined weight;

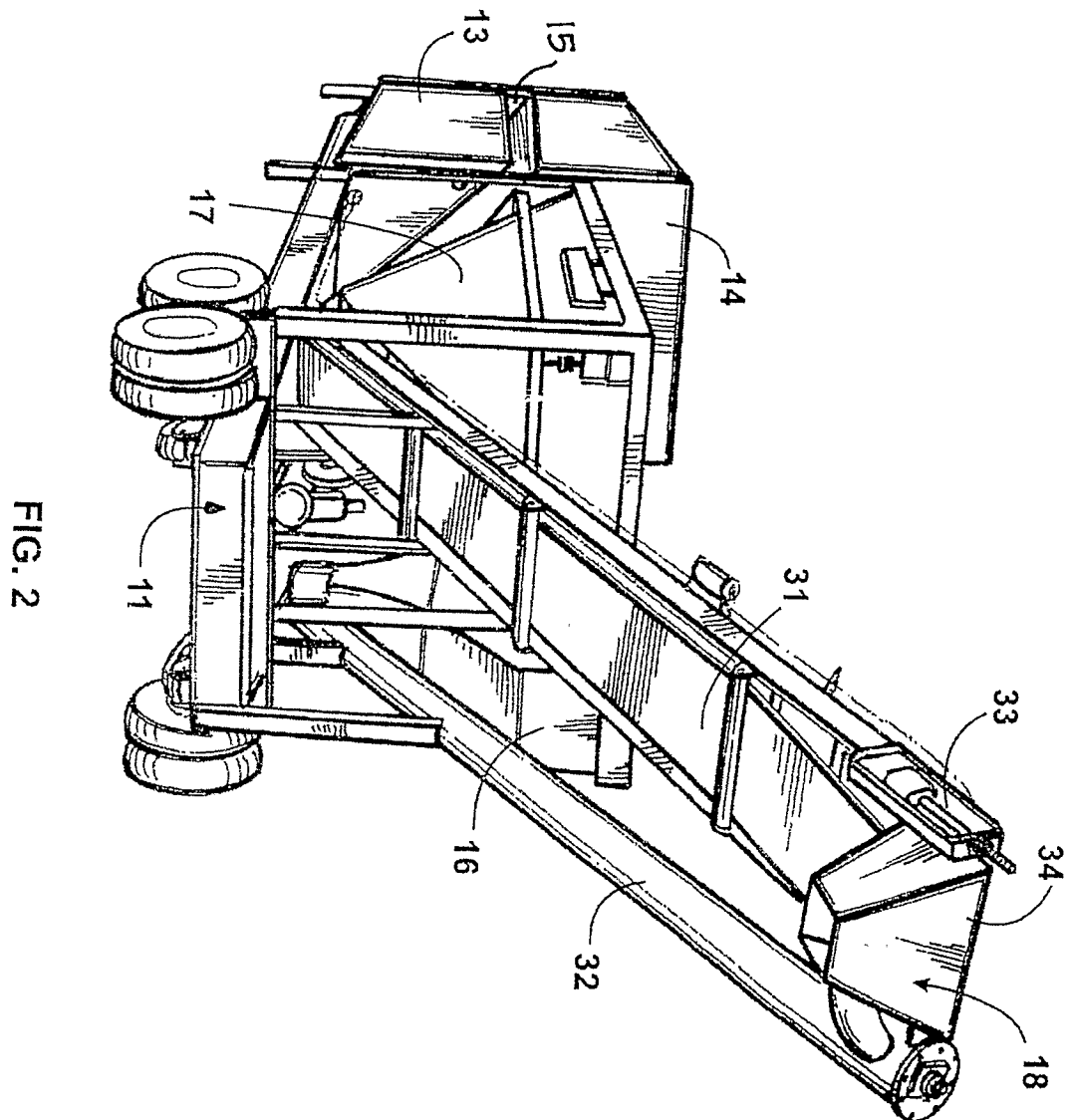
25 loading cement material conveyed from said cement silo to a cement weigh batcher of a concrete batching plant in a predetermined weight;

conveying batched cement material and batched aggregates simultaneously with water to a material mixing apparatus.

30 25. A process for producing concrete mix according to claim 24, wherein the volume of said loaded aggregates and cement is measured by a weight-volume controlling means connected to said cement weigh batcher and said aggregate weigh batcher provided on said mobile concrete batching plant.

FIG. 1





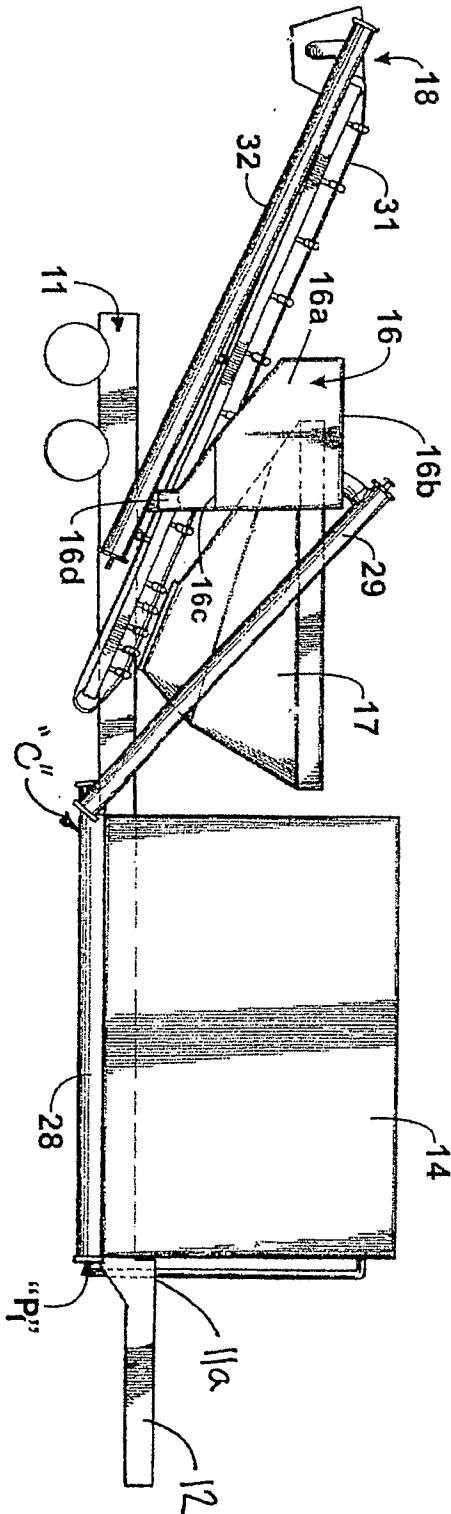
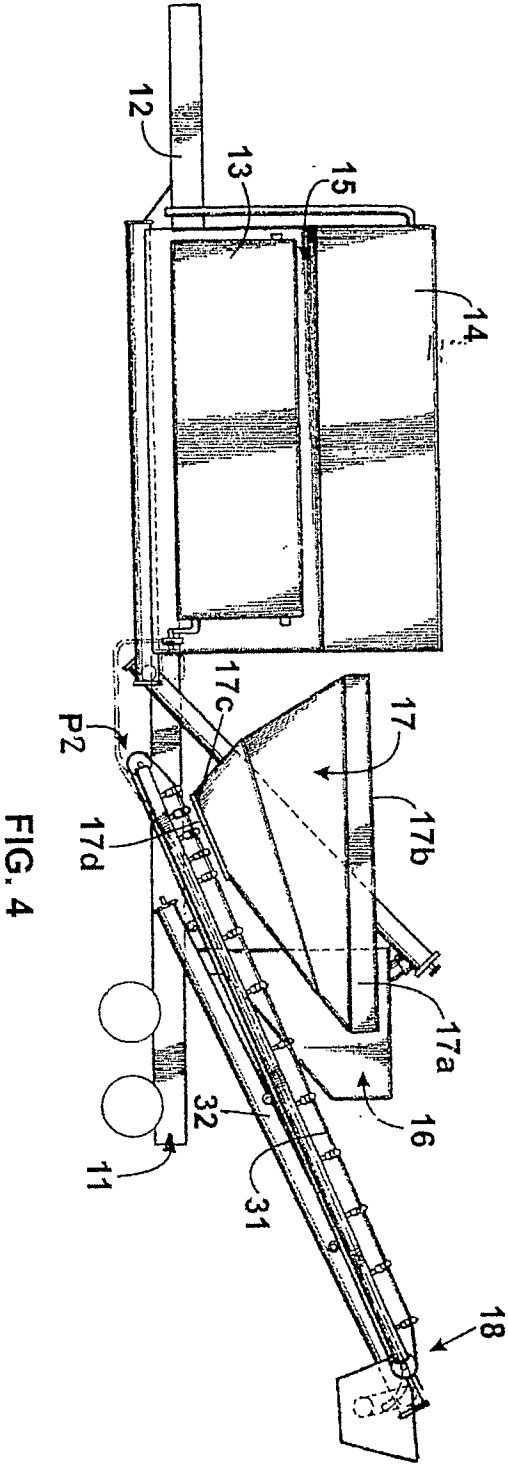


FIG. 3



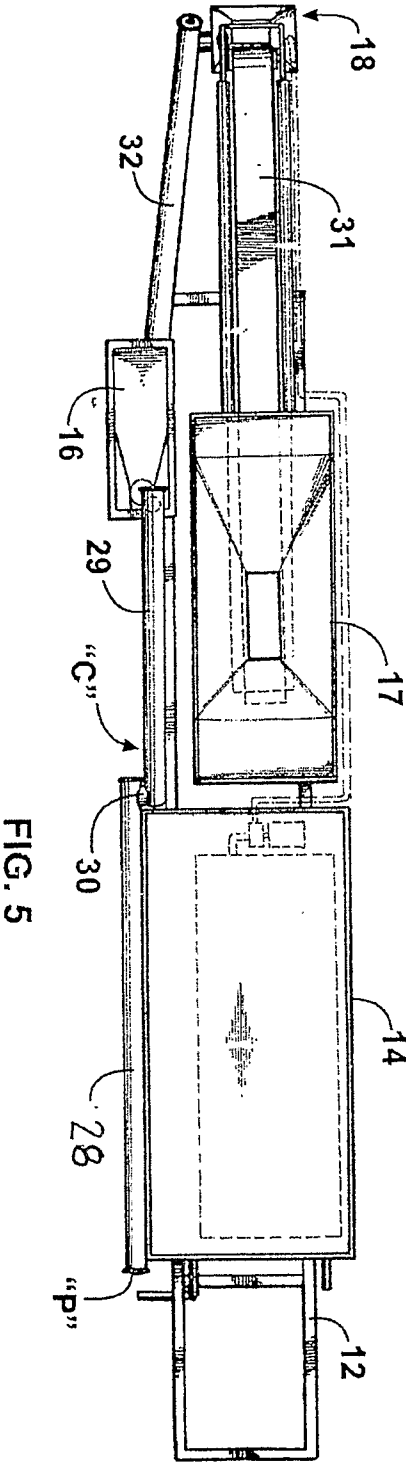
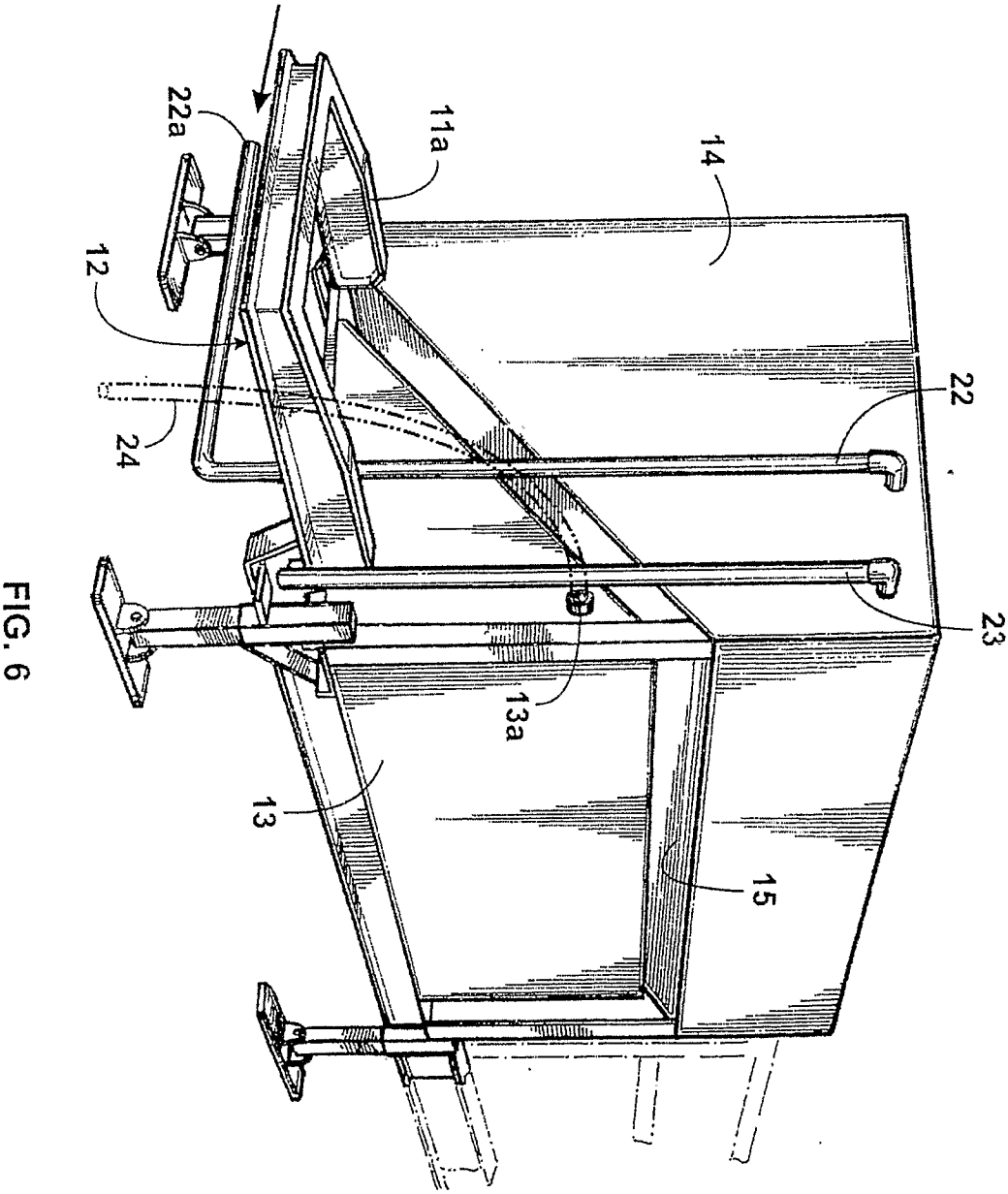


FIG. 5



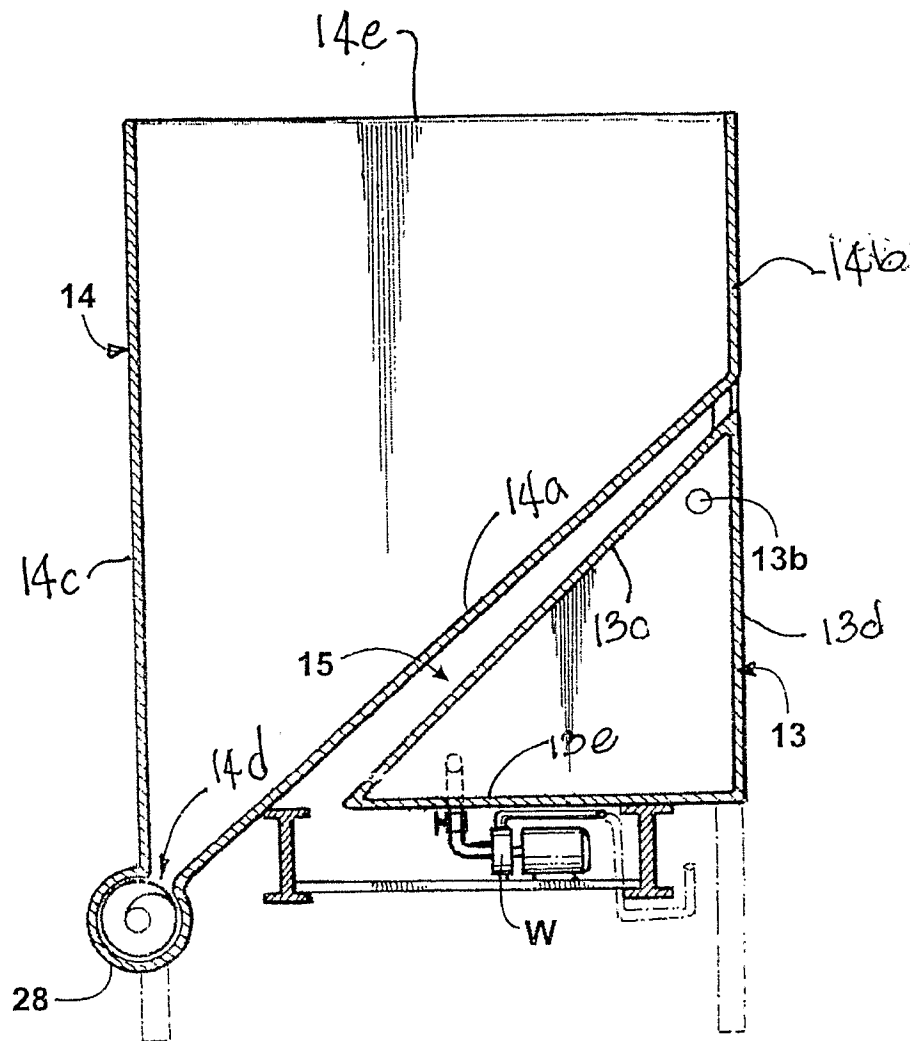


FIG. 7

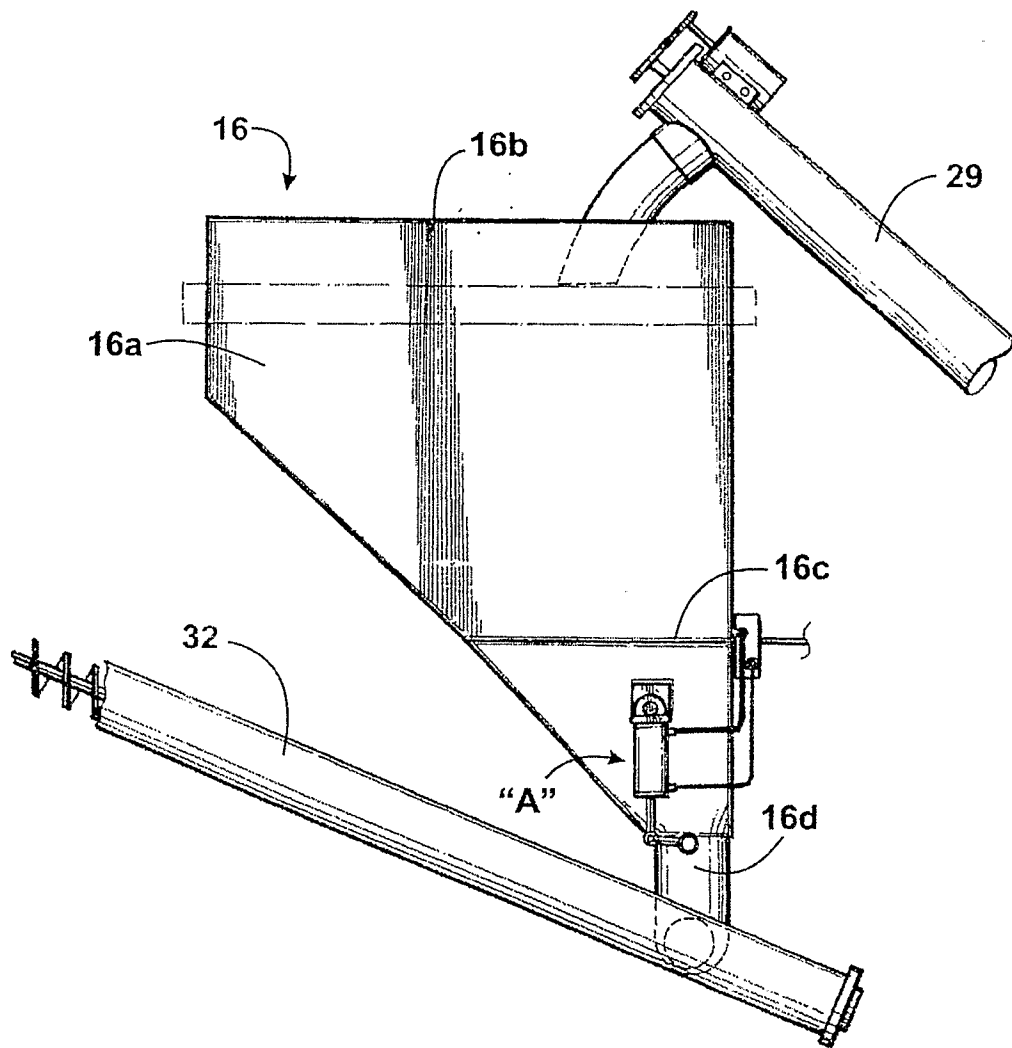


FIG. 8

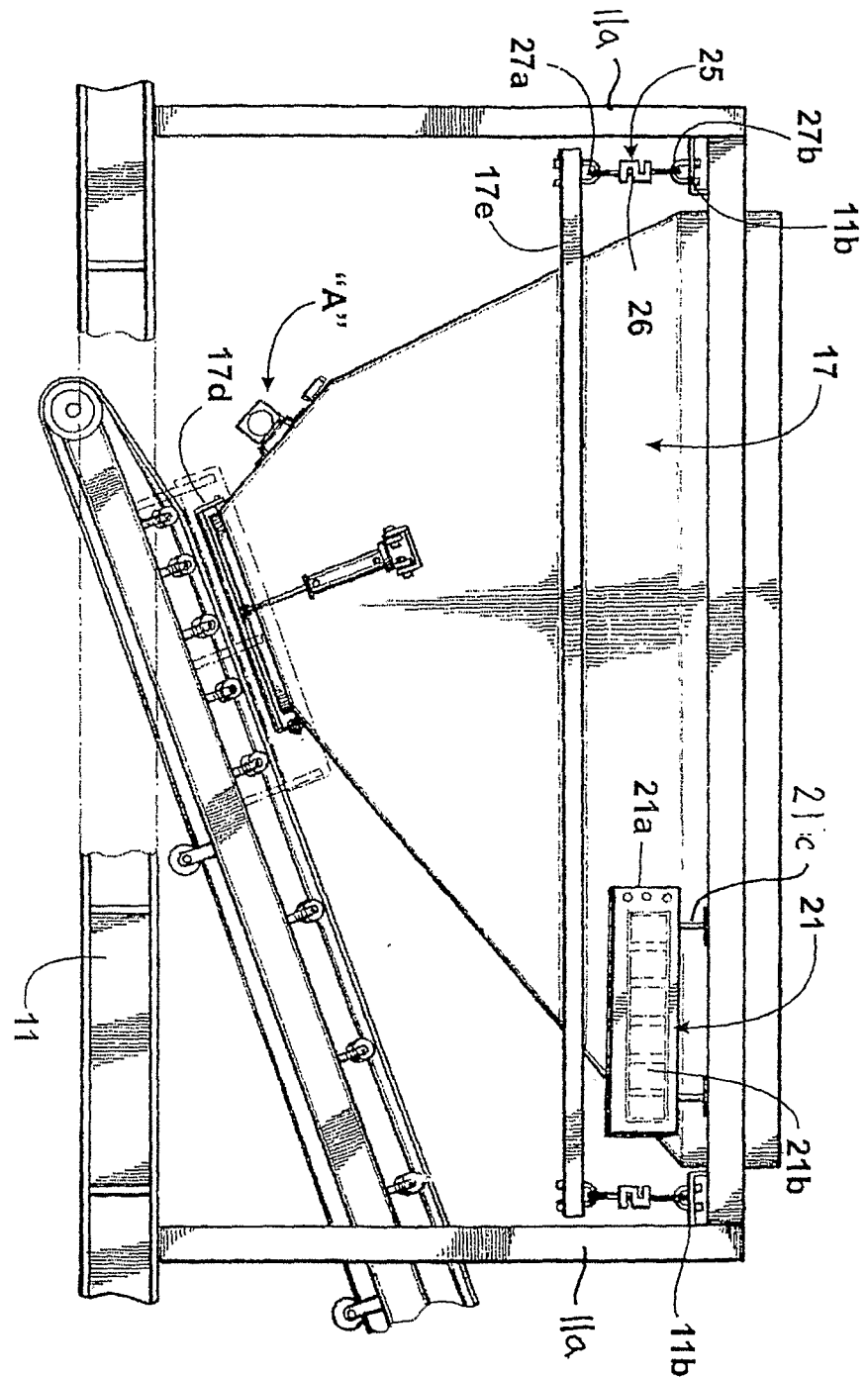


FIG. 9

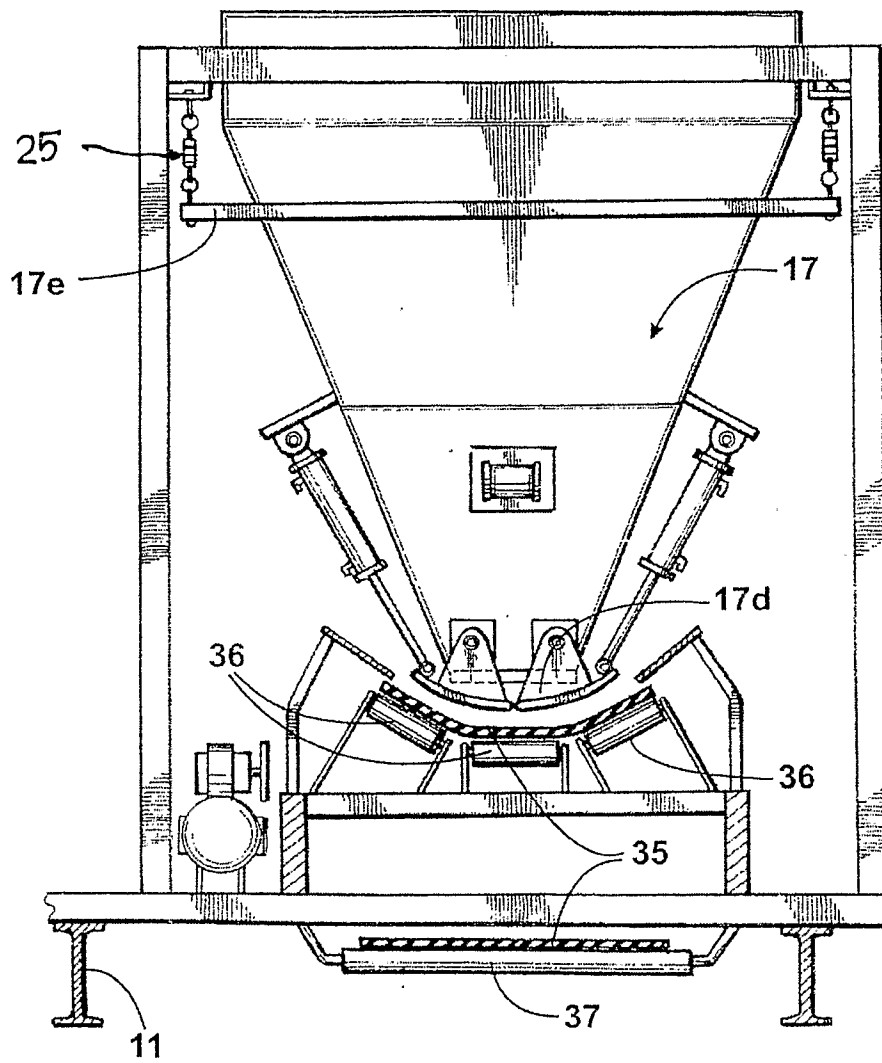


FIG. 10

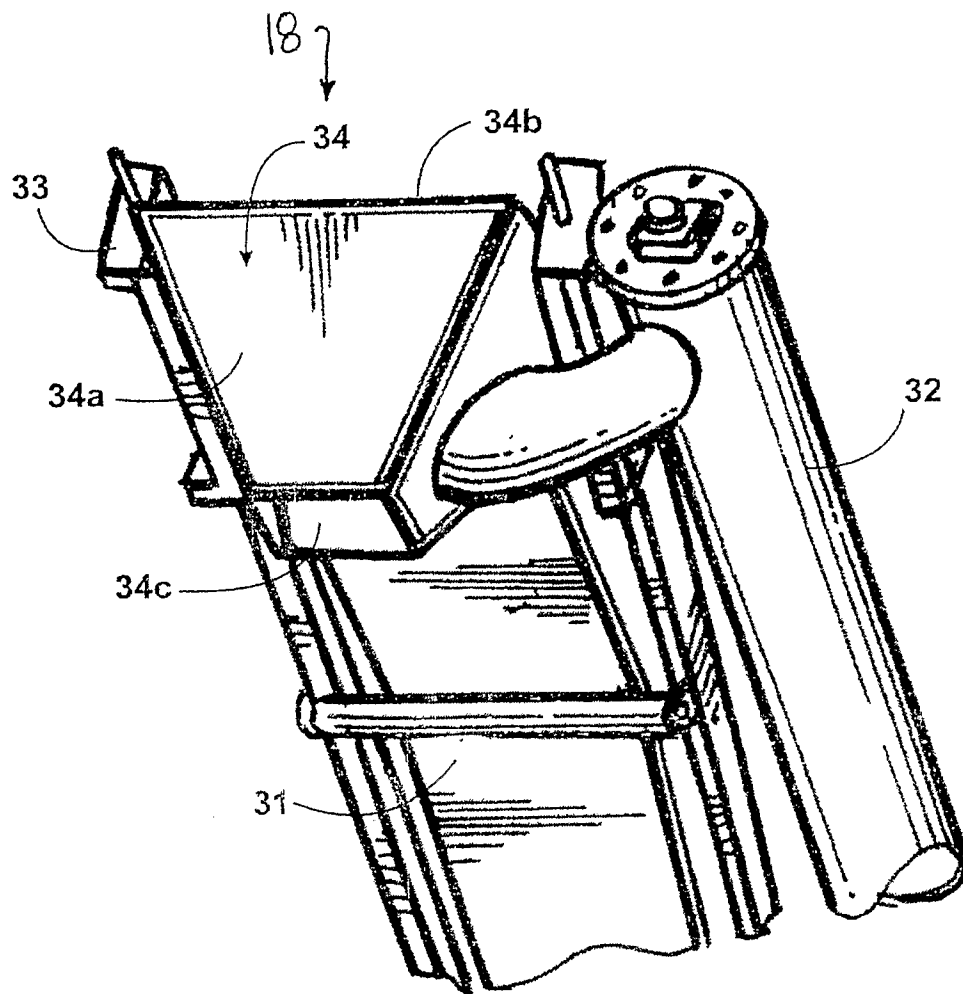


FIG. 11

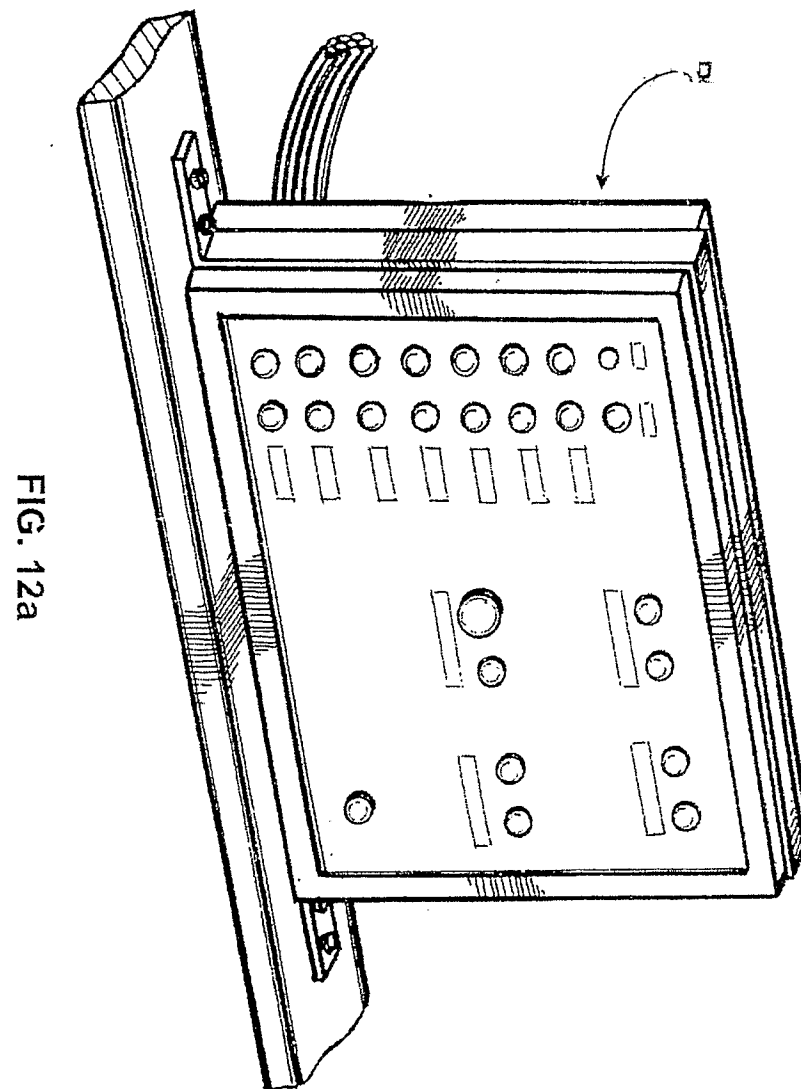
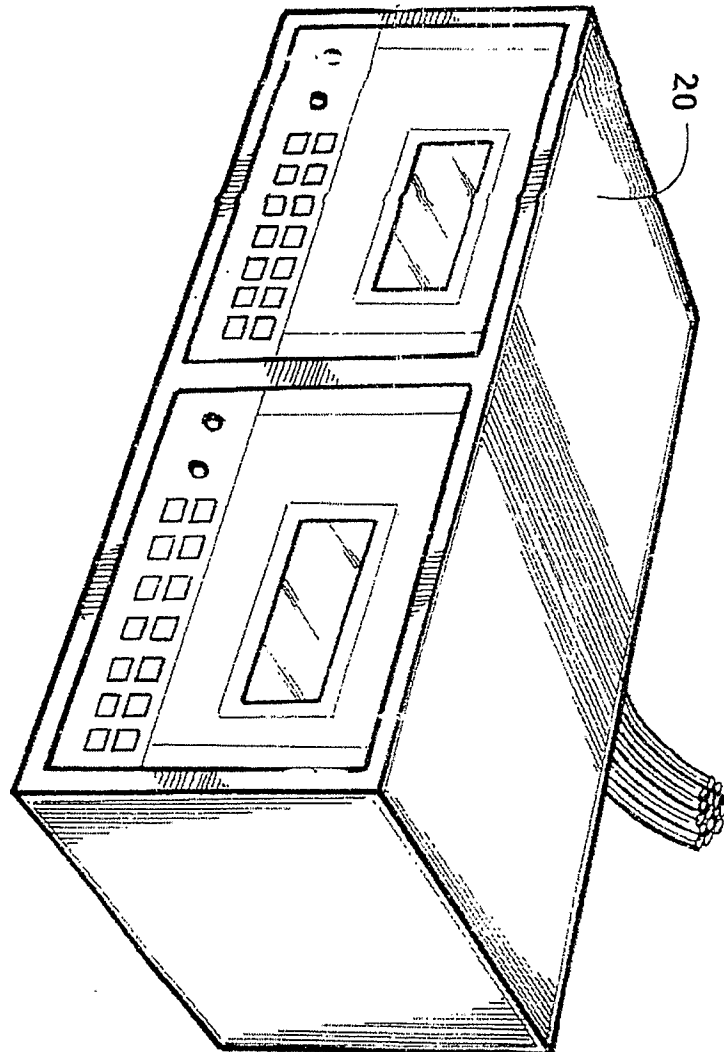


FIG. 12b



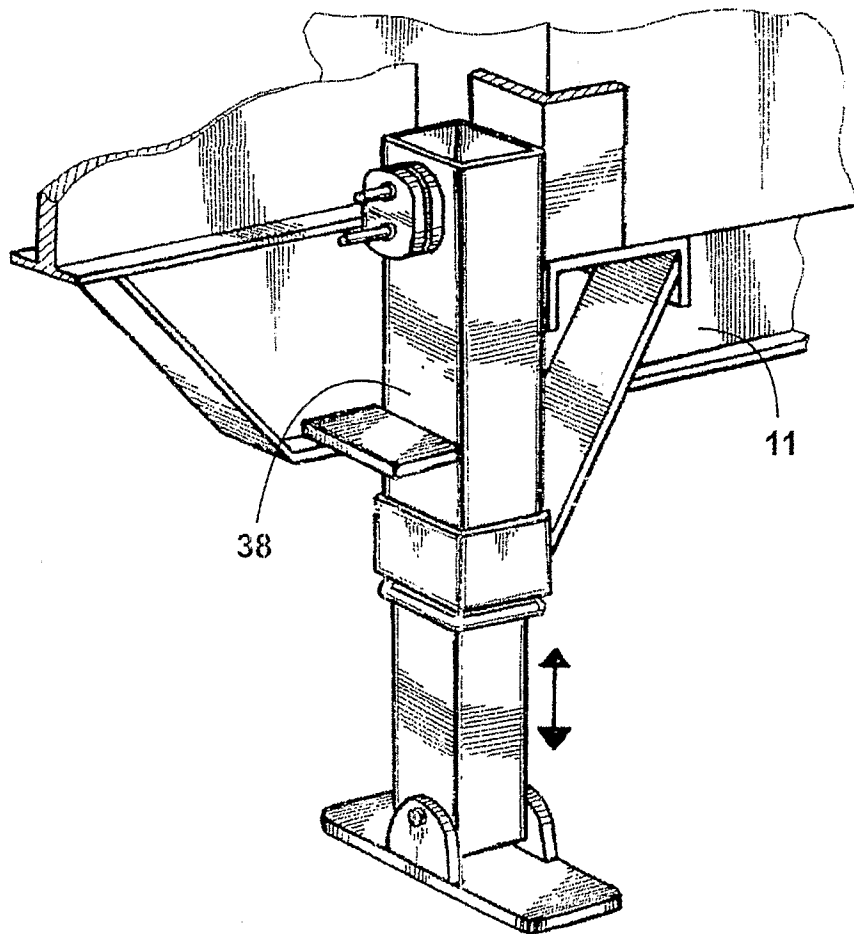


FIG. 13