Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2636568 C 2012/06/19

(11)(21) 2 636 568

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 2008/07/02

(41) Mise à la disp. pub./Open to Public Insp.: 2010/01/02

(45) Date de délivrance/Issue Date: 2012/06/19

(51) Cl.Int./Int.Cl. *C08L 95/00* (2006.01),
C08J 3/20 (2006.01), *C08K 3/36* (2006.01),
E01C 7/18 (2006.01)

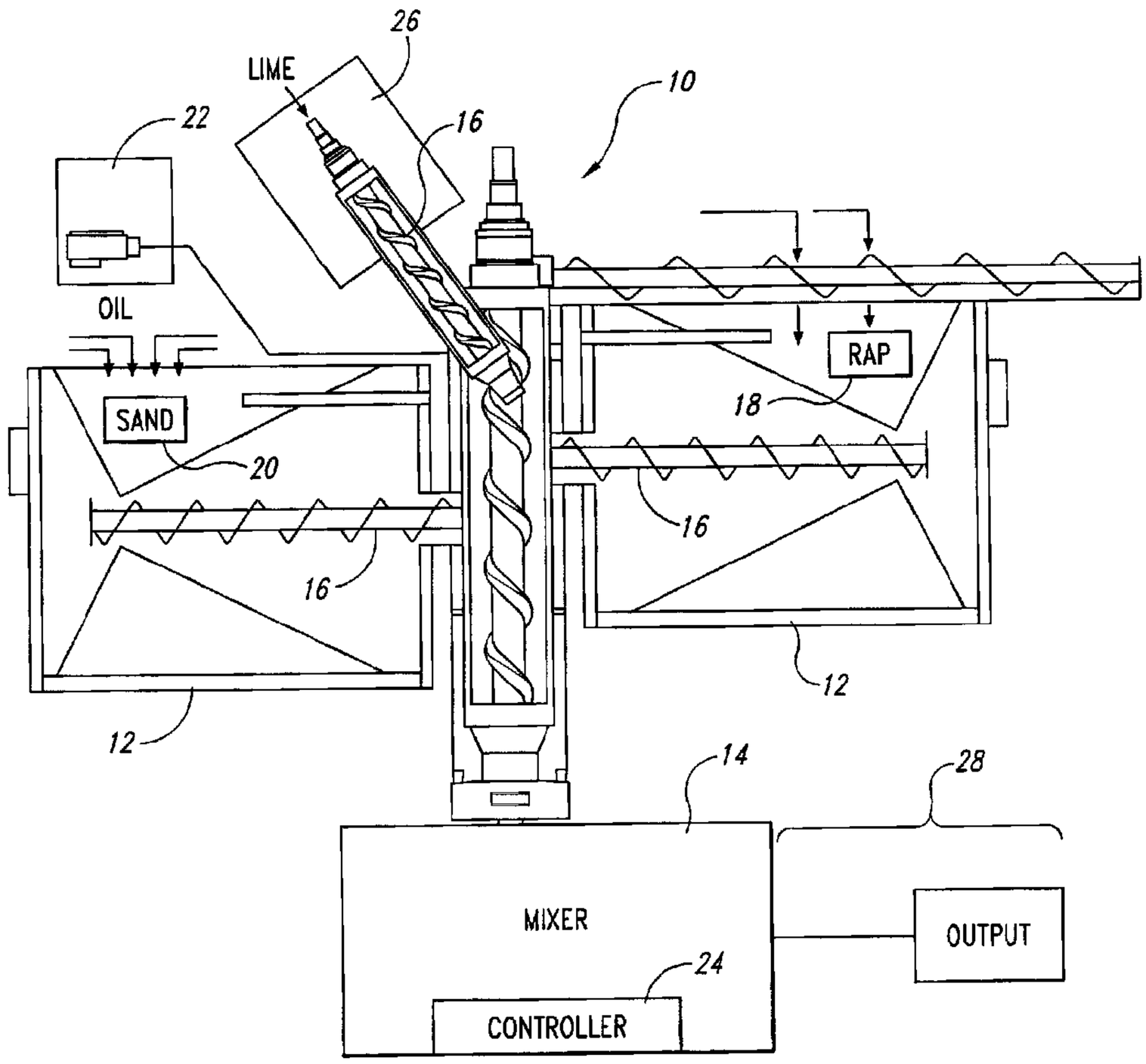
(72) Inventeur/Inventor:
ACKERMAN, JOHN T., US

(73) Propriétaire/Owner:
ACKERMAN, JOHN T., US

(74) Agent: OYEN WIGGS GREEN & MUTALA LLP

(54) Titre : APPAREILLAGE DE PRODUCTION D'ASPHALTE A FROID, PROCEDE DE FABRICATION D'ASPHALTE A FROID ET PRODUIT-PROCEDE CONNEXE

(54) Title: APPARATUS FOR PRODUCING COLD ASPHALT, METHOD OF MANUFACTURING COLD ASPHALT, AND PRODUCT-BY-PROCESS FOR SAME



(57) Abrégé/Abstract:
Apparatus and a process for producing cold asphalt for road repair and construction that allows cold asphalt to be easily produced at or near the job site. The apparatus includes at least two hoppers for receiving granular and screened particulates, a live feed for

CA 2636568 C 2012/06/19

(11)(21) 2 636 568

(13) C

(57) Abrégé(suite)/Abstract(continued):
additive oil, and another for optional lime, conveyors in which to convey the granular and screened particulars, oil, and optional lime to a mixer. The mixer is controlled through a controller that is programmed to determine the correct proportion of RAP (recycled asphalt and a small amount of new asphalt), sand (silicates and/or sieved RAP), additive hydrocarbon oil, and optional lime (limestone powder). The apparatus may be permanently installed to create a cold asphalt manufacturing plant or placed on a trailer for use at a construction site. The invention further includes a method of manufacturing cold asphalt through the introduction of RAP, sand, and additive oil, and optional lime into the apparatus and a product-by-process in which cold asphalt mix is produced through the process claimed in the method. The end product is essentially non toxic with little to no VOCs and HAPs, has long shelf-life, and is produced, stored, used, and compacted at ambient temperature.

ABSTRACT

[0041] Apparatus and a process for producing cold asphalt for road repair and construction that allows cold asphalt to be easily produced at or near the job site. The apparatus includes at least two hoppers for receiving granular and screened particulates, a live feed for additive oil, and another for optional lime, conveyors in which to convey the granular and screened particulars, oil, and optional lime to a mixer. The mixer is controlled through a controller that is programmed to determine the correct proportion of RAP (recycled asphalt and a small amount of new asphalt), sand (silicates and/or sieved RAP), additive hydrocarbon oil, and optional lime (limestone powder). The apparatus may be permanently installed to create a cold asphalt manufacturing plant or placed on a trailer for use at a construction site. The invention further includes a method of manufacturing cold asphalt through the introduction of RAP, sand, and additive oil, and optional lime into the apparatus and a product-by-process in which cold asphalt mix is produced through the process claimed in the method. The end product is essentially non toxic with little to no VOCs and HAPs, has long shelf-life, and is produced, stored, used, and compacted at ambient temperature.

APPARATUS FOR PRODUCING COLD ASPHALT, METHOD OF MANUFACTURING COLD ASPHALT, AND PRODUCT-BY-PROCESS FOR SAME

TECHNICAL FIELD

[001] The present invention relates generally to machinery and a process that can more cost effectively and locally produce cold asphalt used for filling potholes and road repair and construction.

BACKGROUND OF THE INVENTION

[002] Cold asphalt has been used to repair roads, and particularly, cracks and potholes without the expense of hot asphalt repairs. A particular type of cold asphalt process is described in U.S. Patents to Kitagawa and all assigned to Hikarigiken Co., Ltd. of Kyoto, Japan. These patents are U.S. Patent 6,117,227 issued September 12, 2000 and entitled "Asphalt Paving Mix Formed of Recycled Asphalt Concrete and New Asphalt for Paving at Ambient Temperatures and a Process for Making the Same"; U.S. Patent 6,214,103 issued April 10, 2001 and entitled "Asphalt Paving Mix for Paving at Ambient Temperatures and a Process for Making the Same"; and U.S. 6,139,612 (Kitagawa and Yokokawa) issued on October 31, 2000 and entitled "Asphalt Paving Mix Formed of Recycled Asphalt Concrete for Paving at Ambient Temperatures and a Process for Making the Same" (collectively the "Kitagawa patents"). These patents disclose an asphalt mix and a process of making that combines crushed recycled asphalt at ambient temperature with an additive oil in which the resulting mixture has aggregate grains that have softened and swelled with the additive oil to amalgamate when the aggregate grains are compacted at ambient temperature. Further improvements included combining mostly recycled asphalt with new asphalt and sand along with the additive oil and, later the addition of lime. The resulting asphalt concrete mix achieves sufficient immediate strength after compacting at ambient temperature. Further, because the asphalt mix does not congeal easily, it is particularly suited for long-term storage.

[003] One of the benefits of using cold asphalt over hot asphalt is that hot asphalt typically gets hard in approximately two hours. Thus, timing of jobs relative to receiving the supply of hot asphalt is critical to the job success. Other major benefits of cold asphalt made using the patented mixture and process described above are: 1) that it uses a significant amount of recycled asphalt (*e.g.*, 60% or more) and 2) the additive oil having low vapor pressure and toxicity. Unlike traditional cold asphalt, the additive oil in the Kitigawa patents contain no kerosene, diesel fuel, naptha, jet fuel, or other similar materials which emit high amounts of VOCs (volatile organic compounds) or HAPs (hazardous air pollutants). Because there is little to no toxicity and smell, special handling/special handling equipment is unnecessary. Bags of the mix can be stored for long periods of time. Also, the actual use of the mix in road repair is at ambient temperature and avoids potential dangers of working with a very hot substance that can cause significant burns to workers that accidentally come into contact with it. Thus, using the cold asphalt of the above described patents has great environmental benefits and as well as employee safety benefits.

[004] Commercial success of this product has been strong. Fifty pound bags of the mixture are found on shelves under the U.S. COLD PATCH trademark at home improvement stores and primarily used by the homeowner or small contractor. However, significant supplies would be needed to be used as part of large scale road repair and general construction.

[005] At present, such cold asphalt is manufactured at large hot asphalt manufacturing plants by modifying existing production runs to meet the chemical composition of the desired cold asphalt mix. While limited productions can be made and captured in 50 lb bags for distribution and sale, larger construction projects have proven to be less optimal as the construction project needs to be located relatively close to the asphalt plant to make the transportation cost of the cold asphalt economically viable. Further, existing batches run at modified hot asphalt plants are expensive and inefficient.

SUMMARY OF THE INVENTION

[006] The present invention is directed to machinery that produces cold asphalt more efficiently, cost-effectively, and takes up less space relative to existing modified hot asphalt producers. Further, the present invention allows the user/owner to produce cold asphalt in

bulk, either at the job location, or at least in the city or municipality of the origin of the construction project, in order to make bulk product available for larger repairs and paving applications which are currently cost prohibitive.

[007] The machinery of the present invention includes at least two hoppers in which screened recycled asphalt, aggregate, and small amount of new asphalt ("RAP") and sand are loaded into respective hoppers and conveyed, such as through a screw drive, to a mixer in desired amounts. Additive oil is introduced and sent to the mixer. Optional lime is added to the mix through controlled intervals. Once the mixture reaches the desired consistency, the mixture is conveyed to a bagging assembly or to be loaded in its raw form to a particular application (*e.g.*, job site).

[008] A controller controls the amount and speed of the overall RAP, sand, additive oil, and optional lime. The desired composition is approximately 43-60% RAP, 35-45% sand, and the remainder in additive oil. According to one aspect of the invention, the desired composition includes 3-10% lime, thereby reducing the additive oil to 2% or less of the overall output mixture.

[009] The hoppers, mixer, and feeders for oil and optional lime can be made into a relatively compact size that may be used on a trailer at a job site or as a piece of municipal equipment installed where other type industrial equipment is kept and that can also accommodate truck loads of dumped raw RAP and sand.

[0010] These and other advantages will become more apparent upon review of the Drawings, the Detailed Description of the Invention, and the Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Like reference numerals are used to designate like parts throughout the several views of the drawings, wherein:

Fig. 1 is a schematic view of the apparatus of the present invention;

Fig. 2 is front view of a first embodiment of the apparatus;

Fig. 3 is a top plan view of the apparatus of the first embodiment;

Fig. 4 is a right side view of the apparatus of the first embodiment;

Fig. 5 is a schematic view of the lime feeder, conveyor, feeder, and load cell;

Fig. 6 is an end view of a feed screw used to convey materials to the mixer;

Fig. 7 is a front view of the feed screw of Fig. 6;

Fig. 8 is a front view of a second embodiment of the apparatus and loaded onto a trailer for mobility;

Fig. 9 is a top view of the apparatus of the second embodiment;

Fig. 10 is a left end view of the apparatus of the second embodiment;

Fig. 11 is a right end view of the apparatus of the second embodiment;

Fig. 12 is a section view of one hopper taken substantially along lines 12—12 of Fig. 9;

Fig. 13 is a section view of one hopper taken substantially along lines 13—13 of Fig. 9;

Fig. 14 is an end view of a lime bag frame of the apparatus of the second embodiment;

Fig. 15 is the opposite end view from Fig. 14 of a lime bag frame of the apparatus of the second embodiment;

Figs. 16-20 are detail views of hopper motion stops that may be used in the frame work of the machine of either embodiment; and

Figs. 21-32 are control screen shots to control speed, volume of mixture to the mixer, and to obtain the desired mixture characteristics during the mixing phase.

DETAILED DESCRIPTION OF THE INVENTION

[0012] RAP (aggregate) comes from recycled asphalt and mixed with up to typically 10% new asphalt and is screened so that the aggregate particles are fairly small (such as can pass through a number 3/8 - screen) and, in use, is loaded into the first hopper. RAP typically makes up to 43-60% or more of the overall cold asphalt mixture. Sand, broadly defined as silicates or RAP and/or aggregates that have run through a No. 4 sieve or a combination thereof, typically makes up to 35-45% of the overall cold asphalt mixture and, in use, is loaded into the second hopper. Hydrocarbon oil (petroleum distillates) having a low vapor pressure so as to be practically nonvolatile at ambient temperatures accounts for a relatively small percentage amount of the overall mixture, but allows for individual surfaces of aggregate grains to swell by absorbing the oil.

[0013] When limestone powder (crushed calcium carbonate --CaCo3—or other synthetic form such as dolomite) and generally referred to herein as “lime” is added in the approximately 3-

10% range, the need for the additive reduces to 2% or less of the overall mixture. The lime also is a preservative when the cold asphalt is bagged.

[0014] In use, the cold asphalt becomes very hard and durable when compacted, as opposed to evaporation or cooling that is required for hot asphalt construction projects.

[0015] Currently, the cold asphalt of the above-referenced Kitigawa patents were manufactured in large hot asphalt plants that required modification to run a batch of cold asphalt of the Kitigawa patents and the mixture as described herein. The present machinery will allow cold asphalt to be produced close to or at the construction site so that large scale repairs or paving applications may also be made, at near year-round temperatures (as hot asphalt will harden quickly upon cooling).

[0016] Referring to Figs. 1-3, the present invention is a machine 10 to produce cold asphalt and a method and product-by-process for same. Machine 10 includes at least two hoppers 12 of which contents are fed into a mixer 14 via conveyors 16, such as 9 inch feed screws as illustrated. In one hopper is RAP 18, which itself is comprised of up to 90% recycled asphalt, aggregate, and a small amount of new asphalt (approximately 10% or less), makes up approximately 40-50% of the overall output cold asphalt mixture. The other hopper is fed sand 20. Because sand is defined broadly that can include fine RAP that has passed through a No. 4 sieve, the overall mixture can comprise in excess of 90% recycled asphalt. Additive oil 22 is pumped into the mixer 14. The mixer is controlled by controller 24, which will be discussed in further detail below.

[0017] Optional lime 26 may be fed into the mixer 14. The controller 24 is programmed to control the mix ratios, quantity, and time for mixing that can include the processes defined herein and in the Kitigawa patents. When the desired resulting mixture (cold asphalt) is then moved or conveyed through an outlet 28 of the mixer for immediate use, bagging for distribution and sale (such as in 50 lb bags that can be sold to the retail stores), or for bulk application, or for long term storage.

[0018] A first embodiment of the present invention is disclosed in Figs. 2-7 in which the machine 10 includes oppositely-situated hoppers 12 with feed screw conveyors conveying each hopper's respective load to the mixer 14 that is roughly centrally-positioned between

the two hoppers. The mixer may include a screw mechanism 21 (such as a 20 inch large screw mechanism illustrated in Figs. 6 and 7) for turning and mixing the received RAP and sand. The controller 24 controls the amount, speed, and time of the mixing before the mixture is conveyed through the outlet 28. Additive hydrocarbon oil 22 is pumped into the mixer via an oil feed line 23 and an oil pump 25 the rate of which is controlled by the controller. Lime (limestone powder) 26 is fed into the mixer by its own conveyor 27 (for example, through a 5 inch feed screw as illustrated in Fig. 5 and again at a rate and amount controlled by the controller).

[0019] The machine of the first embodiment may be installed at a job site or inside a warehouse facility (such as one operated by a municipality). The overall frame 30 supports the hoppers, conveyors, controller, mixer, and may contain traditional safety and operational features, such as a ladder 32, as shown.

[0020] Load cells 34 detect the load deflection and send a signal to the controller 24 in which to measure overall weight of the load from the hoppers. The controller then uses the load cell signal to determine speed of the conveyed load (RAP or sand) to get the correct composition percentage into the mixer. Once the hoppers 12 are connected to the load cells 34 and support frame 30, hopper motion stops 36 may be added, as illustrated in Figs. 16-20 to provide additional structural integrity when supporting heavy and full loaded hoppers.

[0021] A second embodiment of the machine 10' is illustrated in Figs. 8-15 in which the hoppers 12' are positioned adjacent each other to minimize the space footprint. Section views of the hopper ribs are illustrated in Figs. 12 and 13 in which a slightly smaller shape and angled shape may be used. In this embodiment, the machine is sufficiently compact that it can be placed on a trailer 38 for mobility. The conveyors 16' may still be 9 inch feed screws, such as illustrated.

[0022] The additive oil may be in a separate container on the ground beside the machine 10' sitting on the trailer. The optional lime 26 is illustrated with its own support structure 40 for the lime bag and may be physically located at the front of the trailer near the output.

[0023] The same hopper motion stops described in the first embodiment and illustrated in detail in Figs. 16-20 may be utilized in the second embodiment, as well.

[0024] Referring now to the controller 24 and to Figs. 21-32, the controller feeds from the RAP hopper, sand hopper, the additive oil, and lime to create the desired cold asphalt mixture per batch run. As discussed above, the desired cold asphalt mixture is made up of approximately 43-60% RAP (stone aggregate, recycled asphalt, new asphalt), 35-45% sand (which itself may be a form of fine RAP), and the rest additive hydrocarbon oil. In this manner, the overall mixture may contain over 90% recycled asphalt, which has great environmental benefits. According to another aspect, limestone powder (lime) is introduced to the mixture at a content percentage of approximately 3-10%, with the resulting additive oil percentage of overall content being only 2% or less. The controller determines the speed (timing) of each conveyor to the mixer, which essentially controls the percentage content as the various composition matters have significantly different weights. The controller also determines the run and discharge of the mixer per batch and sends out the appropriate instructions to the conveyors and gates at the output.

[0025] Once the desired mixture is attained, the controller signals to the mixer to send the mixture to the outlet (generally denoted as "28") in which the mixture is carried by a conveyor 42 out of the mixer through a gate or portal and to a desired location, such as into a bagging apparatus illustrated at 44 in Fig. 2.

[0026] One of ordinary skill in the art would know how to add the appropriate motors, sensors, and switches, check valves, etc. to effectuate the general electrical and mechanical functions and are, therefore, not further discussed.

[0027] In either embodiment, the production of cold asphalt can be greatly increased. For example, with large hoppers, motors, and mixers, the output of cold asphalt can be over 500 tons produced a day. At this rate, cold asphalt can be sufficiently produced for large road repairs and paving applications, as opposed to mere pot hole filling via 50 lb bags.

[0028] Further, the use of cold asphalt with its hydrocarbon oil has little to no VOCs and HAPs that are indigenous in other asphalt products. The stored product has low toxicity and poses little health hazard to employees and workers.

[0029] Benefits of the present invention include the production of an environmentally friendly cold asphalt at or near the construction or repair site. Large hot asphalt plants no longer need

to be modified for cold asphalt batch runs. Because cold asphalt inherently made using the process described above and in the Kitigawa patents does not harden by cooling temperatures (but does under compaction), it can be stored longer and used year long (as opposed to putting all road projects on hold except for the summer). The present invention allows users to manufacture the cold asphalt at the job site (particularly in the mobile version of the invention) or even during the winter if the machine is installed inside.

CLAIMS

What is claimed is:

[001] 1. Apparatus used to manufacture single mixed cold asphalt, without emulsion, the apparatus comprising:

at least two hoppers being of a size and shape in which aggregate particulate matter is gravity fed into one hopper and substantially granular matter is gravity fed into the other hopper;

conveyors in which to convey any matter from the two hoppers to a mixer;

said mixer being of a size and shape to mix aggregate and granular matter;

an additive oil supply and pump system that is capable of pumping the additive oil to the mixer at a desired time, speed, and in a desired amount;

an outlet to direct any resulting mixture outside the mixer; and

a controller that controls input to the mixer, mixing activities of the mixer, and output from the mixer.

[002] 2. The apparatus of claim 1 further comprising a lime feed inlet that is connected to the mixer.

[003] 3. The apparatus of claim 1 wherein the conveyor is a feed screw.

[004] 4. The apparatus of claim 1 wherein the outlet further comprises a gate and conveyor.

[005] 5. The apparatus of claim 1 wherein the machine is of a size and shape to be substantially placed on a trailer.

[006] 6. A method of manufacturing single mixed cold asphalt, without emulsion, the method comprising:

providing apparatus having at least two hoppers capable of conveying matter to a mixer, an additive oil supply and pump system capable of delivering the additive oil to the mixer, and outlet from the mixer, and a controller that controls input to, mixing in, and output of the mixer;

introducing screened and unemulsified RAP into one hopper in the range of approximately 43-60% of the overall output mixture;

introducing sand into the other hopper in the range of approximately 35-45 % of the overall output mixture;

conveying the RAP and sand into the mixer at a rate determined by the controller;

introducing additive oil into the oil supply and pump system in range of approximately of approximately 5-25% of the overall output mixture;

controlling the amount of matter conveyed to the mixer and the speed and length of mixing until a desired mixture is attained;

conveying the resulting single mixed mixture to the outlet.

7. The method of claim 6 wherein the screened RAP is screened through a 3/8 inch minus screen.

[007] 8. The method of claim 6 further comprising the introducing of a lime feed and conveying lime in a range of approximately 3-10% of the overall output mixture and reducing the amount of the additive oil to 2% or less of the overall output mixture.

[008] 9. The method of claim 6 wherein the RAP comprises a mixture of approximately 40-50% recycled asphalt as measured by the overall output mixture and new asphalt in the range of 3-10% of the overall output mixture.

[009] 10. A chemical composition for cold asphalt mix comprising:

screened RAP of approximately 43 to 60% of an overall mixture content ratio;

sand of approximately 35 to 45% of an overall mixture content ratio; and

additive oil of approximately 5 to 25% of an overall mixture content ratio.

11. The chemical composition of claim 10 further comprising lime of quantity in an overall mixture content ratio of approximately 3-10% and in which the additive oil is reduced to an overall mixture content ratio of approximately 2% or less.

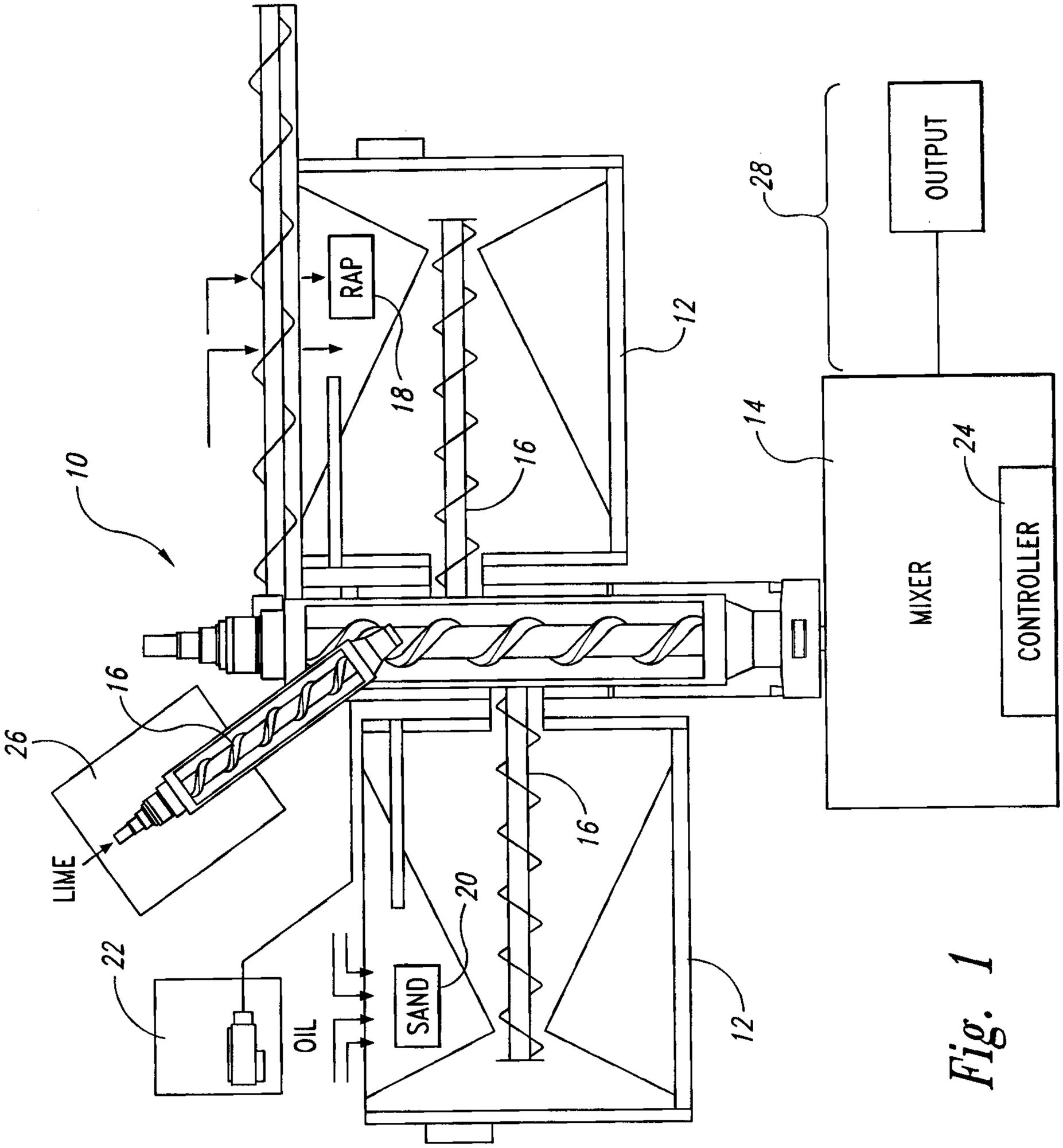

10
RAP
18
12
16
28
OUTPUT
14
24
MIXER
CONTROLLER
16
26
LIME
22
OIL
SAND
20
16
12

Fig. 1

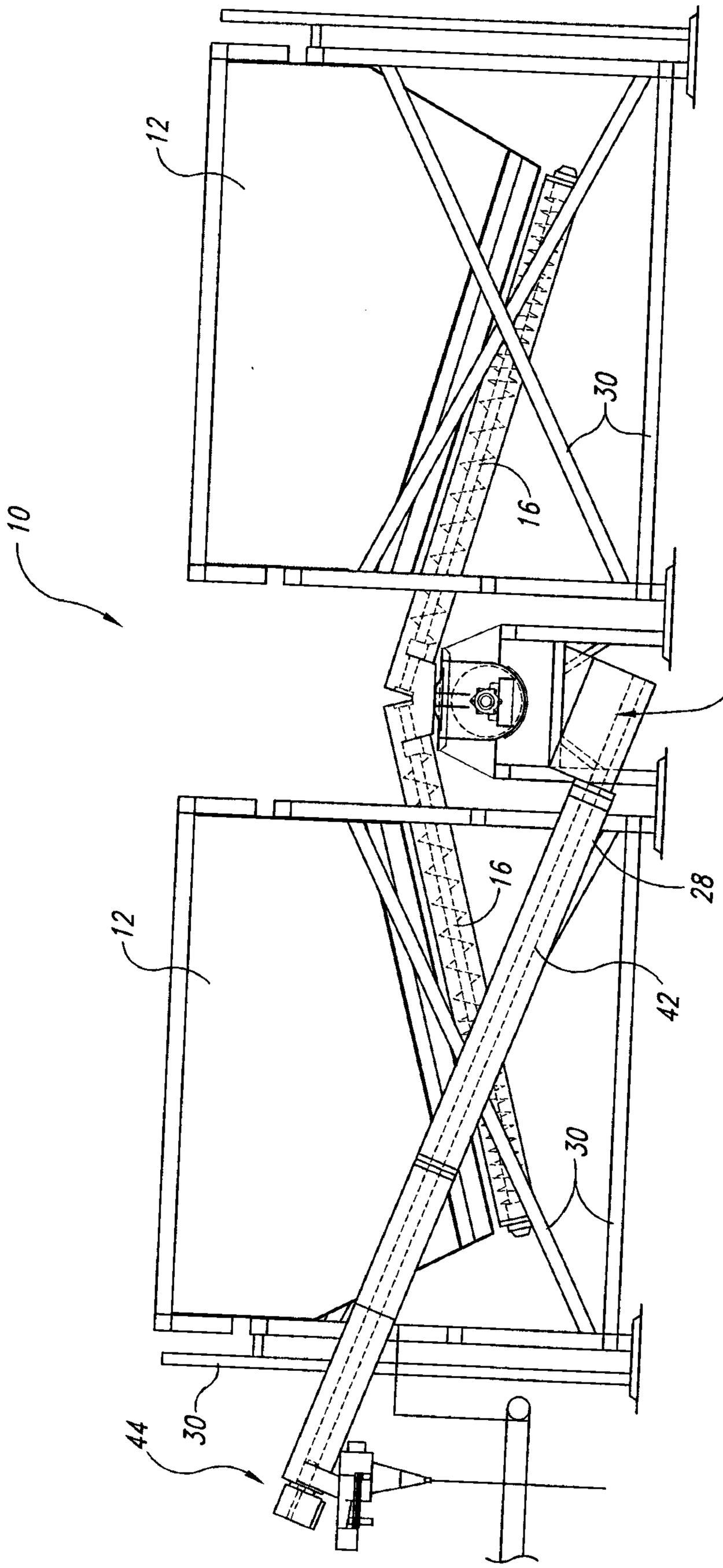


Fig. 2

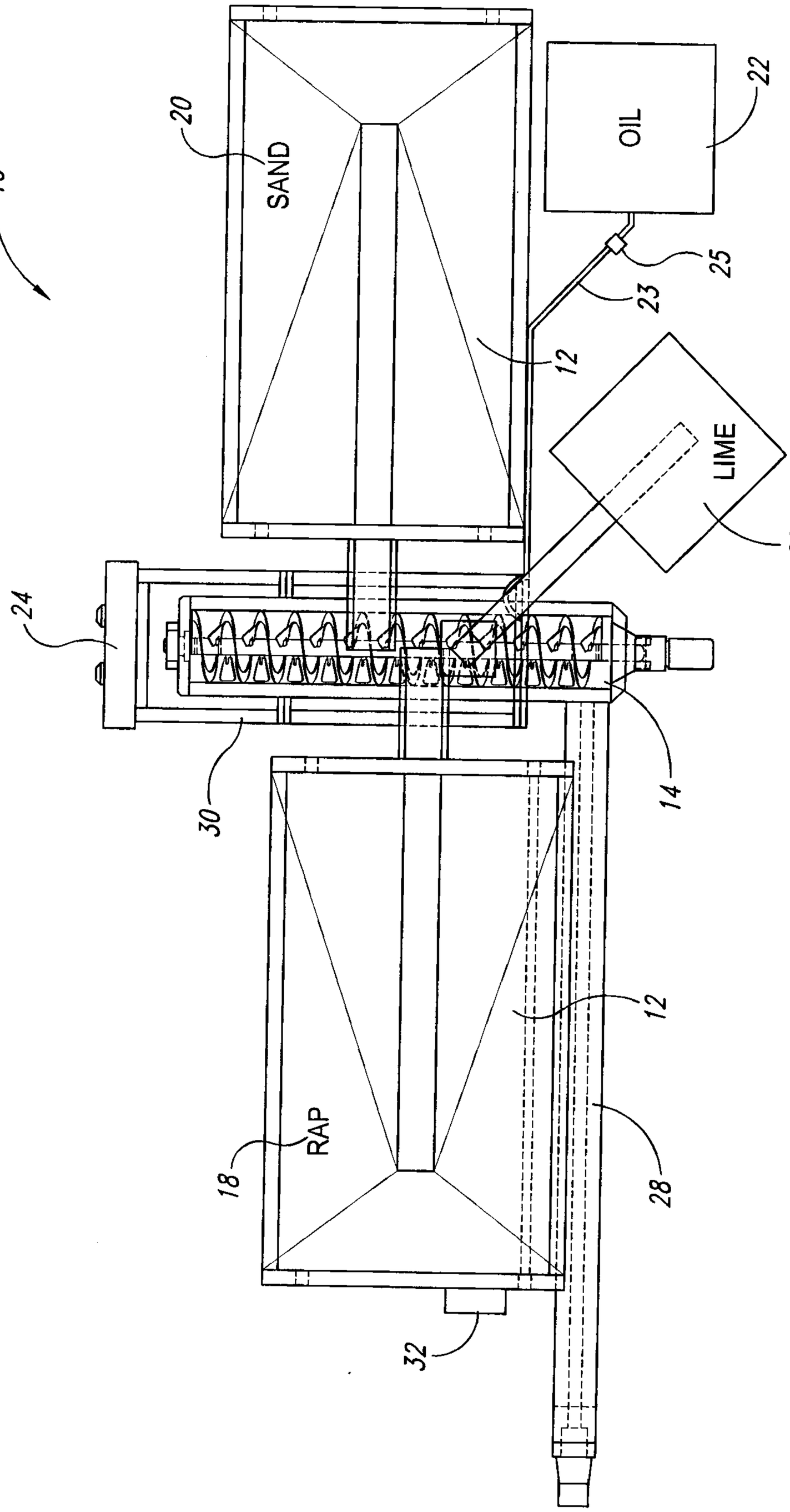


Fig. 3

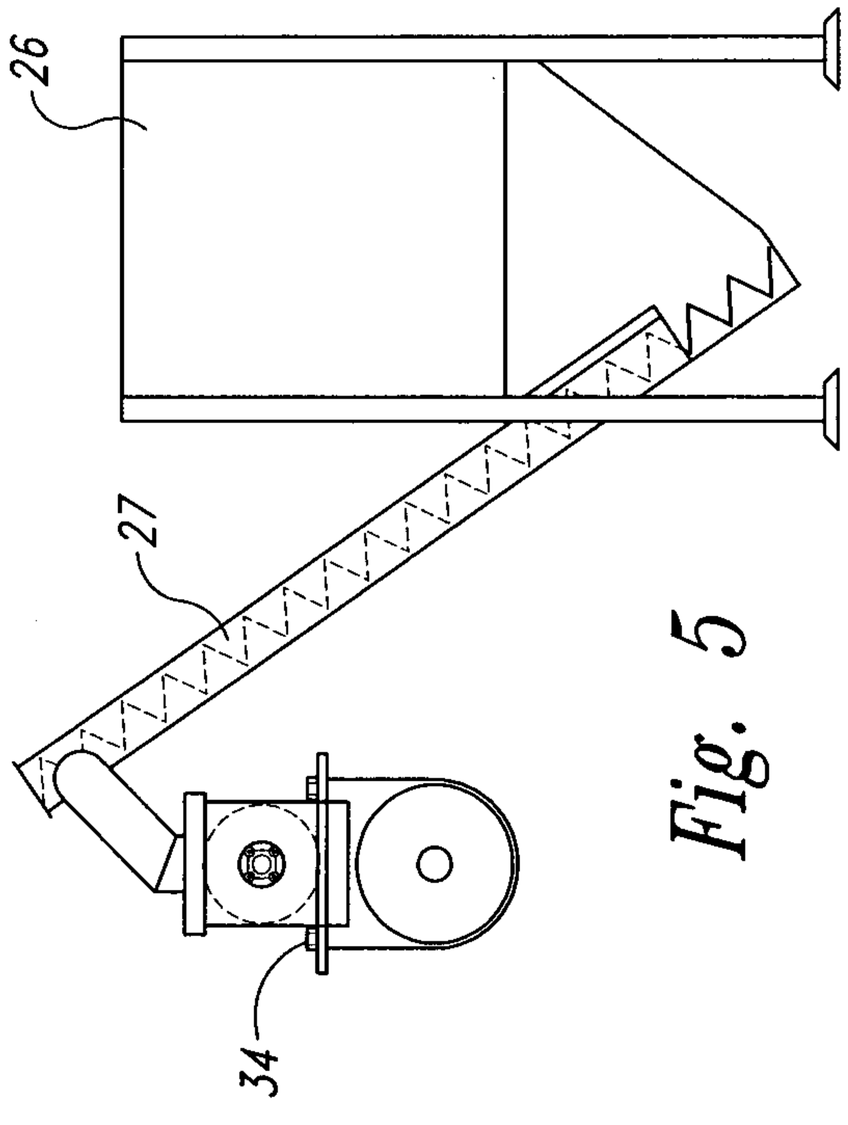


Fig. 5

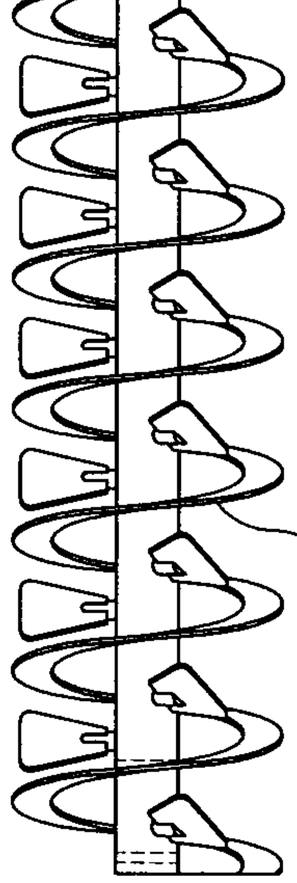


Fig. 7

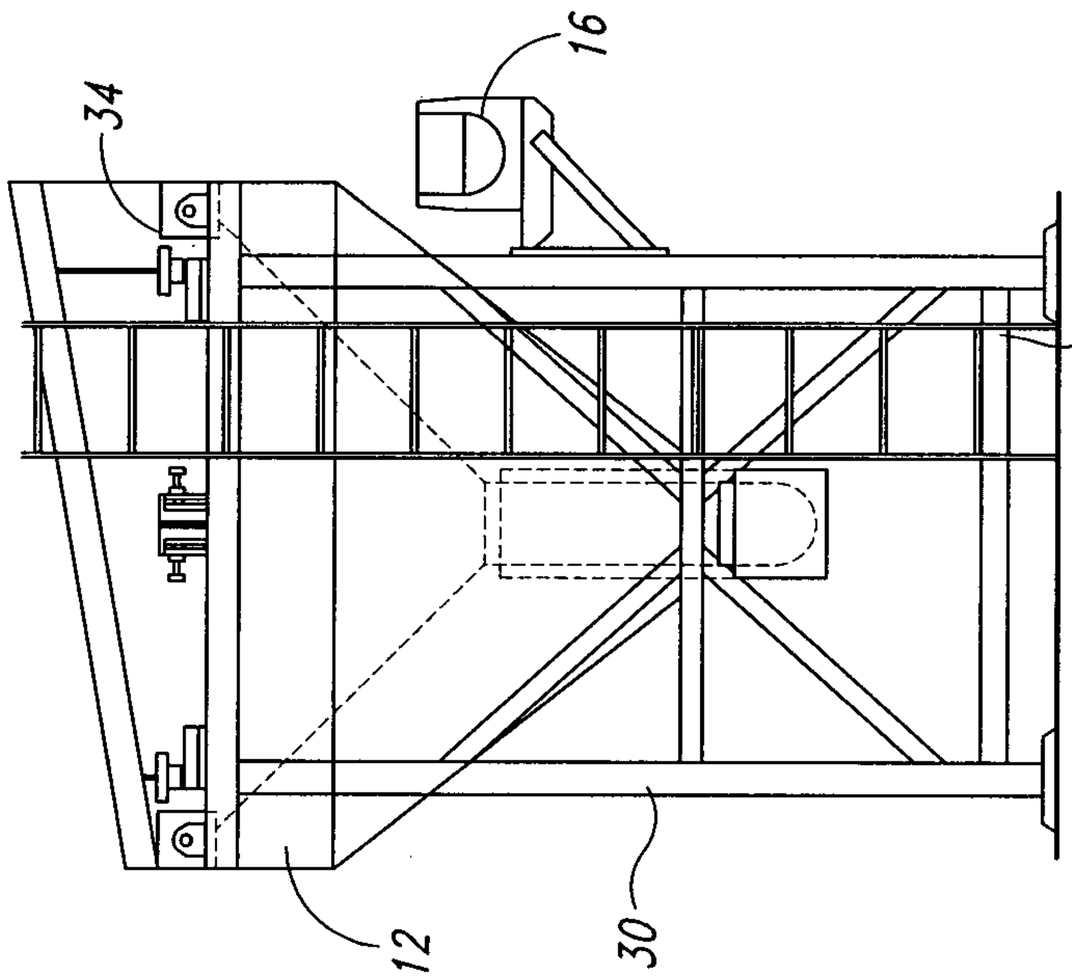


Fig. 4

Fig. 6

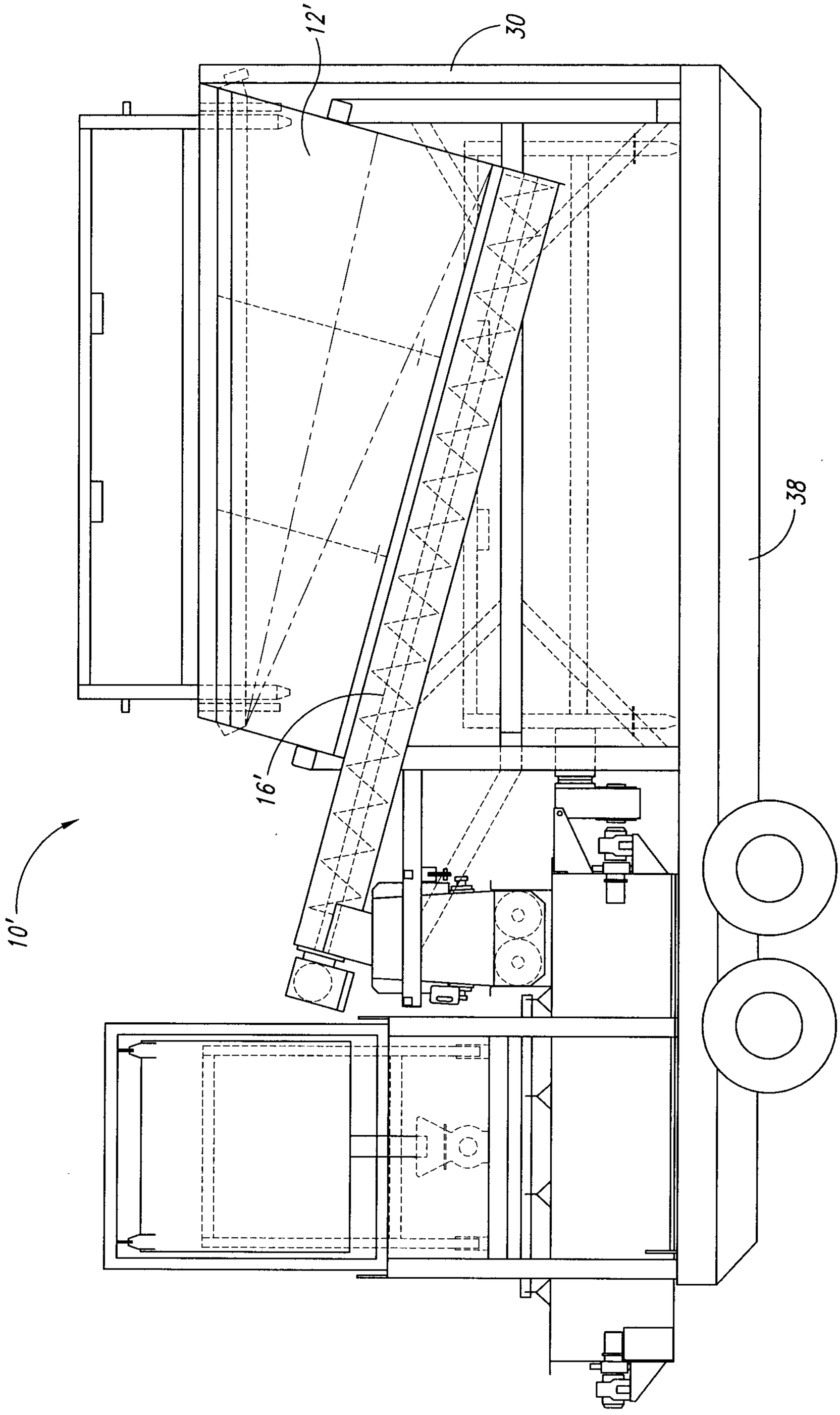


Fig. 8

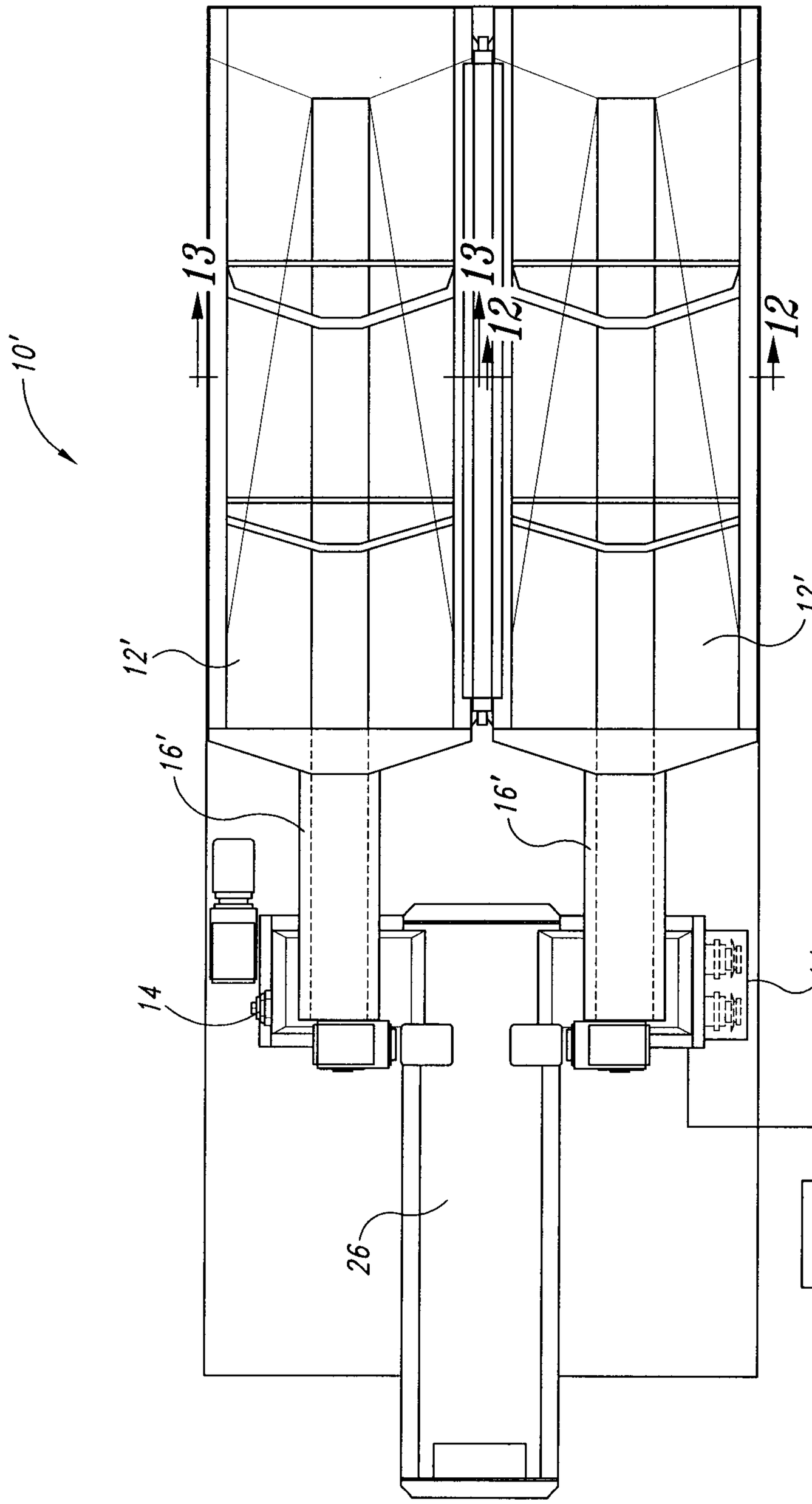


Fig. 9

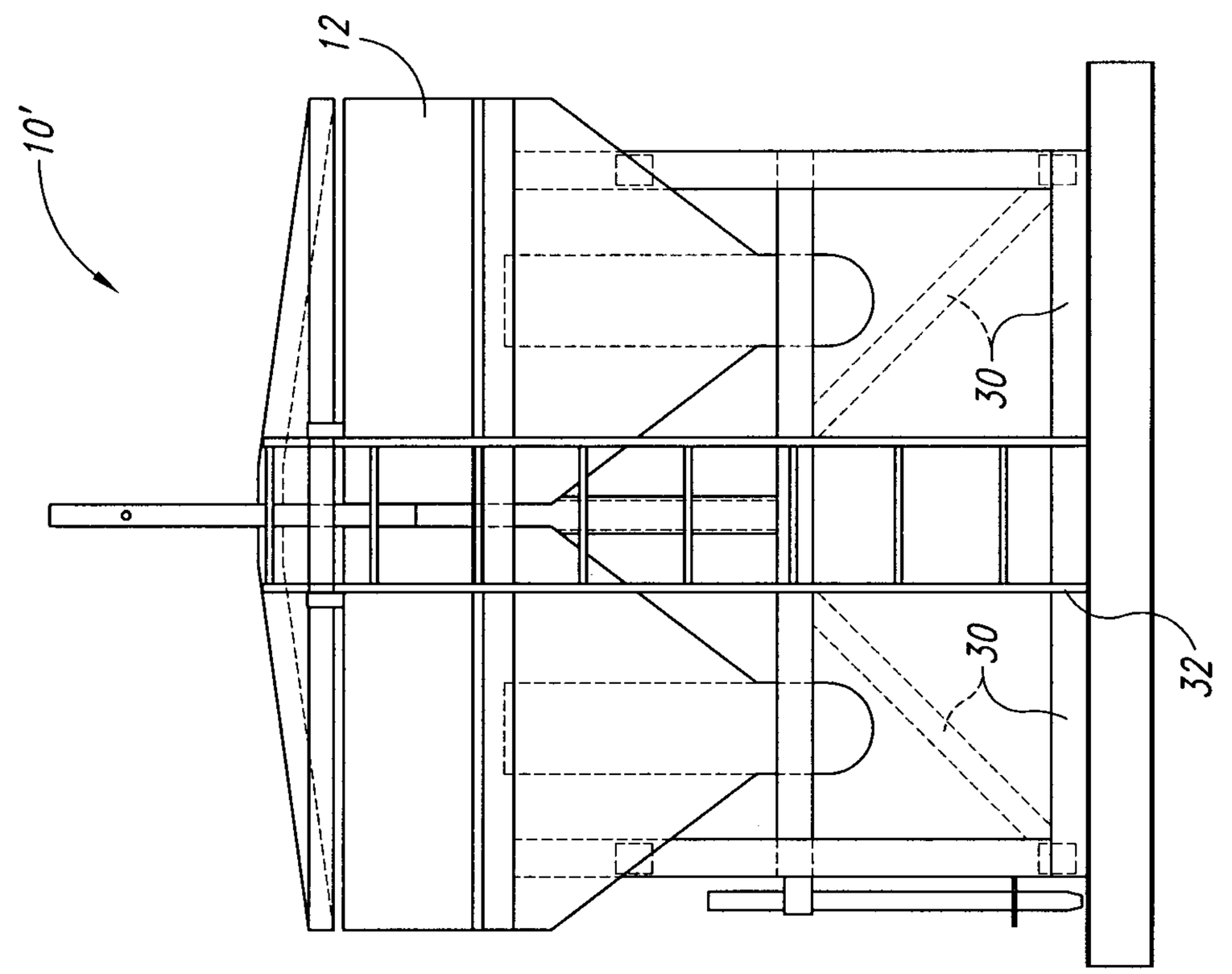


Fig. 11

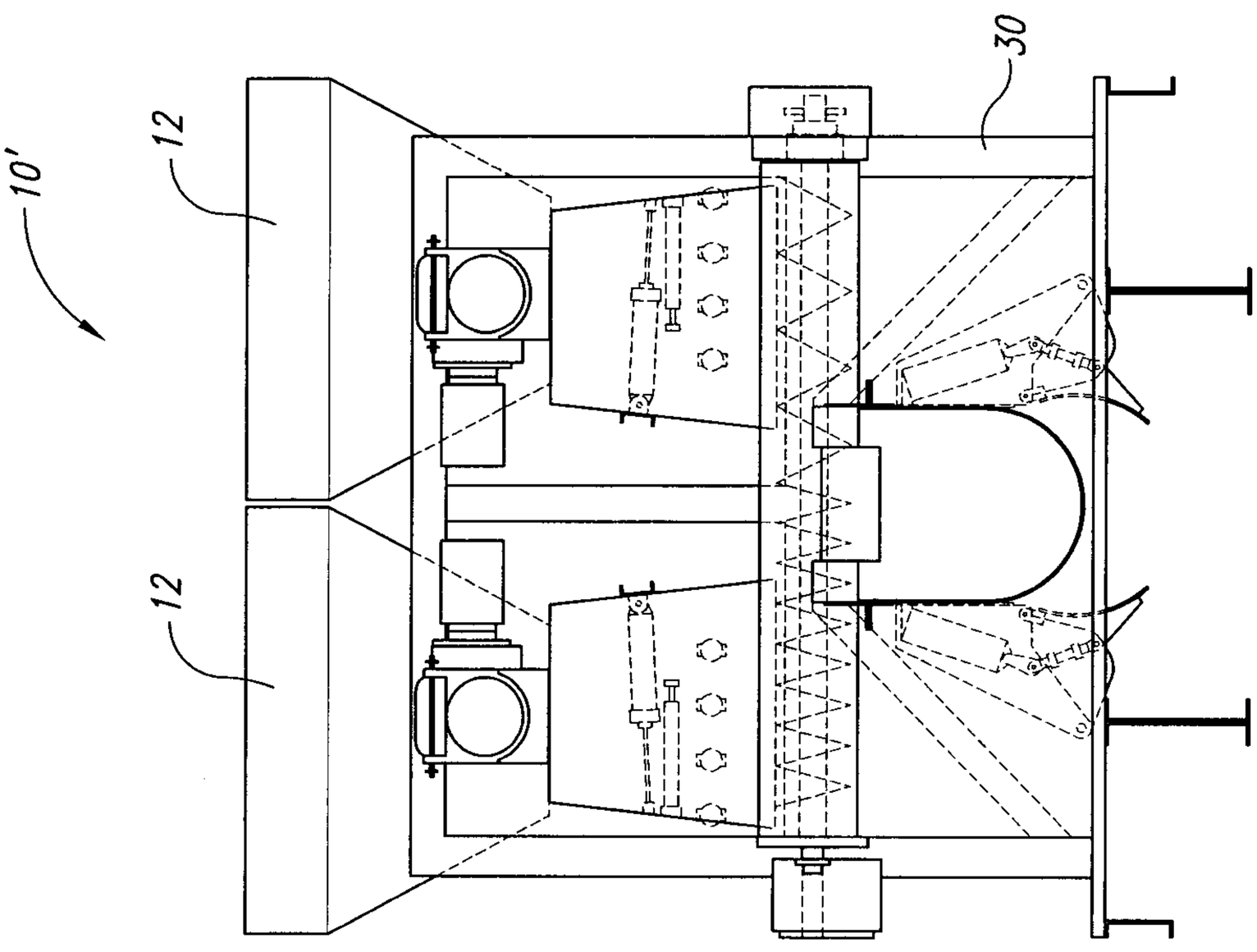


Fig. 10

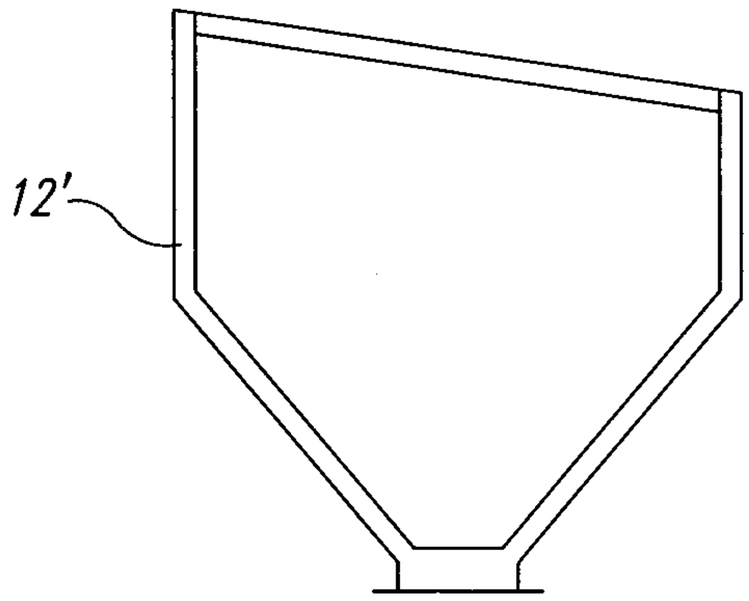


Fig. 12

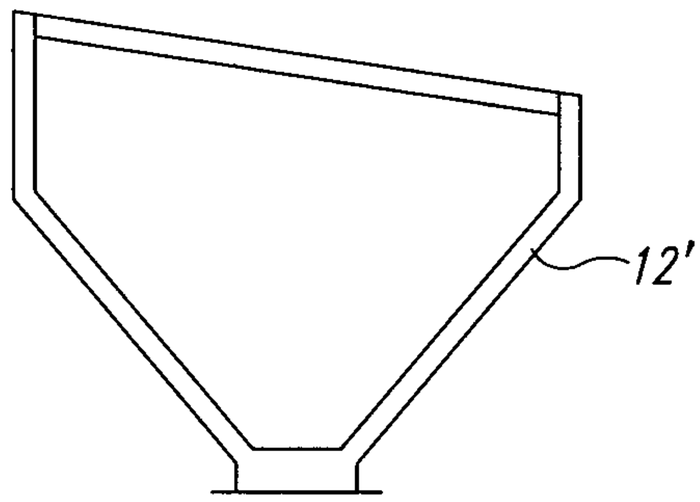


Fig. 13

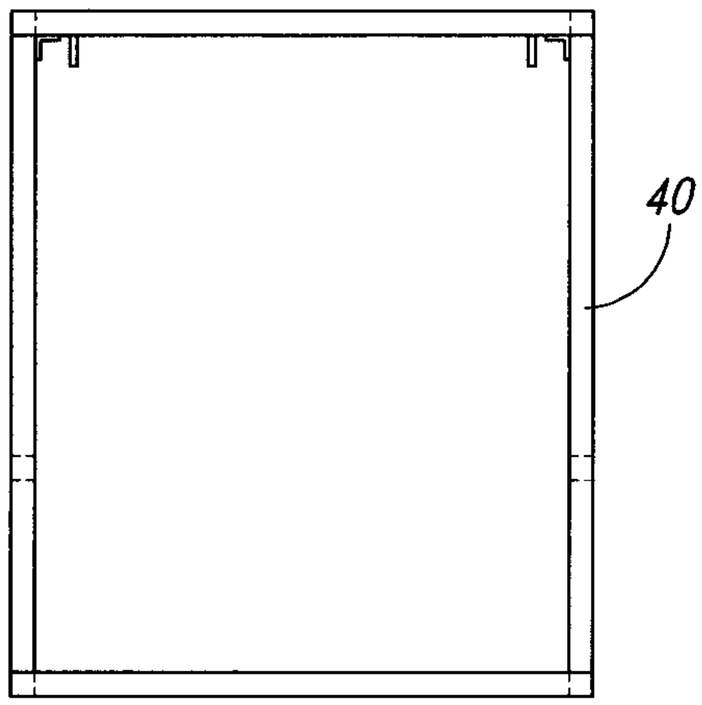


Fig. 14

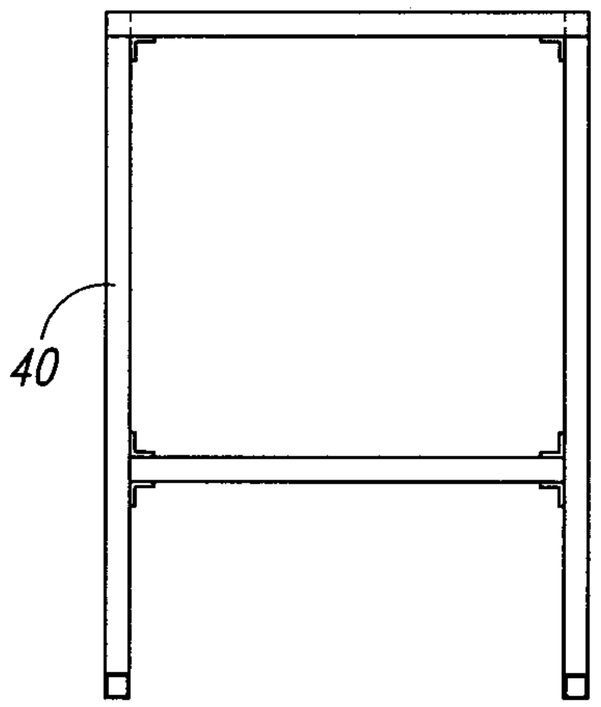


Fig. 15

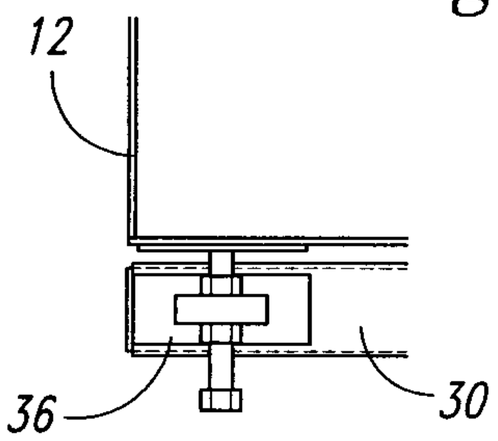


Fig. 16

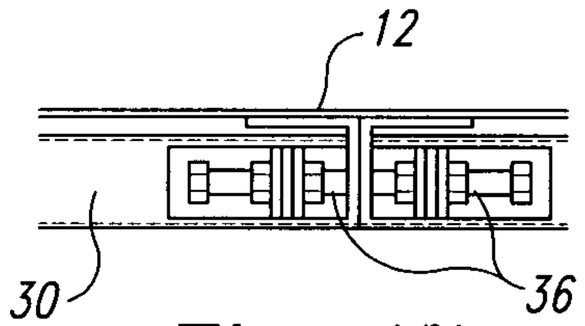


Fig. 17

Fig. 18

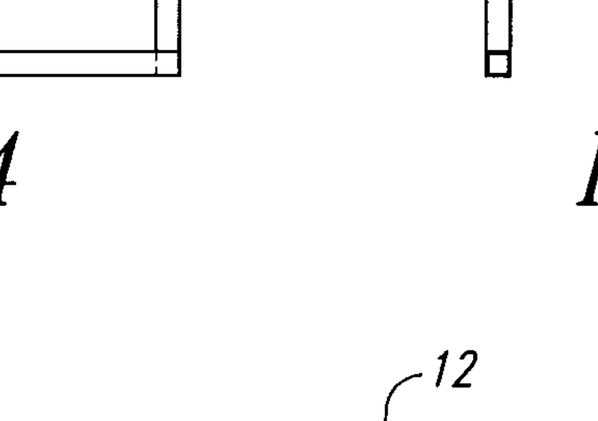


Fig. 19

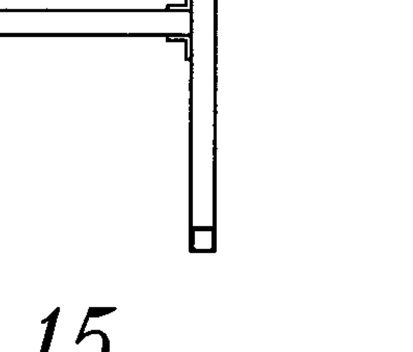


Fig. 20

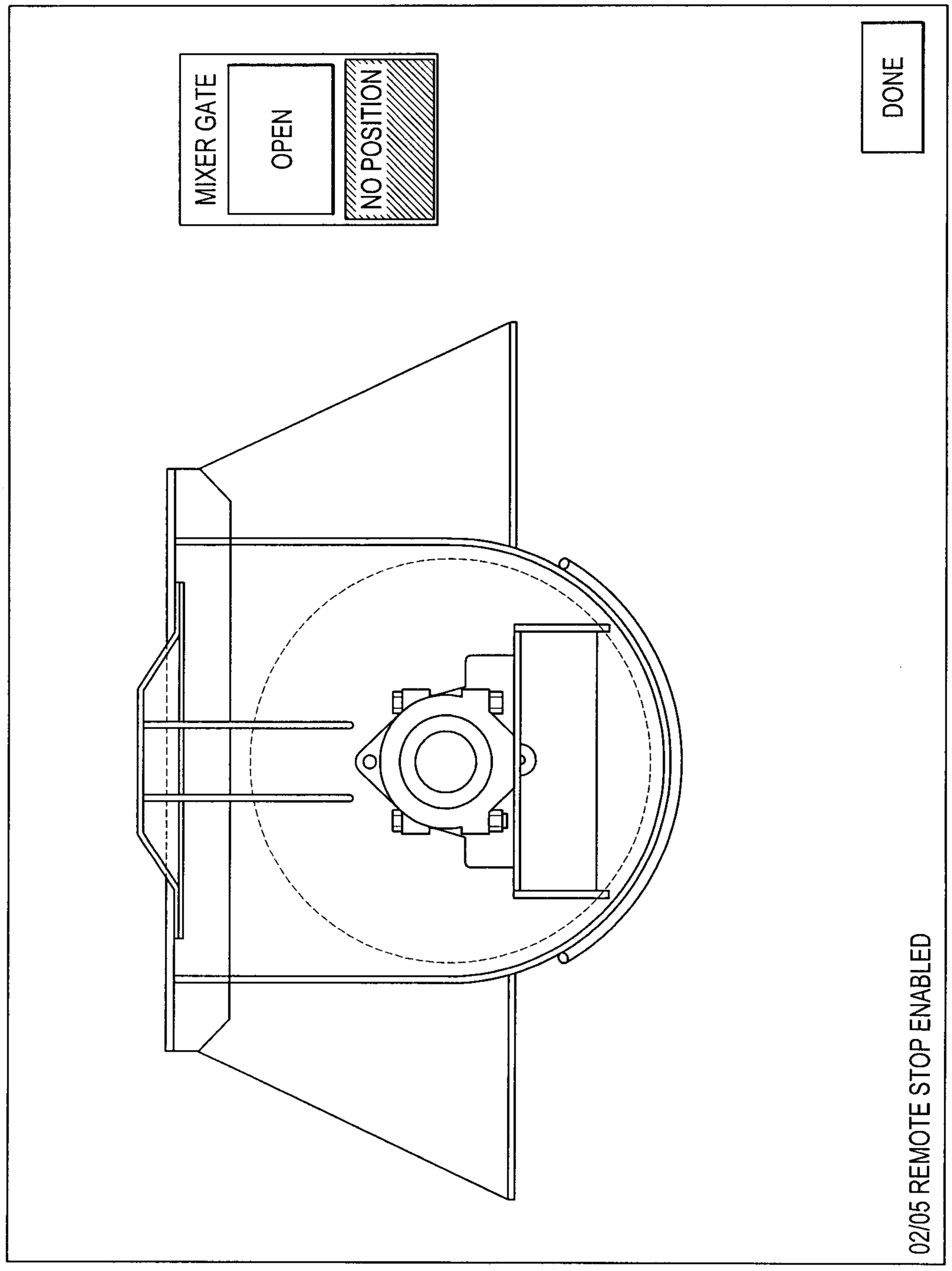


Fig. 21

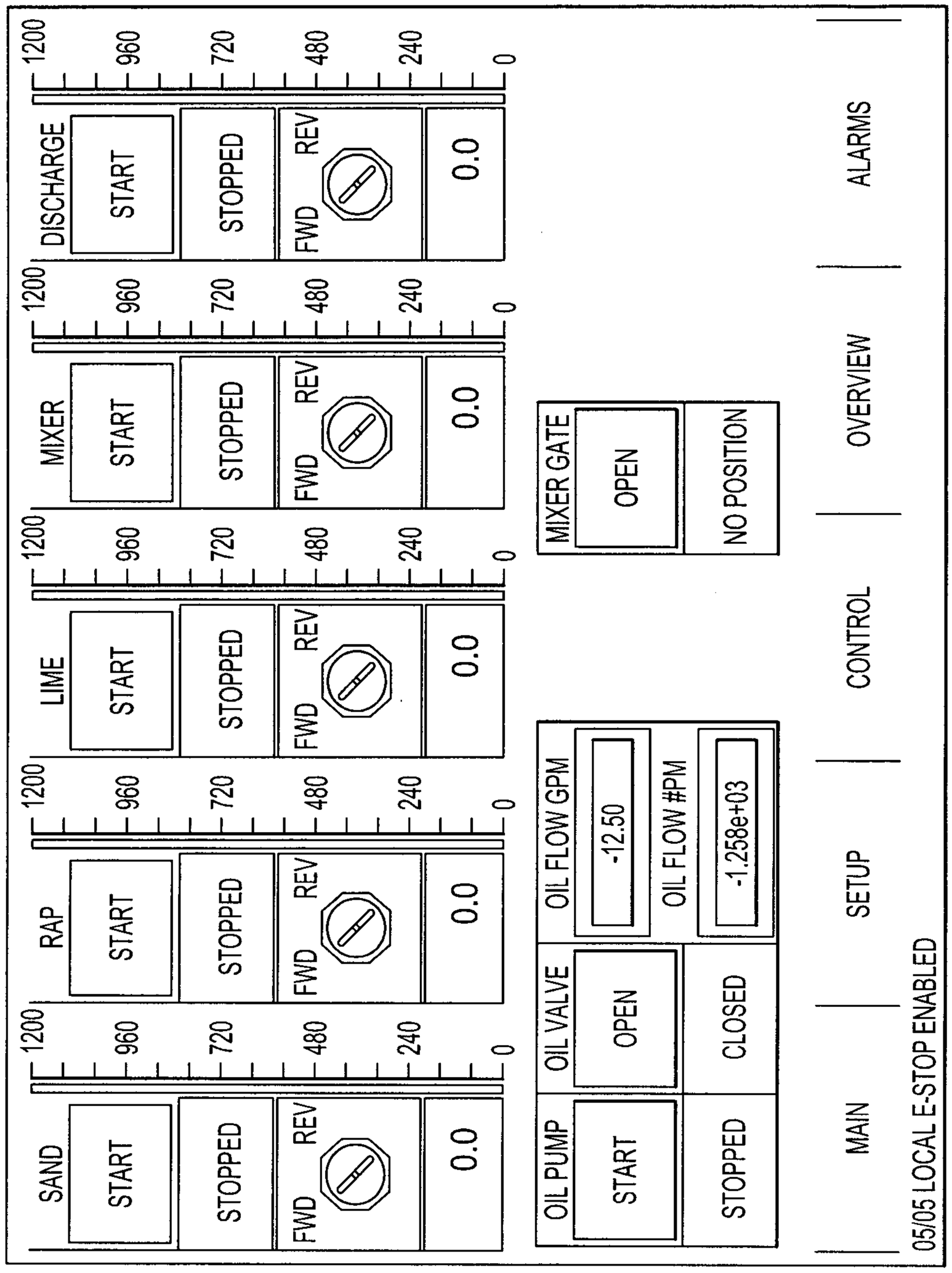

MIXER
START
STOPPED
FWD
REV
0.0
1200
960
720
480
240
0
DISCHARGE
START
STOPPED
FWD
REV
0.0
LIME
START
STOPPED
FWD
REV
0.0
RAP
START
STOPPED
FWD
REV
0.0
SAND
START
STOPPED
FWD
REV
0.0
MIXER GATE
OPEN
NO POSITION
OIL FLOW GPM
-12.50
OIL FLOW #PM
-1.258e+03
OIL VALVE
OPEN
CLOSED
OIL PUMP
START
STOPPED
OVERVIEW
ALARMS
SETUP
CONTROL
MAIN
05/05 LOCAL E-STOP ENABLED

Fig. 22

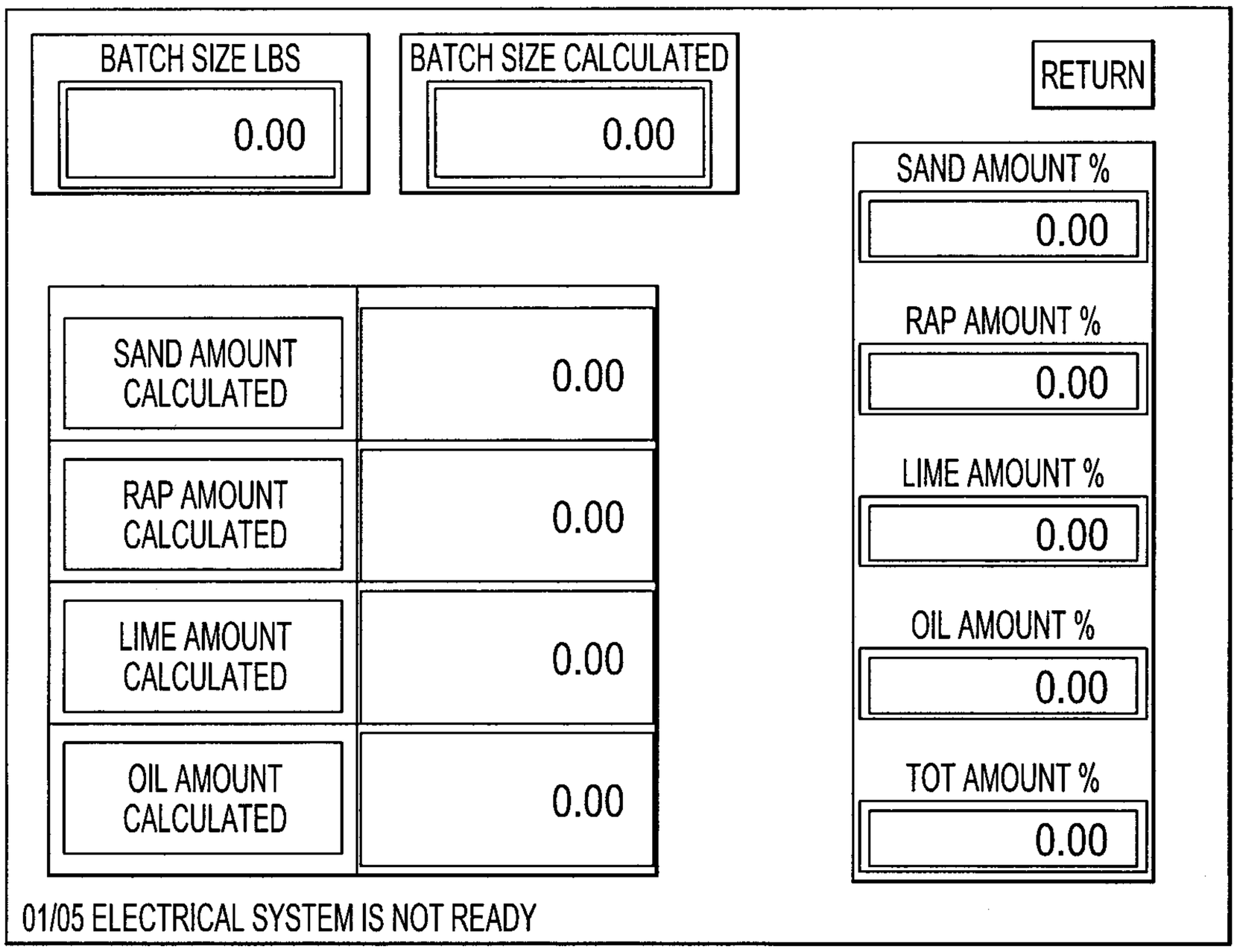

BATCH SIZE LBS
0.00
BATCH SIZE CALCULATED
0.00
RETURN
SAND AMOUNT %
0.00
SAND AMOUNT CALCULATED
0.00
RAP AMOUNT %
0.00
RAP AMOUNT CALCULATED
0.00
LIME AMOUNT %
0.00
LIME AMOUNT CALCULATED
0.00
OIL AMOUNT %
0.00
OIL AMOUNT CALCULATED
0.00
TOT AMOUNT %
0.00
01/05 ELECTRICAL SYSTEM IS NOT READY

Fig. 23

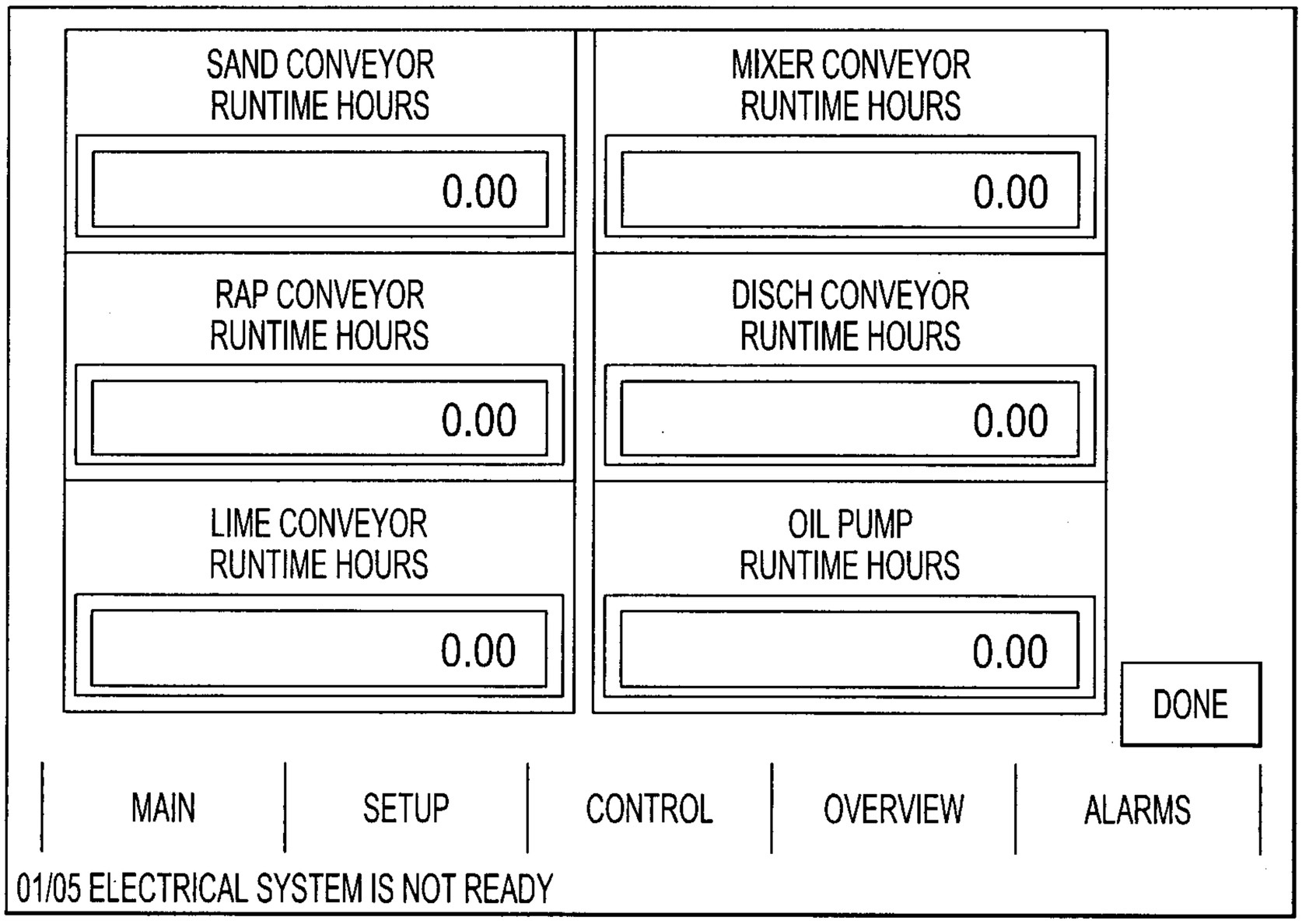

SAND CONVEYOR RUNTIME HOURS
0.00
MIXER CONVEYOR RUNTIME HOURS
0.00
RAP CONVEYOR RUNTIME HOURS
0.00
DISCH CONVEYOR RUNTIME HOURS
0.00
LIME CONVEYOR RUNTIME HOURS
0.00
OIL PUMP RUNTIME HOURS
0.00
DONE
MAIN
SETUP
CONTROL
OVERVIEW
ALARMS
01/05 ELECTRICAL SYSTEM IS NOT READY

Fig. 24

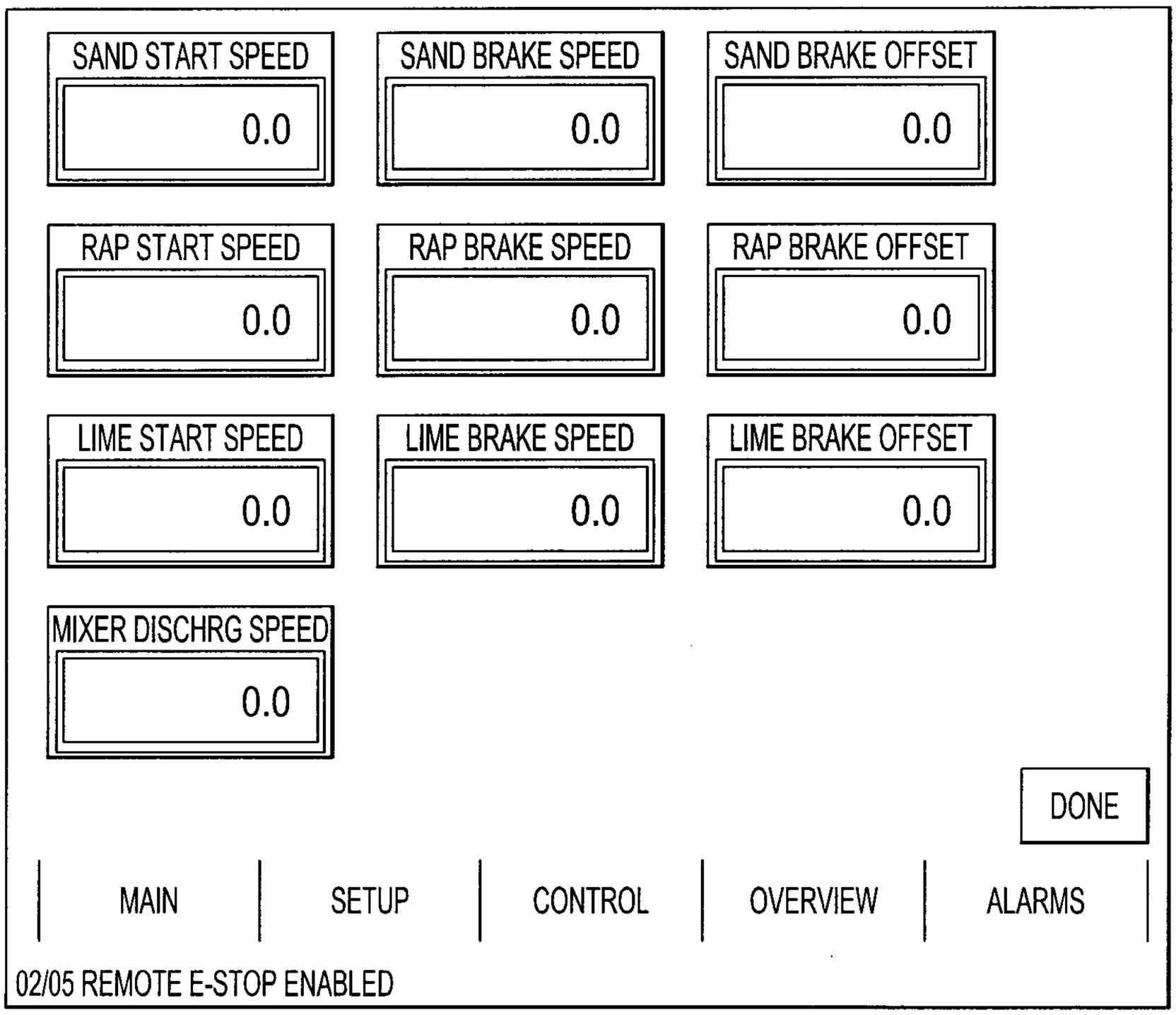

SAND START SPEED
0.0
SAND BRAKE SPEED
0.0
SAND BRAKE OFFSET
0.0
RAP START SPEED
0.0
RAP BRAKE SPEED
0.0
RAP BRAKE OFFSET
0.0
LIME START SPEED
0.0
LIME BRAKE SPEED
0.0
LIME BRAKE OFFSET
0.0
MIXER DISCHRG SPEED
0.0
DONE
MAIN
SETUP
CONTROL
OVERVIEW
ALARMS
02/05 REMOTE E-STOP ENABLED

Fig. 25

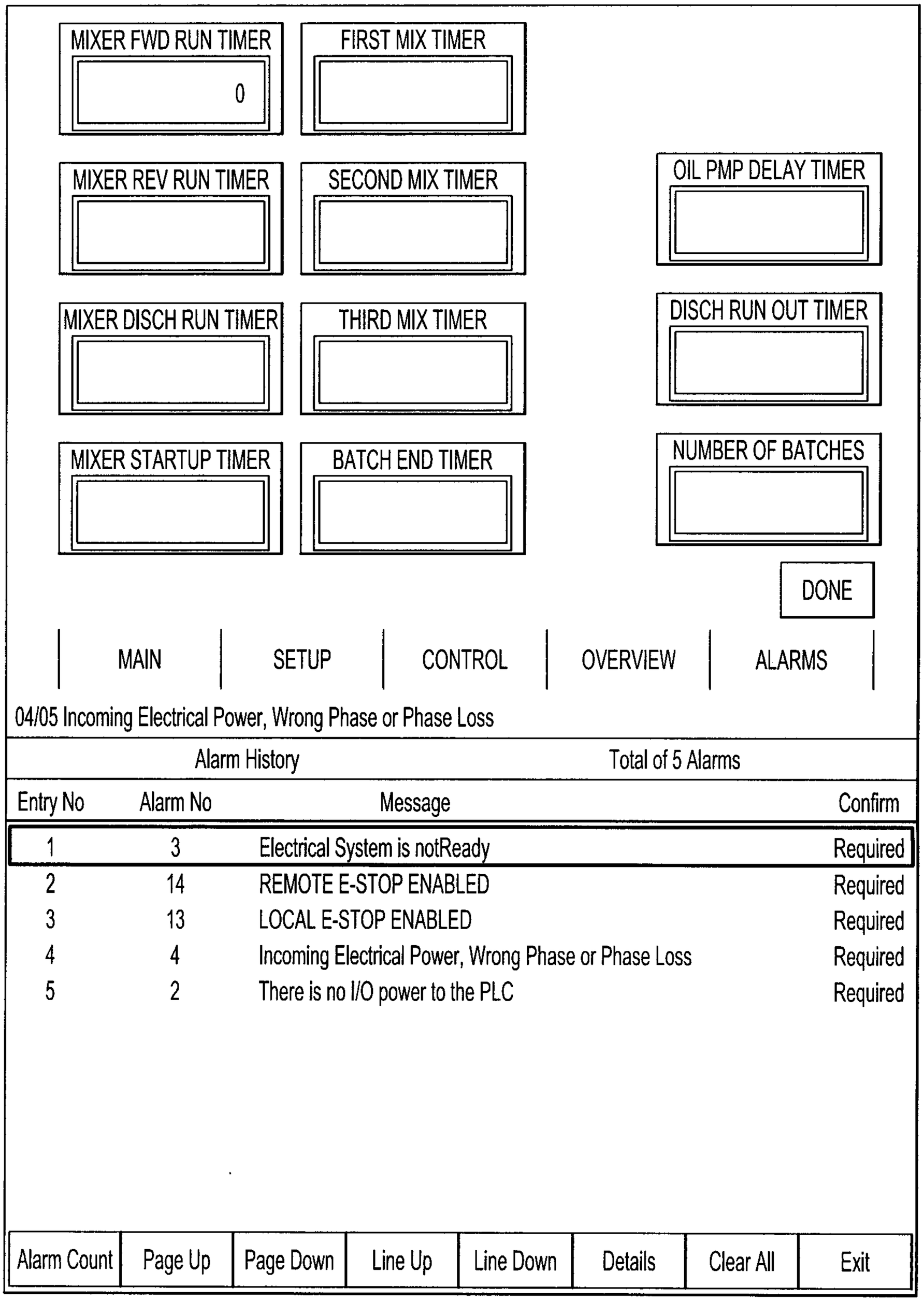

MIXER FWD RUN TIMER
0
FIRST MIX TIMER
MIXER REV RUN TIMER
SECOND MIX TIMER
OIL PMP DELAY TIMER
MIXER DISCH RUN TIMER
THIRD MIX TIMER
DISCH RUN OUT TIMER
MIXER STARTUP TIMER
BATCH END TIMER
NUMBER OF BATCHES
DONE
MAIN
SETUP
CONTROL
OVERVIEW
ALARMS
04/05 Incoming Electrical Power, Wrong Phase or Phase Loss
Alarm History
Total of 5 Alarms
Entry No
Alarm No
Message
Confirm
1
3
Electrical System is notReady
Required
2
14
REMOTE E-STOP ENABLED
Required
3
13
LOCAL E-STOP ENABLED
Required
4
4
Incoming Electrical Power, Wrong Phase or Phase Loss
Required
5
2
There is no I/O power to the PLC
Required
Alarm Count
Page Up
Page Down
Line Up
Line Down
Details
Clear All
Exit

Fig. 26

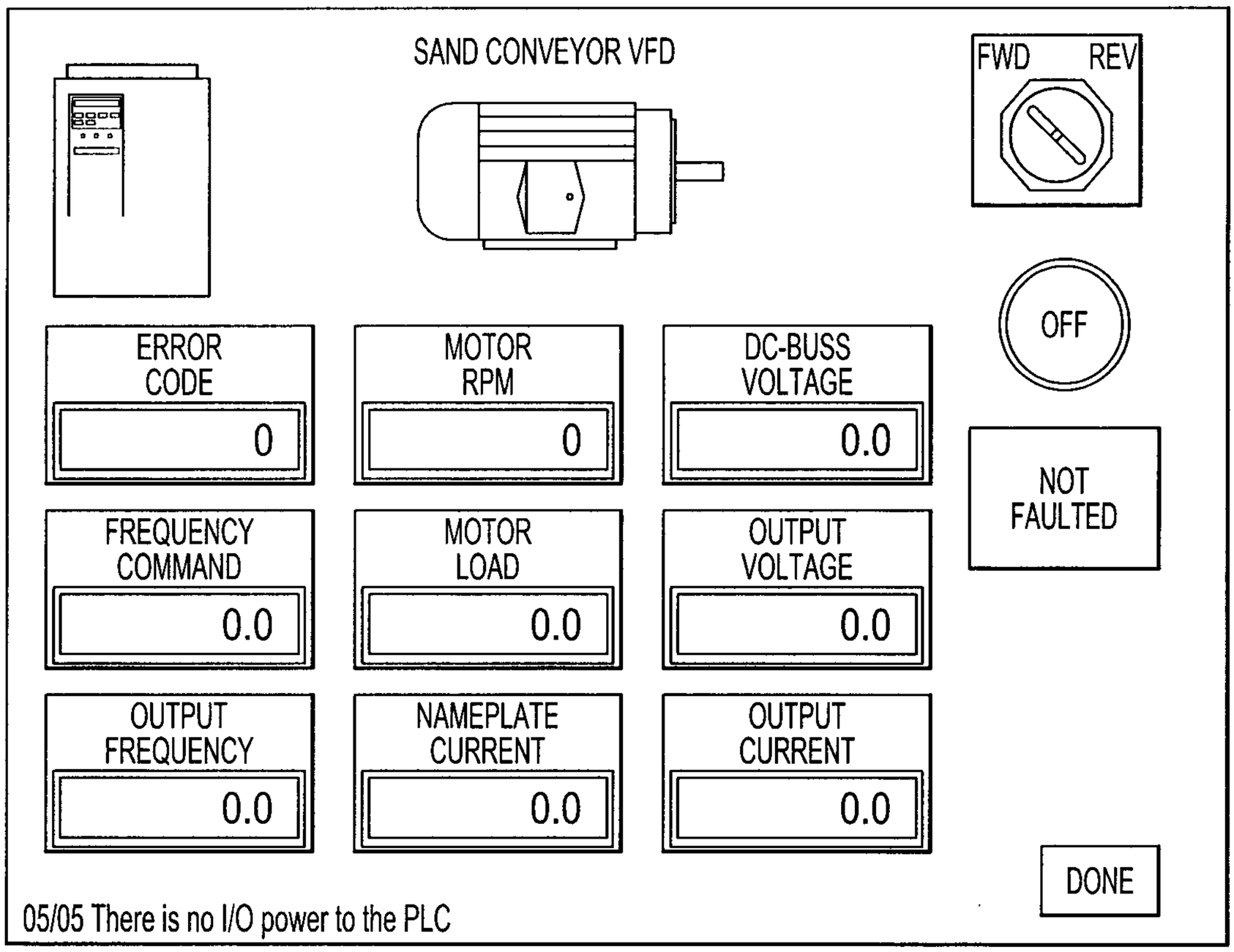

SAND CONVEYOR VFD
FWD
REV
OFF
ERROR CODE
0
MOTOR RPM
0
DC-BUSS VOLTAGE
0.0
NOT FAULTED
FREQUENCY COMMAND
0.0
MOTOR LOAD
0.0
OUTPUT VOLTAGE
0.0
OUTPUT FREQUENCY
0.0
NAMEPLATE CURRENT
0.0
OUTPUT CURRENT
0.0
DONE
05/05 There is no I/O power to the PLC

Fig. 27

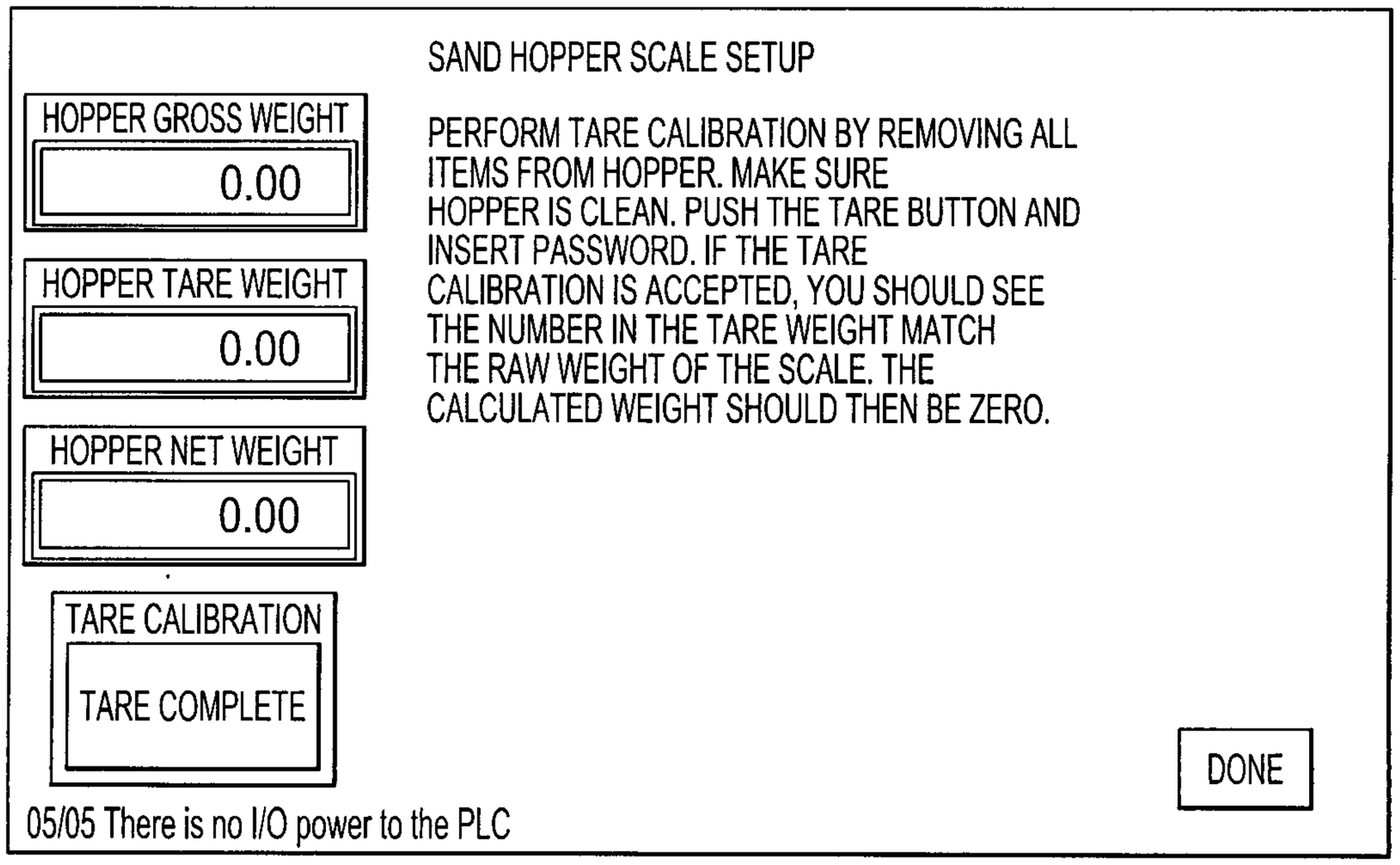

SAND HOPPER SCALE SETUP
HOPPER GROSS WEIGHT
0.00
HOPPER TARE WEIGHT
0.00
HOPPER NET WEIGHT
0.00
PERFORM TARE CALIBRATION BY REMOVING ALL ITEMS FROM HOPPER. MAKE SURE HOPPER IS CLEAN. PUSH THE TARE BUTTON AND INSERT PASSWORD. IF THE TARE CALIBRATION IS ACCEPTED, YOU SHOULD SEE THE NUMBER IN THE TARE WEIGHT MATCH THE RAW WEIGHT OF THE SCALE. THE CALCULATED WEIGHT SHOULD THEN BE ZERO.
TARE CALIBRATION
TARE COMPLETE
DONE
05/05 There is no I/O power to the PLC

Fig. 28

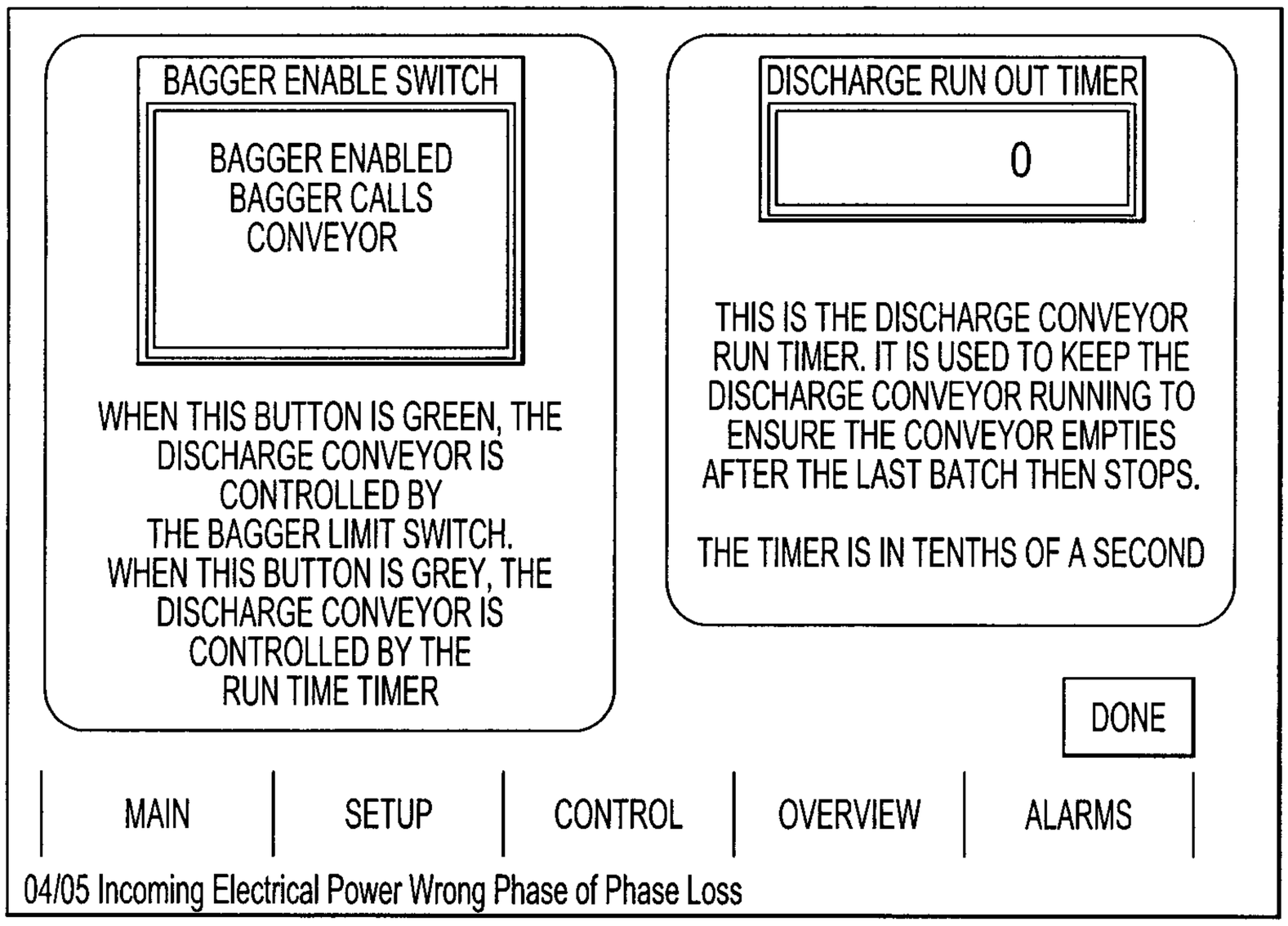

BAGGER ENABLE SWITCH
BAGGER ENABLED
BAGGER CALLS
CONVEYOR
WHEN THIS BUTTON IS GREEN, THE DISCHARGE CONVEYOR IS CONTROLLED BY THE BAGGER LIMIT SWITCH. WHEN THIS BUTTON IS GREY, THE DISCHARGE CONVEYOR IS CONTROLLED BY THE RUN TIME TIMER
DISCHARGE RUN OUT TIMER
0
THIS IS THE DISCHARGE CONVEYOR RUN TIMER. IT IS USED TO KEEP THE DISCHARGE CONVEYOR RUNNING TO ENSURE THE CONVEYOR EMPTIES AFTER THE LAST BATCH THEN STOPS.
THE TIMER IS IN TENTHS OF A SECOND
DONE
MAIN
SETUP
CONTROL
OVERVIEW
ALARMS
04/05 Incoming Electrical Power Wrong Phase of Phase Loss

Fig. 29

OIL PUMP MOTOR
OIL PUMP
START
STOPPED
OIL VALVE
OPEN
CLOSED
OIL FLOW GPM
0.00
OIL FLOW #PM
0.00
OIL LBS SETPOINT
0.0
OIL ACTUAL GALLONS
0.0
OIL ACTUAL POUNDS
0.0
OFF
PUMP FAULTED
DONE
04/05 Incoming Electrical Power Wrong Phase of Phase Loss

Fig. 30

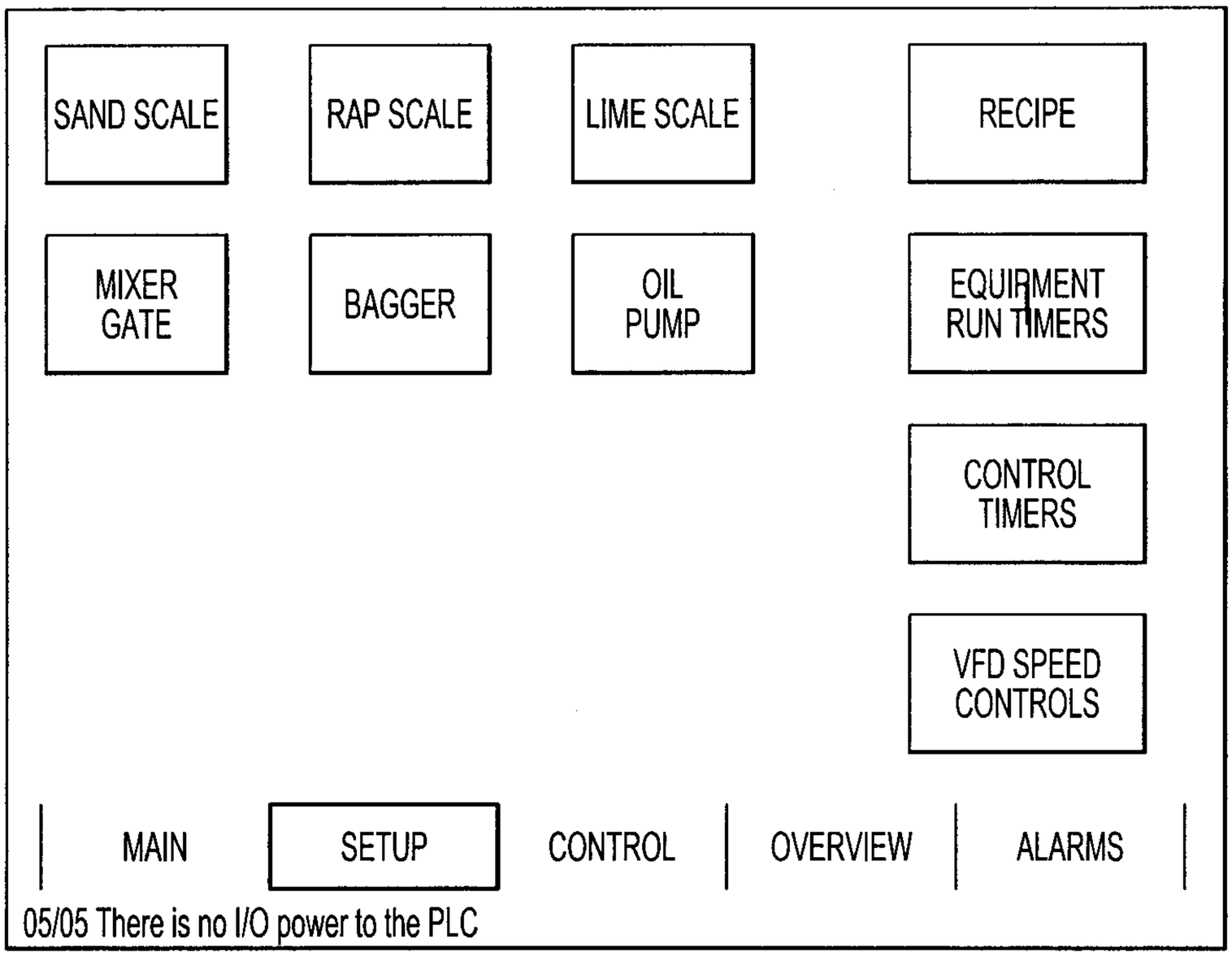

SAND SCALE
RAP SCALE
LIME SCALE
RECIPE
MIXER GATE
BAGGER
OIL PUMP
EQUIPMENT RUN TIMERS
CONTROL TIMERS
VFD SPEED CONTROLS
MAIN
SETUP
CONTROL
OVERVIEW
ALARMS
05/05 There is no I/O power to the PLC

Fig. 31

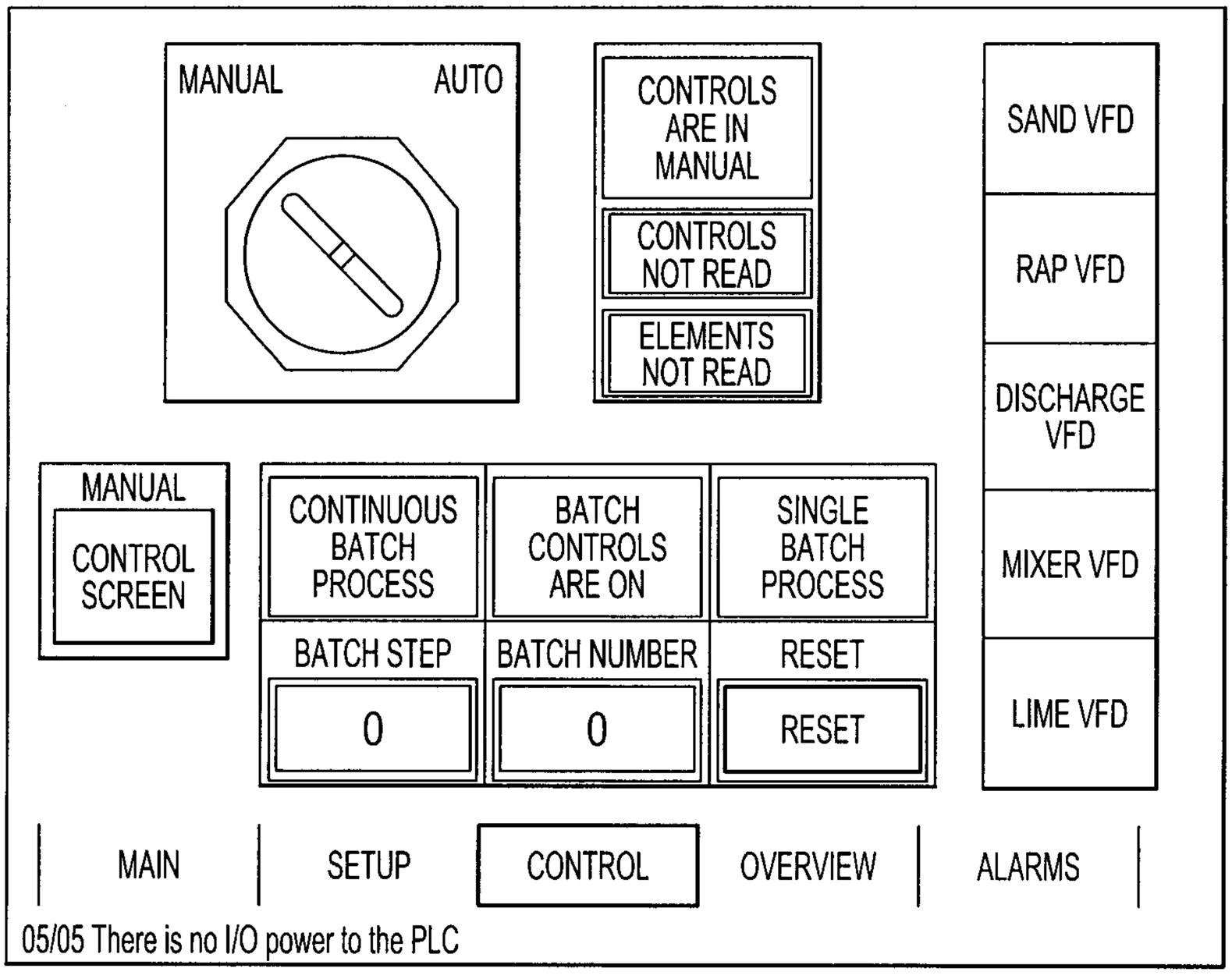
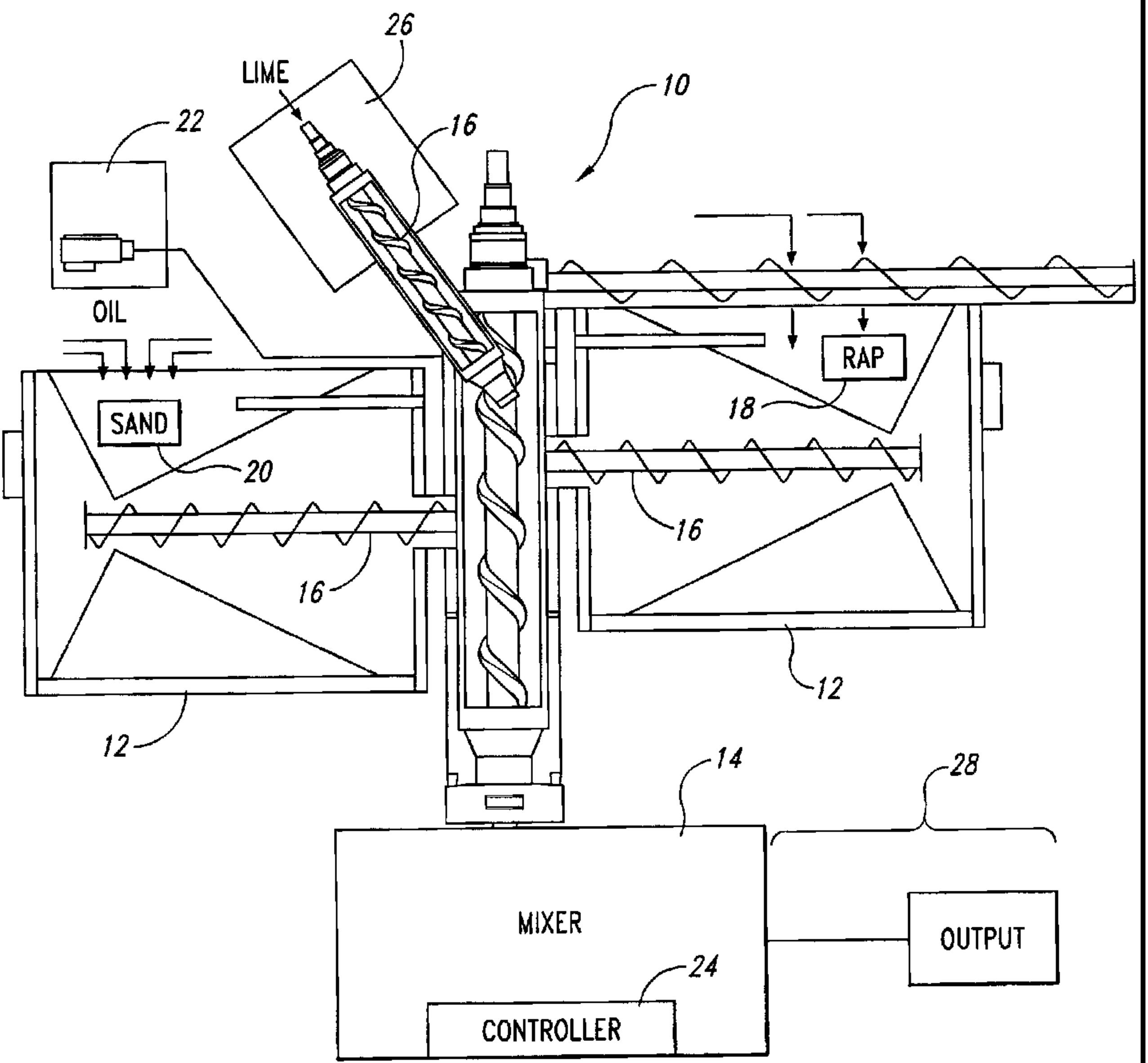

MANUAL
AUTO
CONTROLS ARE IN MANUAL
CONTROLS NOT READ
ELEMENTS NOT READ
SAND VFD
RAP VFD
DISCHARGE VFD
MIXER VFD
LIME VFD
MANUAL
CONTROL SCREEN
CONTINUOUS BATCH PROCESS
BATCH CONTROLS ARE ON
SINGLE BATCH PROCESS
BATCH STEP
0
BATCH NUMBER
0
RESET
RESET
MAIN
SETUP
CONTROL
OVERVIEW
ALARMS
05/05 There is no I/O power to the PLC

Fig. 32


26
LIME
10
22
16
OIL
RAP
SAND
18
20
16
16
12
12
14
28
MIXER
OUTPUT
24
CONTROLLER