DEVICE FOR THE BATCHING OF MEDIA

Inventors: Elgas Pulk, deceased, late of Stockholm, Sweden, by Carl Gustaf Hallstenius, Administrator, Uppsala, Sweden; John Paul Noren, Upplands Vasby, Sweden

Assignee: Stabilator AB, Bromma, Sweden

Filed: Mar. 24, 1975

Related U.S. Application Data
Continuation of Ser. No. 327,313, Jan. 29, 1973, abandoned.

Foreign Application Priority Data
Feb. 3, 1972 Sweden 1276/72

U.S. Cl. 222/145; 222/309
Int. Cl. F04B 9/08
Field of Search 417/343, 398, 404, 429; 222/145, 193, 309

References Cited
UNITED STATES PATENTS
3,164,325 1/1965 Veum 417/404
3,610,783 10/1971 Croucher 417/429

Primary Examiner—Stanley H. Tollberg
Attorney, Agent, or Firm—Anthony A. O'Brien

ABSTRACT
The present invention relates to a device for batching at least two, preferably liquid, media in predetermined proportions by volume. According to the present invention, each medium has its own separate pump unit, at least one of these pump units having a variable capacity with respect to the others, and all pump units being driven by a common drive unit itself driven from a power source.

3 Claims, 4 Drawing Figures
DEVICE FOR THE BATCHING OF MEDIA

CROSS REFERENCE TO RELATED APPLICATION

This is a continuation of application Ser. No. 327,313 filed Jan. 29, 1973 now abandoned.

The present invention relates to a device for batching at least two, preferably liquid, media in predetermined proportions by volume.

When applying sprayed concrete there is sometimes a need to admix liquid additives, called accelerators, to the water due to be added to the concrete mix, their function being to accelerate hardening. To secure good results it is essential that additive and water be mixed in properly batched proportions. Normally used additives have a viscosity that is closely dependent on temperature so that problems arise when a batching device equipped with a conventional pump is employed since even a slight change in temperature of the additive will alter its viscosity and so effect its pumpability thereby influencing the mixing ratio.

As a rule water and additive need be fed only for limited periods in which case there are several possible ways of shutting off the feed. One way is simply to stop the batcher but the drawback here is that on restarting some time will usually elapse before the pump's delivery of additive attains the same level as before the batcher was stopped, which of course means that the mixing proportions are altered, though only for a shortish time. Another method is to stop the efflux of water and additive and let the batcher continue working against the back-pressure generated in the delivery line. The result of this is fractional heating which in turn alters viscosity and hence proportioning. Yet another solution in the last-mentioned case is to provide the batching plant with one or more bypasses and allow the pumped media to circulate until the outflow is once again opened. But such circulation involves a certain heating of both water and additive in consequence of flow-friction and similar factors. Depending on the quantity of flow medium in the bypass circuit and the duration of circulation, the preset mixing ratio will thus also suffer changes under these conditions.

Besides the requirement that a desired mixing ratio shall not be affected by temporary stoppages of work, it is also desirable for the mixing ratio to be readily changeable to meet the needs of different types of job. Furthermore, in order to cut down wastage to a minimum, it is equally desirable that the mixture of water and additive delivered by the batching device should be usable ab initio or, expressed the other way about, it is undesirable to have to spray a certain quantity to waste at the start of every operation.

The object of the present invention is to create a batching device which is not subject to the aforesaid disadvantages, a device which is simple, robust and easily maintained, with a facility for changing the mixing proportions and which can be easily stopped and restarted. In such a device according to the present invention there is a separate pump unit for each medium, at least one pump unit having a variable capacity with respect to the others and all pump units being driven by a common drive unit, itself driven from a power source.

According to one preferred embodiment of the invention, the drive unit consists of a rocker element hinge connected to the power source and to the pump units in such a manner that the distance between its rocker shaft and its pivot connection to at least one pump unit is adjustable. A further preferred feature is that each pump unit comprises a double-acting cylinder which is connected, via a conventionally designed flow-regulating valve unit, a suction line for supply and a delivery line for delivery of the medium concerned. By these means a capability is secured whereby the stroke and hence the pumping capacity of one pump unit can be simply altered by varying the length of the lever arm.

A continuously working system is also obtained.

Yet another preferred embodiment of the invention consists in that the delivery lines from the pump units open into a common proportioning line and that the torque generated by the power source on the rocker element's rocker shaft is so dimensioned that, on the proportioning line being blocked, it will be balanced by an opposite torque generated on the said element's rocker shaft by one of the pump units, thereby rendering it possible to stop the pump units by blocking the proportioning line. Thus, with a low back-pressure in the proportioning line a high pump capacity is obtained which can be gradually reduced to zero by increasing the said back-pressure. This provides a simple means of controlling capacity and of stopping the whole device.

As a power source it is possible to use, for example, one or more double-acting cylinders or one or more double-acting load cells in either case provided with associated control valves for controlling the direction of operation. The torque developed by the power source can be made variable by arranging that the distance between the power source's pivot connection to the rocker element and that element's rocker shaft shall be adjustable.

According to yet another embodiment of the invention the power source is intended for compressed air whose pressure can be controlled by means of an adjustable pressure regulator to which is connected a pressure gauge. Here too the torque can be varied, and with it the pump's delivery head, which latter can thus be adjusted as required.

Yet a further embodiment of the invention envisages a pressure regulator associated with and fitted to the suction side of one or more pump units. By these means the suction head of the pump unit concerned can be kept essentially constant.

The invention will now be described with reference to an example of an embodiment illustrated in the attached drawings, where

FIG. 1 shows a general arrangement of a device according to the present invention,

FIG. 2 shows a possible application of the device of FIG. 1,

FIG. 3 shows an embodiment of the device of FIG. 1, and

FIG. 4 shows the same device as FIG. 3 but viewed from a different angle.

In the general arrangement for a batching device 1 in FIG. 1 a drive unit in the form of an element 3 rockably mounted in an upper central portion of a support 2 is hinge-connected by pivots 4, 5, 6 to pump units 7, 8 and a power source 9 respectively. Both pump units 7, 8 extend vertically on the same side of the rocker shaft 10 of element 3 and are pivotally mounted at 40, 41 on a base portion of the support 2. The pump units 7, 8 are driven via the said element 3 by the power source 9 extending vertically on the opposite side of the rocker shaft 10 to a pivot 43 on the base portion of the support 2. The pivot connection 4 of the pump unit 7 to ele-
ment 3 is adjustable in the sense that its distance from rocker shaft 10 can be variously set, thereby giving the pump unit 7 a variable capacity in relation to pump unit 8. By arranging that when in a certain set position the pivot connection 4 shall be at zero distance from rocker shaft 10 it is possible to stop pump unit 7 while pump unit 8 continues working. Pivot connections 5 and 6 can naturally be designed on this same principle if desired.

Connected to pump unit 7 are a suction line 11 and a delivery line 12. Suction line 11 can be provided with a filter 13 and is led from a tank 14 containing one of the preferably liquid media required to be mixed in predetermined proportions. To pump unit 8 are connected a suction line 15 and a delivery line 16. Suction line 15 is provided with a filter 17 and pressure regulator 18 by means of which the head on the other force-fed medium to be mixed is reduced to a level lower than the lowest pressure that could occur during feed on account of pressure variations. Pump unit 8 can in work with an essentially constant suction head which is an advantage from the standpoint of accuracy.

Both delivery lines 12 and 16 terminate in a common proportioning line 19 along which the two mixed media are pumped. The proportioning line 19 can be made blockable by inclusion of a valve 19a and it may conveniently be arranged in this connection that, on blocking of the proportioning line, the torque generated on rocker shaft 10 by the power source 9 shall be balanced by a countertorque generated on that same shaft 10 by pump units 7 and 8.

Each pump unit 7 and 8 may suitably consist of a double-acting cylinder 20 and 21 respectively connected in conventional fashion to a conventionally designed flow regulating valve unit 22 and 23 such as those described in U.S. Pat. No. 3,164,325 issued Jan. 5, 1965.

In the example illustrated the power source 9 consists of a double-acting cylinder 24 with which are associated conventionally designed control valves 25, 26 such as those described in U.S. Pat. Nos. 3,164,325 issued Jan. 5, 1965 and 3,610,783 issued Oct. 5, 1971 which regulate the cylinder's direction of operation by responding to the position of a position indicator 27 fitted on the rocker element 3. Connected to control valve 26 is a line 28 for supply of a working medium under pressure from a pressure source 29. Line 28 includes a filter 30, an adjustable pressure regulator 31 and a pressure gauge 32. The pressure of the working medium in cylinder 24 can be varied by means of the pressure regulator 31. Instead of one or more double-acting cylinders it is equally possible to use as a power source one or more double-acting load cells, the term load cells being here understood to mean a container with a fixed working element in the form of a diaphragm or suchlike. The working medium is preferably compressed air when line 28 can also be provided with a conventional oil-mist lubricator or suchlike (not shown in the drawing), particularly when a compressed-air cylinder is used. The parts included in the device here described can naturally be combined and/or placed in a variety of different ways within the scope of the inventive concept.

FIG. 2 shows the abovedescribed device being used for the spraying of concrete in an application where water and/or liquid accelerator are mixed in predetermined proportions and then mixed under pressure with a pressurized mix of cement and aggregate, fluidized with compressed air. In this Figure and in FIGS. 3 and 4 the same identification numbers are used as in FIG. 1 for indicating parts corresponding to those in that latter Figure. The batching device 1 is placed upon a container 14 for the liquid accelerator with its suction line inserted downwards into the latter. Water is supplied under pressure from a water main via line 15 and compressed air from an air main via line 28. The mixture of water and accelerator is delivered through line 19 terminating in an adjustable nozzle 19a, fitted on a hose 51 connected to the pneumatic concreter 50 whence it delivers a fluidized dry concrete mix transported by compressed air. In order to get effective mixing of dry cement mix and liquid it is essential that the pressure on the liquid be kept higher than that on the cement mix.

A possible construction of a device intended for the application illustrated in FIG. 2 is shown in FIGS. 3 and 4. The device shown is of compact and robust construction and readily portable. The stroke of cylinder 20 is set manually by means of an adjusting screw 60, but it is also possible to employ an adjusting mechanism remote-controlled from the nozzle 19a in FIG. 2. To facilitate adjustment a scale can be provided that directly indicates the mixing proportions. A tubular member 44 is attached to the base portion of the support 2 and is bent to form inverted U-shaped handles 45, 46 extending upward on opposite sides of the batching device. The device should preferably be enclosed in a casing as a protection against external impurities.

In order to make the accelerator easily pumpable by giving it a suitable viscosity, the accelerator tank and/or suction line 11 may conveniently be furnished with heating arrangements for keeping the temperature of the accelerator at a suitable level.

What is claimed is:

1. A device for batching at least two liquid media in mutually predetermined proportions by volume comprising

a power source including a double acting cylinder with associated control valves adapted for operation by an air pressure source connected to an input line thereof,
a constant pressure regulator in the input line of the power source,
a pair of pump units each including a double acting cylinder and a flow controlling valve unit suitably connected to an input line and a delivery line of each pump unit,
a rocker element pivotally connected to the power source and the pump units,
means for varying the distance between the rocking axis of the rocker element and the pivot connection to at least one pump unit,
means for varying the distance between the rocking axis of the rocker element and the pivot connection to the power source,
a common proportioning line into which the delivery lines from the pair of pump units terminate,
a valve controlling the outlet of the common proportioning line,
said rocker element being such that torque generated by the power source around the rocking axis of the rocker element is balanced when the valve in the common proportioning line is in a closed position by counter torque generated around the rocking axis of the rocker element by the pump units thereby enabling the pump units to be stopped by
3,926,345

5 closing the valve, said inlet line of a first of the pair of pump units supplying a non-pressurized medium, said input line of the second of the pair of pump units supplying pressurized medium, and a pressure regulator in the input line of the second pump unit by means of which the head of the pressurized medium to be mixed is reduced to a lower level in the input line of the second pump unit to a pressure lower than the lowest feed pressure that occurs in the input line of the second pump unit on account of pressure variations thereof.

2. A device as claimed in claim 1 including a support having a base portion and an upper central portion,

said rocker element being pivotally mounted on the upper central portion of the support, said pair of pump units having one ends pivotally mounted on the base portion and extending vertically to one side of the central portion to the pivot connections to the rocker element, and said power source having one end pivotally mounted on the base portion and extending vertically to the opposite side of the central portion to the pivot connection to the rocker element, whereby said device is compact and readily portable.

3. A device as claimed in claim 2 including a tubular member attached to the base portion of the support and bent to form a pair of inverted U-shaped handles extending upward on opposite sides of the device.

* * * * *