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HIGH PRESSURE INJECTOR AND SYSTEM FOR PRESSURIZING INGREDIENTS

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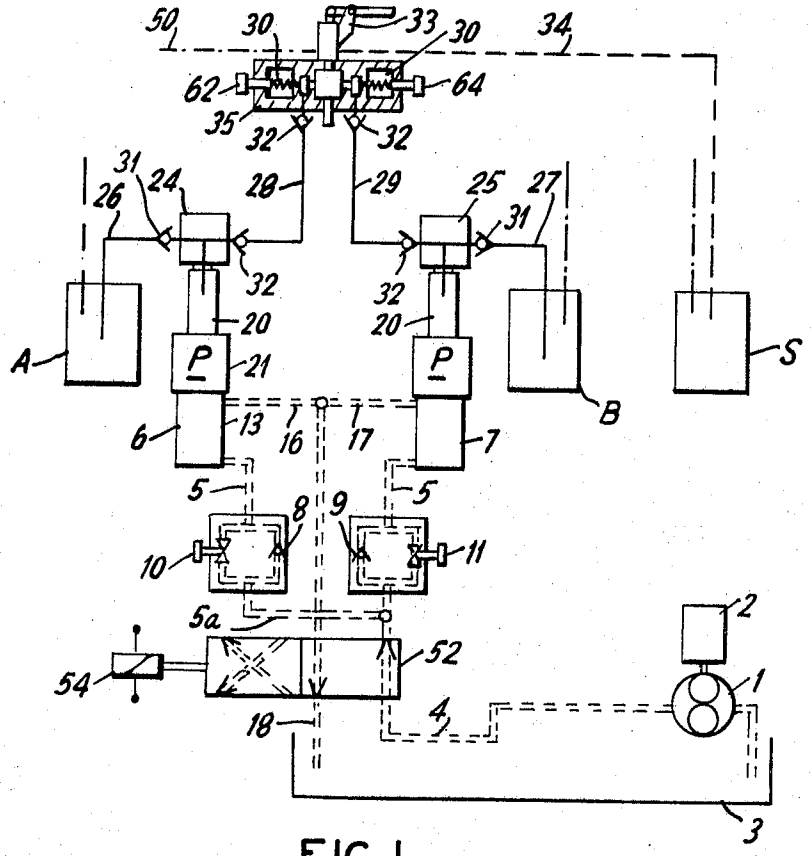

FIG. 1

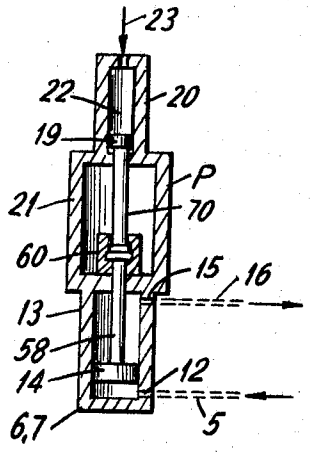

FIG. 2

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HIGH PRESSURE INJECTOR AND SYSTEM FOR PRESSURIZING INGREDIENTS

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ABSTRACT OF THE DISCLOSURE

A high pressure injector for producing synthetics and particular polyurethane foams includes a piston pump for hydraulically conveying liquid synthetic ingredients and includes a relatively large size actuating piston which is reciprocated under the control of a pressurized fluid and a relatively small-sized high pressure piston which is movable in a cylinder arranged at an opposite end of the housing from the actuating cylinder. The small-sized piston operating in the small-sized high pressure cylinder is arranged to draw in a synthetic ingredient and discharge it at high pressure under the force of operation of a relatively low pressure moving piston on the opposite end of the connecting housing. The system of the invention includes at least two high pressure pumps which are connected to respective synthetic ingredient sources and which discharge through a mixing head which is regulated to discharge a mixture with the proper proportions from each pump. The system also includes a connection from a rinsing medium to the mixing head in order to permit rinsing of the head and the associated connecting line.

SUMMARY OF THE INVENTION

This invention relates in general to devices for producing synthetic materials and in particular to a new and useful device and system for pressurizing and discharging a synthetic ingredient into a mixing head and to a construction of a pump for such a system.

The present invention is particularly applicable to the production of polyurethane foams and includes a system having a high pressure injector with a dosing and mixing device associated therewith. It is known with such equipment to convey the liquid ingredients of the synthetic separately by piston pumps in quantities regulated in accordance with the desired mixing ratio so that they may be apportioned to a specific mold. The ingredients are thereby pressed in dosed quantities from the feed pump and delivered to a central mixing chamber where they are thoroughly mixed and thereafter directed through a spray nozzle to a delivery line. The feed pumps for such a system function with relatively low pressures in a range of between 3 to 7 atmospheres absolute. In order to obtain a thorough mixing of the synthetic ingredients in the mixing chamber, very high pressures are desirable and thus it is necessary to resort to high pressure pumps. Such pumps are very difficult to operate and they are of complicated and expensive construction.

In order to circumvent the preflow and afterflow of the ingredients which is harmful to the maintenance of the proper mixing ratios, other known machines have been equipped with separate dosing pumps in addition to the feed pumps. This again increases the size and cost of the system, especially when the high pressure pumps are used to obtain a high feeding pressure.

In accordance with the present invention, a feed pump is employed which is capable of achieving a high feed pressure but is nevertheless simple in construction and provides exact quantitative dosing of the ingredients. In addition, the machine may be operated intermittently without preflow and afterflow. The system advantageously includes a feed pump which comprises a relatively large size fluid cylinder in which is movable a relatively large size piston actuating member which is connected through a rod to a small-sized piston operating in a small-sized cylinder arranged at the opposite end of a central housing. The energy supplied by a relatively low pressure fluid medium in displacing the relatively large-sized piston is sufficient to draw in a supply of a synthetic ingredient and to pressurize it and to discharge it into a mixing head. In the preferred system arrangement at least two such pumps are connected to discharge to a common mixing head so that the ingredients may be properly proportioned by the head and delivered to a delivery line. The mixing head may also advantageously be connected to a rinsing medium which may be directed through the head in order to rinse the connecting lines.

Accordingly, it is an object of the invention to provide an apparatus for pressurizing a synthetic ingredient particularly for the manufacture of polyurethane foams which includes a pumping member comprising a relatively large-sized piston moving in a relatively large-sized cylinder under the force of an actuating fluid which causes the movement of a relatively small-sized piston operating in a relatively small-sized cylinder for the purpose of drawing in a supply of the synthetic ingredient from a supply tank and delivering under pressure to a mixing head.

A further object of the invention is to provide a system for the production of a synthetic which includes a plurality of pressure pumps arranged for conveying the ingredients hydraulically and which are designed as pressure transmitters for the pupose of increasing the feed.

A further object of the invention is to provide a system for the production of a synthetic which includes a plurality of pressure pumps arranged for conveying the ingredients hydraulically and which are designed as pressure transmitters for the purpose of increasing the feed.

A further object of the invention is to provide a pump device and pressure system for the production of a synthetic material which are simple in design, rugged in construction, and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a diagrammatic illustration of the apparatus for the production of a synthetic polyurethane foam constructed in accordance with the invention; and

FIG. 2 is a longitudinal section of a pump housing employed in the system of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in particular, the invention embodied therein comprises a system for the production of a synthetic such as a polyurethane foam which includes ingredient tanks A and B which are connected

through respective lines **26** and **27** to check valves **31** in each line to a valve control distributor **24** and **25**, respectively. The associated distributors **24** and **25** permit admission for the intake into a pump cylinder **20** which subsequently is arranged to discharge through check valves **32**, **32** into appropriate lines **28** and **29** to respective chambers **30**, **30** in a mixing head **35** which is connected for separate discharge through a line **50** to supply a synthetic mold (not shown).

In accordance with the invention, the operating equipment for operating the pumps **20** includes an electric motor **2** arranged to drive a gear pump **1** which takes suction in a liquid or hydraulic reservoir **3** and discharges it through a line **4** through a reversing valve **52** to a pressure line **5** servicing a respective pump **6** or **7**. The reversing valve **52** may be shifted to the right from the position indicated in FIG. 1 by operating a control **54** so that the pressure discharge **4** is connected through a connecting line **56** to either line **16** or **17** for the pumps **6** or **7**, respectively. Between the lines **4** and **5** there are located quantity regulating valves **8** and **9** respectively which may be set in accordance with the setting of an adjustment **10** or **11**, respectively. Bypass line **5*a*** extends from the pressure line **4** to the valve **8** servicing the pump **6**. A feature of the inventive construction is that the pumps P comprise a relatively large diameter fluid operating cylinder **13** in which is slidable a relatively large diameter operating piston **14**. The piston **14** is shifted upwardly upon admission of the pressurized fluid through the line **5** and the inlet **12** and at the same time the fluid is discharged ahead of the piston through the discharge **15** and connecting lines **16** or **17** back through line **18** to the supply tank **3**. The piston **14** is provided with a long piston rod **58** which is connected either directly or through a removable coupling **60** to a rod portion **70** which in turn carries a small-sized piston **19**. The small-sized piston **19** is slidable in a cylinder **20** which defies a pump chamber **22** for the synthetic ingredient. The pump cylinder **13** is separated from the pump cylinder **20** by means of a housing **21** formed therebetween which also encloses the piston rod portions **58** and **70** when the associated piston moves them into this housing.

By using the pump P it is possible to use a liquid or hydraulic fluid from the reservoir **3** of relatively low pressure to provide a great pressurizing of the synthetic in the chamber **22**. The level of the pressure transmission can be predetermined by the ratios resulting from the geometric data of the cylinder chamber sizes and the associated pistons.

During the downward stroke of the piston **19**, ingredients are sucked up from the associated ingredient tanks A or B to charge the chamber **22** with the synthetic material. During the upward pressurizing stroke, the material is discharged out through the line **23** and into the associated distributor **24**, **25** for discharge to the mixing head **31**. The mixing head **31** includes a valve member **33** which may be set to permit discharge through a connecting conduit **50** to the mold and the amounts

of the ingredients from the respective pumps may be regulated by setting elements **62** and **64**, respectively. The check valves **31** and **32** permit the recharging of the cylinders without flow back through the lines **28** and **29** as well as the subsequent discharging of the ingredients without flow into the ingredient tanks A or B. The valve **33** may be positioned to permit flow through the conduit **34** from the rinsing medium tank S to rinse the valve head and the associated connecting line after compressed air is first directed through these parts.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A high pressure injector for discharging a synthetic ingredient under pressure in particular for the manufacture of polyurethane foam comprising a piston pump having a first cylinder for the intake of a liquid ingredient and the subsequent discharge thereof, a first piston movable in said cylinder and being of relatively small diameter, a second cylinder arranged opposite said first cylinder and being of a larger size than said first cylinder, a second piston of a larger size than said first piston and connected to said first piston to move said first piston in said first cylinder upon movement of said second piston in said cylinder, means for selectively admitting and withdrawing a pressurizing fluid from said second cylinder on respective sides of said second piston to operate said second piston, a plurality of pumps, and a mixing head, each of said pumps being connected to said mixing head, said mixing head being provided with means for regulating the quantities of the ingredients being delivered by each of said pumps.

2. A high pressure injector according to claim **1**, wherein said pump includes a housing connecting said first and second cylinders together, said first cylinder having a smaller volume than said second cylinder.

3. A high pressure injector according to claim **1**, wherein said first and second cylinders are joined together in a common housing.

4. A high pressure injector according to claim **1**, including a regulating valve connected to said first cylinder for regulating the quantity of an ingredient directed thereto and for the regulating of the pressure of discharge of the ingredient.

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