

- (21) Application No 8130132
- (22) Date of filing 6 Oct 1981
- (30) Priority data
- (31) 25312
- (32) 14 Oct 1980
- (33) Italy (IT)
- (43) Application published 28 Apr 1982
- (51) INT CL³
B01F 13/00
- (52) Domestic classification
B1C 112 3073 412 AC
- (56) Documents cited
GB 2031474A
GB 2022163A
GB 1551979
GB 1421673
GB 1336069
GB 1291086
GB 1275424
GB 1270868
GB 1270670
GB 1172822
GB 1063731
GB 1040638
GB 995208

- (58) Field of search
B1C
B2A
B3M
B5A
B6C
D2A

(71) Applicants
Comerio Ercole S.p.A.
Via Silvio Pellico,
3, Busto Arsizio,
Italy.

(72) Inventors
Rinaldo Comerio

(74) Agents
Haseltine Lake & Co.,
Hazlitt House,
28, Southampton
Buildings,
Chancery Lane,
London, WC2A 1AT,
England.

(54) Roller nip control

(57) A roller mixer includes rollers, one roller (2) being displaceable to adjust the spacing. This displacement is controlled by a control arrangement which

comprises respective hydraulic cylinders (5) having pistons (6) which control supports (7) of the roller (2) to be displaced. The cylinders (5) are actuated by means of relay-valves (8) which are connected with a hydraulic control unit and are controlled by an electronic control. This ensures even gap during displacement and can control the displacement speed. Pressure relief valves (11) allow gap increase if foreign bodies cause overloading of the rollers.

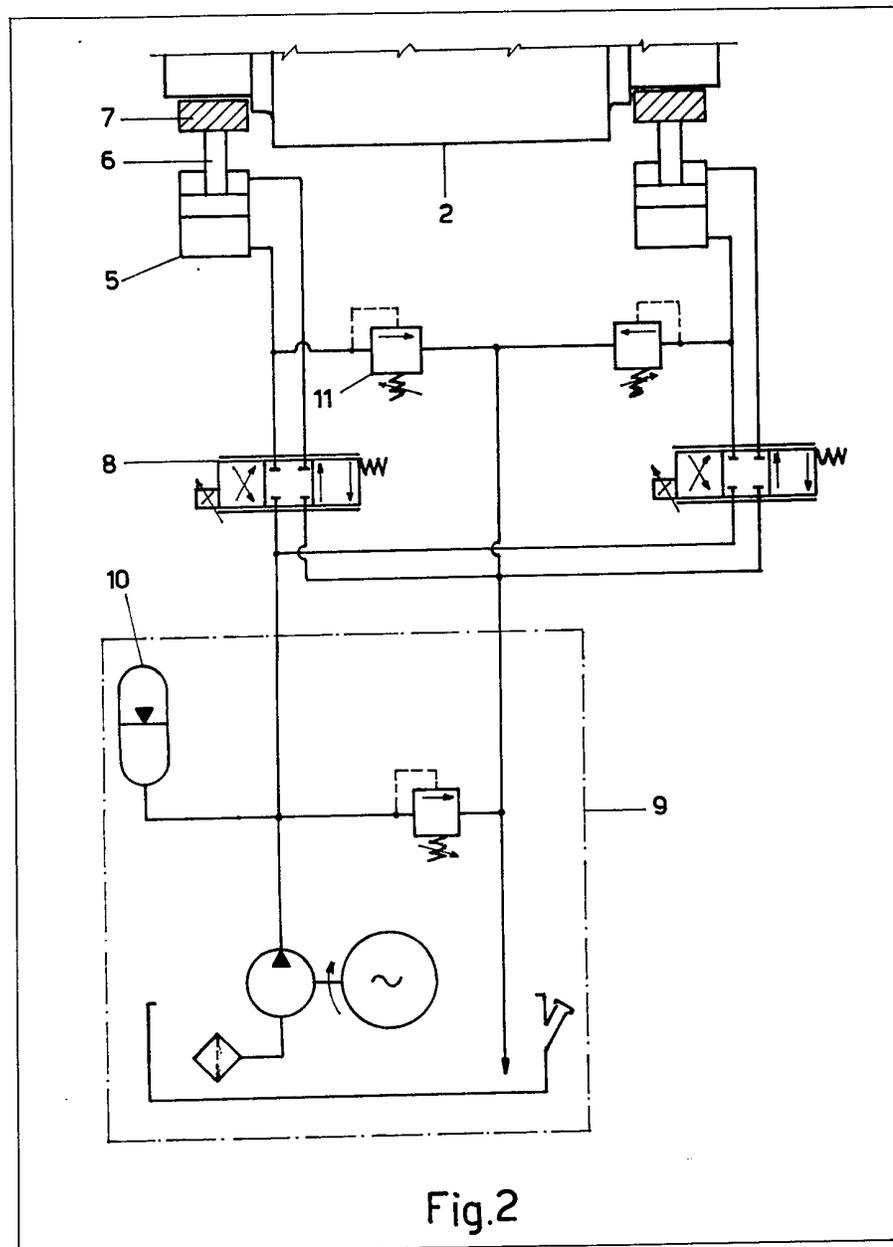


Fig.2

1/2

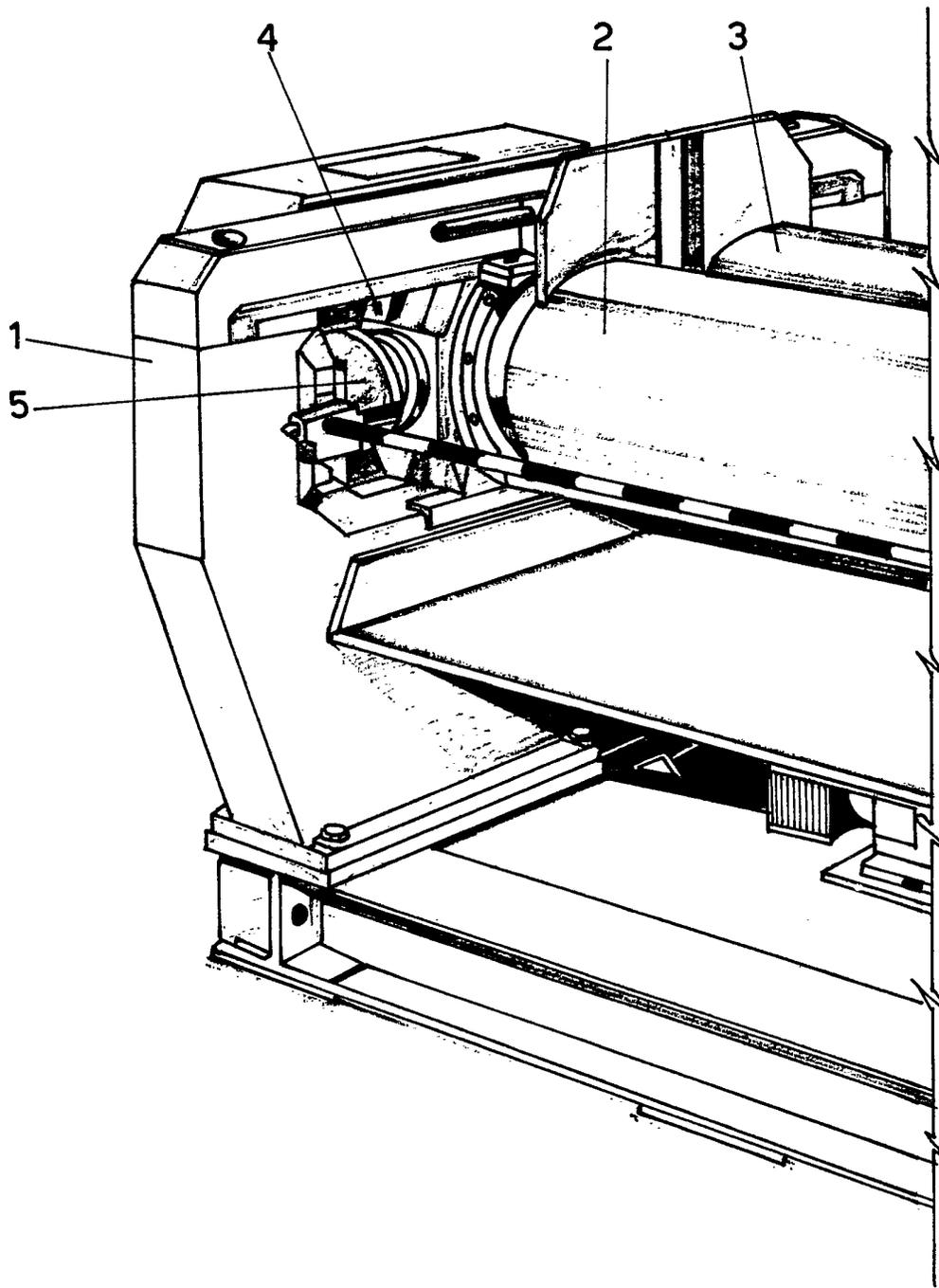


Fig.1

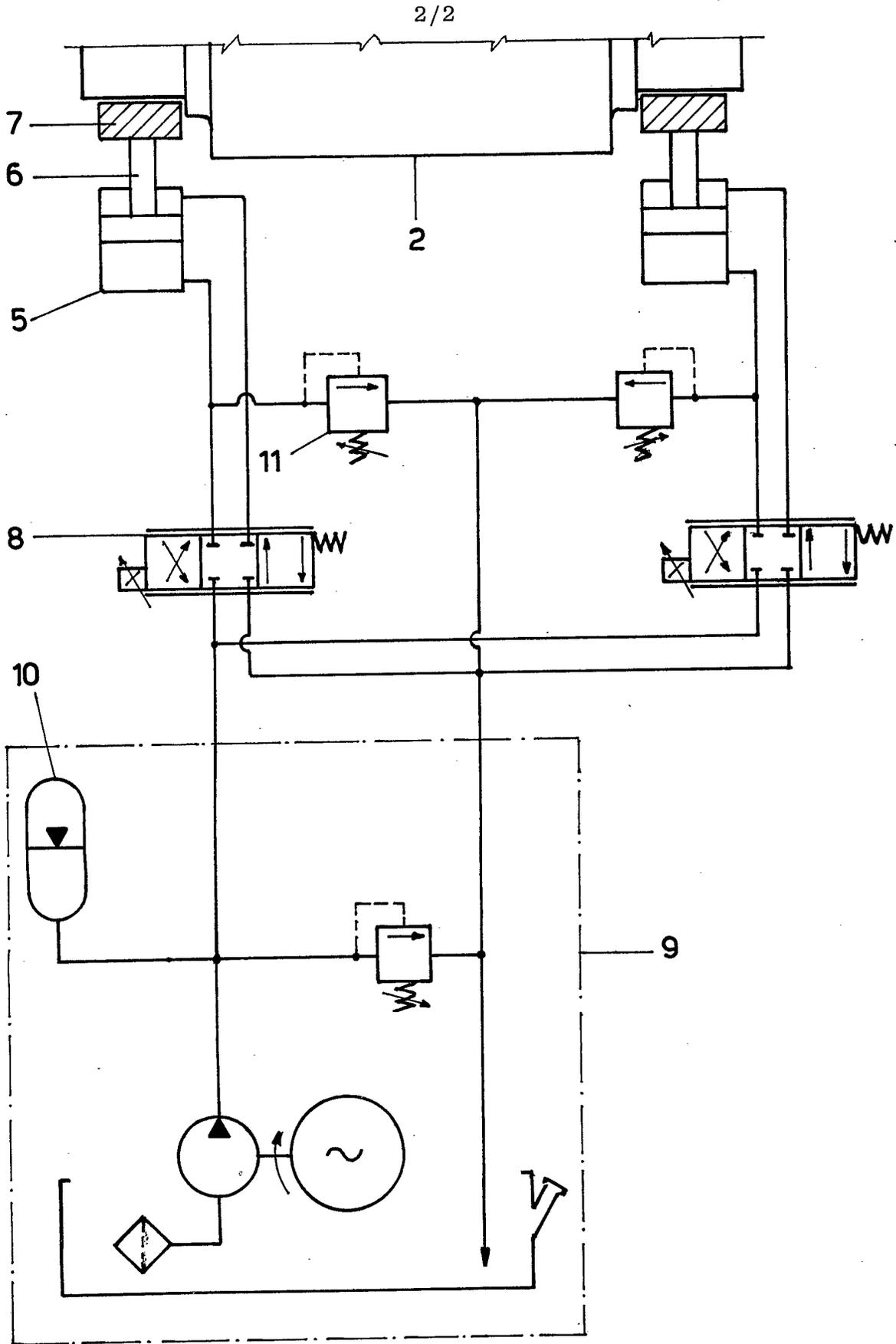


Fig.2

SPECIFICATION

A control arrangement in a machine comprising a roller

5

This invention relates to a control arrangement for the adjustment or displacement of a roller in a machine such as a roller mixer.

Roller mixers are used in a known manner both for rubber and also for plastics, and, in order to adapt the device to the operating parameters, the roller nip has to be adjusted by displacing one of the rollers, referred to for identification as the front roller.

With present practice, the front roller is merely displaced mechanically with the use of adjusting screws which act independently on two supports of the roller and which are operated by an operator manually or with the use of electromotors with reduction gearing, in order to change the position of the roller and to adapt the roller nip.

Arrangements of this type have some disadvantages as far as their operational efficiency is concerned and as regards operating the machine without damaging it.

A first disadvantage of conventional arrangements of this type lies in the slow adjustment of the front roller, particularly when the adjustment is made manually. Even when geared motors are used the speed of adjustment does not correspond to the technical theoretical data seeming to be appropriate, unless it is acceptable for the motors and associated gears to be oversized which leaves the operator too little room in which to work.

A second disadvantage which has still not been overcome in the case of conventional machines is that the front and rear rollers do not remain parallel to each other during adjustment because, in the case of manual adjustment, the two screws are actuated in succession so that from the start to finish of the adjustment the two operating rollers remain out of line which can have adverse effects on both the process and the machine, particularly when the roller nips concerned are very small. Thus it may easily happen that the operator will allow the two rollers to contact one another at one of their ends. This can easily lead to the rollers jamming, the roller material being distorted or even to the rollers breaking.

When geared motors which are not mechanically coupled together are used for the displacement it is highly unlikely that the advance can be effected exactly equally for both supports of the roller because the load of the two motors cannot be identical. There are two reasons for this: firstly, the transverse load for working the charge is not equal along the rollers because of its uneven distribution on the two supports, and secondly the friction and the clearances of the two adjusting mechanisms are unequal because the two systems are treated differently or are affected by dust, or because the lubrication is uneven. Under such circumstances it is only possible to achieve a precisely accurate adjustment of the rollers when the roller is precisely adjusted after being displaced, by the use of one of the geared motors.

A third disadvantage, relating to the operational reliability of the mixer, lies in the difficulty of being able to make the adjustment to the minimum roller nip. In conventional arrangements the adjustment to the minimum nip or position is left entirely to the operator, so that any error made during the operation may lead to contact between the rollers, with the result that their working surface is damaged or the roller over-load protection systems are destroyed. In some cases the rollers may even be broken.

Another disadvantage is that, in an emergency, there is no possibility of moving the rollers apart from one another quickly. According to accident prevention regulations, in the case of an unforeseen event or accident the displacement of a safety rod should produce immediate blocking of the roller mechanism after a turn not exceeding one radian, after which the rollers should be turned back by approximately one radian and then finally brought to a halt. It is easy to see that this sequence of turning movements does not guarantee the release of a victim who may be caught between the rollers, since this can only be brought about by increasing the roller nip and this is a lengthy process.

According to the present invention there is provided, in a machine comprising a roller mounted in a respective support at each end, a control arrangement for displacing the roller, the control arrangement comprising a respective fluid-operated cylinder and piston unit acting on each support, pressure medium being supplied to each cylinder and piston unit from a pressure medium supply system through a respective relay valve which is controlled by an electronic control and drive unit.

Embodiments in accordance with the present invention make it possible for the roller to be displaced extremely accurately and rapidly, which means that a manual control movement made by the operator is no longer required. This exact adjustment or positioning is ensured at both ends of the roller which means that, at all times, the two rollers remain parallel, even during the adjusting movement.

In a preferred embodiment a novel control device serves the purpose of ensuring that the mixer will also be opened quickly, even during a power failure.

For a better understanding of the present invention and to show how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which;

Figure 1 shows a perspective view of one end of a roller mixer; and

Figure 2 is a hydraulic circuit diagram representing a control circuit for the mixer of *Figure 1*.

The roller mixer shown in *Figure 1* comprises a fixed frame supporting front and rear mixer rollers 2 and 3 in a rotatable manner.

The front roller 2 has at each end (only one is shown in *Figure 1*) a control unit 4.

It is evident from *Figure 2* that the control unit comprises an adjusting hydraulic cylinder 5, the cylinder part and piston part 6 of which are fixed respectively to the frame 1 of the mixer and with a support 7 of the roller 2. The ends of the roller 2 shown diagrammatically in *Figure 2* are arranged

between the supports 7.

Each cylinder 5 is supplied with pressure medium from a pressure medium supply system 9 through a control or relay valve 8. These relay valves 8 and 5 other components of the hydraulic circuit are indicated in Figure 2 by conventional symbols. The supply system comprises a central hydraulic unit of known design having a tank, an inlet filter, an inlet duct, an electrically driven pump, a pressure line and 10 also an adjustable pressure relief valve; furthermore, the system includes a gas pressure accumulator 10 which provides a constant pressure value in the pressure lines and also provides the hydraulic power level necessary to open the rollers quickly 15 during a power failure.

The outer hydraulic circuits of the central unit 9 comprise in addition to the two relay valves 8 and the two cylinders 5, two adjustable pressure relief valves 11 which serve the purpose of letting out the 20 pressure medium when the roller pressure between the rollers exceeds a certain value and so as to allow the operating rollers of the mixer to move away from each other. In this way it is possible to dispense with other, mechanical, over-load safety devices associated with the mixer including, in particular, discs. In 25 existing mixers such devices are essential for protecting the rollers against out-of-the-ordinary loads, such as may be caused for example, by foreign bodies which can fall between the rollers without 30 warning.

The relay valves are controlled by a small electronic unit which adjusts the spacing between the mixer rollers continuously and provides a digital indication of the instantaneous values, the distance being 35 picked up by linear transducers or emitters. This allows a very precise adjustment and also a very fast rate of displacement.

It will be appreciated that the arrangement as described eliminates all the disadvantages mentioned above which occur in conventional installations. 40

In fact, the electronically controlled rate of displacement may be increased or reduced to a desired value for which reason the pump output is oversized, 45 i.e. is greater than is normally required.

As the advance of the movable roller is continuously controlled by the electronic unit, it ensures complete parallelism of the displacement, the extent of which is identical at both ends of the roller. This 50 means that the final position, which is determined by the electronic unit and not by the operator whose function is limited to feeding the required value of the displacement into the electronic component, is more exact.

A further advantage of the arrangement described lies in the possibility of putting a lower limit value for the roller spacing into the electronic component, which finally determines the maximum closeness of the rollers. 55

A further advantage lies in the possibility of controlling the operating cycle following predetermined parameters or following signals coming from an outside process controller. Finally, to produce an emergency command to open or swing back the 60 front roller quickly, the gas pressure accumulator 10

may be connected into the supply circuit of the pressure medium relay-valves.

The arrangement is also equipped with devices for opening the rollers when there is a power failure, 70 which, because they are known per se, are not shown and which have an electronic control component with its own battery so that at the given time the relay-valves 8 are brought into the appropriate position for opening the front roller. The electronic 75 component is not represented or described in detail because it is known per se. It will be appreciated that it is provided with all the necessary features to ensure the desired course of operation.

Although the arrangement has been described as 80 acting only on the roller 2, it could alternatively act only on the roller 3.

CLAIMS

85 1. In a machine comprising a roller mounted in a respective support at each end, a control arrangement for displacing the roller, the control arrangement comprising a respective fluid-operated cylinder and piston unit acting on each support, pressure 90 medium being supplied to each cylinder and piston unit from a pressure medium supply system through a respective relay valve which is controlled by an electronic control and drive unit.

2. A control arrangement in a machine as 95 claimed in claim 1, in which the roller is one of a pair of cooperating rollers.

3. A control arrangement in a machine as claimed in claim 2, in which pressure relief valves are provided which relieve the pressure medium to 100 allow the rollers to move apart from each other if they are overloaded.

4. A control arrangement in a machine as claimed in any one of the preceding claims, in which emergency control means is provided for operating 105 the relay valves to cause the rollers to move apart from one another.

5. A control arrangement in a machine as claimed in claim 4, in which an emergency power source is provided for operating the emergency control means and the electronic control and drive unit in the event of a power failure. 110

6. A control arrangement as claimed in any one of claims 1 to 3, in which a pressure accumulator is provided in the pressure circuit supplying the relay 115 valves.

7. A control arrangement in a machine as claimed in any one of the preceding claims, in which 120 the electronic control and drive unit includes devices for controlling the speed of displacement of the roller.

8. A control arrangement in a machine as claimed in any one of the preceding claims, in which the machine is a roller mixer.

9. A control arrangement in a machine as 125 claimed in any one of the preceding claims, in which each cylinder and piston unit is a hydraulic unit.

10. In a machine comprising a roller, a control arrangement substantially as described herein with reference to, and as shown in, the accompanying drawings.

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1982.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.