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E. CAVALIERI

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HYDROPNEUMATIC DRIVE AND HYDRAULIC PRESSURE CONTROL DEVICE

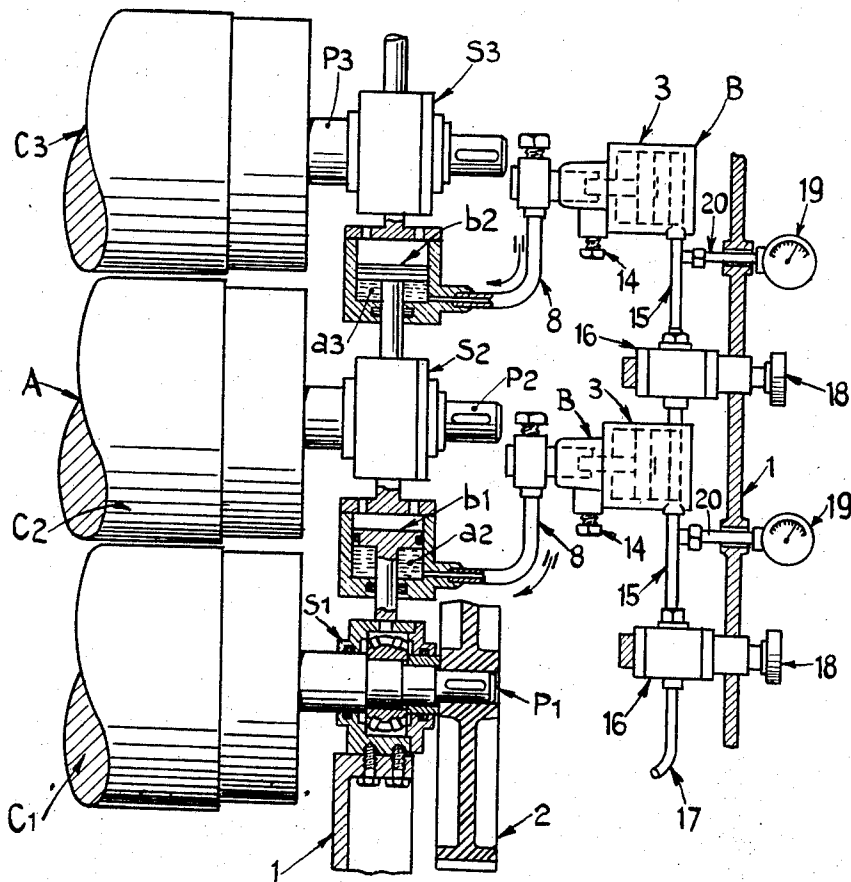
FOR THE JOURNALS OF ROLLS' NECKS IN CHOCOLATE

MILLING AND REFINING MACHINES

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Sheet 1 of 2

*Fig. 1*



INVENTOR.  
EMILIO CAVALIERI  
BY *Ralph W. Kalish*  
ATTORNEY

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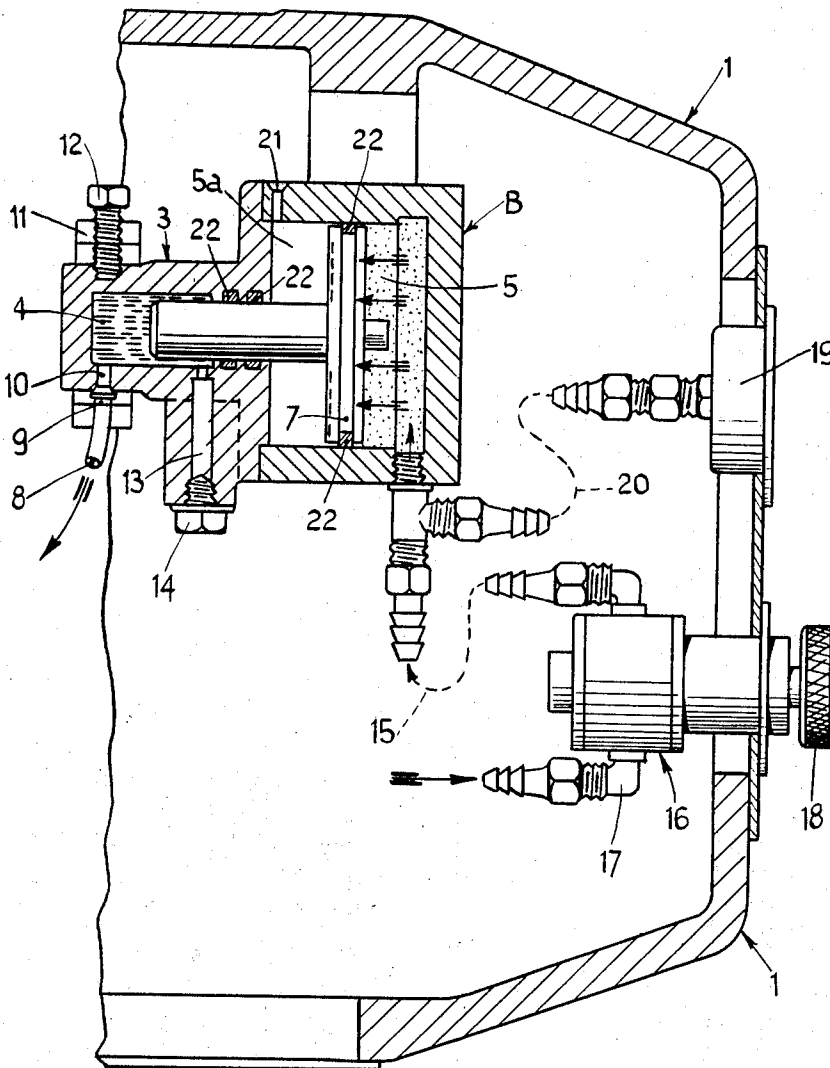
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*Fig. 2*



INVENTOR.  
EMILIO CAVALIERI  
BY *Ralph W. Kalish*

ATTORNEY

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## HYDROPNEUMATIC DRIVE AND HYDRAULIC PRESSURE CONTROL DEVICE FOR THE JOURNALS OF ROLLERS' NECKS IN CHOCOLATE MILLING AND REFINING MACHINES

Emilio Cavallieri, Via Neera 39, Milan, Italy

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### ABSTRACT OF THE DISCLOSURE

A refining machine having a plurality of rollers arranged in parallel relationship and provided with end journals received within related bearings, there being hydraulic means connected to said bearings for effecting adjust of the spacing between said rollers, and a hydro-pneumatic control device associated with said hydraulic means for regulating the pressure therein.

### BACKGROUND OF THE INVENTION

This invention relates in general to refining machines and, more particularly, to means for adjusting the spacing between the machine rollers.

Heretofore refining machines, such as used in the chocolate industry, customarily utilized a pump-type body for creating pressure within the hydraulic cylinders associated with the roller bearings, said pump-type bodies being adapted to supply hydraulic fluid thereto under a specified pressure. Said pump-type bodies incorporated acting upon the hydraulic fluid therein which was substantially constituted of a threaded stem and having a hand wheel mounted on the exterior portion for facilitating manual pumps driven by electric delivering hydraulic fluid under predetermined pressure to the hydraulic cylinders.

The hand wheel-type operated pump body has several marked disadvantages, such as requiring direct hand drive for creating necessary pressure upon the fluid with attendant substantial effort for effecting such piston movement, which means do not have the desired rapidity of operation so that undo time is required in effecting the requisite pressurization of the fluid.

In the motor-driven pump system, the hydraulic fluid is continually moving through the lines at a relatively high pressure such as between 80 and 100 atmospheres, which lines lead from the pump to reduction valves, liquid cylinders, reservoirs, filters, and vents for return to said pump. This system incorporates parts which are given to relatively rapid wear; which require extensive sealing to render the same oil-proof; and which systems also call for continuous supervision with frequent servicing.

In the present invention, there is provided a hydro-pneumatic device having a hydraulic fluid chamber connected to the hydraulic cylinders associated with the machine rollers and an air chamber; there being a two-part piston provided within said device so that one portion thereof, within the air chamber is acted upon by air under a relatively low pressure such as in the order of 3 to 4 atmospheres which air has been supplied from a relatively high pressure source, and with the other portion of said piston being of reduced cross section and acting upon the hydraulic fluid in said other chamber so that fluid delivered to said cylinders will be under relatively increased pressure.

With the present invention, another object is the provision of an air compressor which may be driven only for a limited period of time for creating the requisite pressure for the system.

Another object of the present invention is to provide a hydro-pneumatic device of the character stated which during operation does not require continual motion of the component elements, so that wear and tear is substantially eliminated.

It is another object of the present invention to provide a device of the character stated which produces substantial economies in operation; which permits of the use of but a single air compressor for a multiplicity of machines, so that the same are fully serviceable in factories having a centralized air system.

It is a still further object of the present invention to provide a device of the character stated which renders the associated machines and incorporated systems markedly safer than systems heretofore known.

FIGURE 1 shows a partial front view (with parts in section) of a refining machine incorporating a hydraulic-fluid pressure control device constructed in accordance with and embodying the present invention.

FIGURE 2 is an enlarged view, being partially in section, of the hydraulic-fluid pressure control device shown in FIGURE 1.

### Description of the preferred embodiment

Referring now by reference character to the drawing which illustrate the preferred embodiment of the present invention, A generally designates a refining machine, as used in the manufacture of chocolate using a stationary frame 1, conventional gearing 2 driven by a prime mover (not shown), and a plurality of customary rollers or cylinders C1, C2, C3, etc. The ends of each of said rollers C1, C2, C3 are each provided with necks P1, P2, P3, etc., each of which is journaled within a bearing S1, S2, S3 respectively. Said bearings S1 and S2 have matted upon their upper end the lower end of a piston b1, b2, respectively, the upper ends of which are received within cylinders a2, a3 respectively which cylinders are secured to the under surfaces of bearings S2, S3 respectively. The foregoing components constitute a hydraulic fluid system of the type shown in United States Patent No. 2,992,866, granted July 18, 1961.

B generally designates a control device associated with each cylinder a2, a3 and being in communication therewith through conduits 8 for pressurizing the hydraulic fluid therein. Said control devices chamber 4 which fluid is directed through said conduits 8 for impingement against the underface of the related piston b1, or b2, as the case may be for causing rollers C2 and C3 to be moved toward each other for altering the gap therebetween. Thus, each device B comprises a body incorporating said hydraulic liquid chamber 4 and an air chamber 5 within which are snugly received, coaxial pistons, 6, 7 respectively; said piston 7 being of greater diameter than said piston 6, with said chambers 4 and 5 being of commensurately different cross section. Movement of piston 6 axially within chamber 4 will force hydraulic liquid therein from said chamber under relatively high pressure through the associated conduit 8 for delivery to the associated hydraulic cylinder a2, a3 as the case may be. Chamber 4 is connected to its respective conduit 8 through a duct 10 which latter is engaged to a nozzle 9 presented at the inlet end of conduit 8; said nozzle 9 being maintained in operative position by a set bolt 12 threadedly received within a collar 11 in the upper wall of said chamber 4.

Referring now to FIGURE 2 of the drawings, 13 designates a liquid supply duct having one end in communication with the interior of hydraulic liquid chamber 4 and the other end being adapted for closure by a bolt 14; said duct 13 thus permitting of each of supply of hydraulic fluid to said chamber 4 and withdrawal of the same therefrom.

The differential in diameter between piston 6 and 7, operating within their respective chambers 4, 5, is critical in the operation of the present invention, as the same allows for the development of a relatively high hydraulic pressure within chamber 4, despite a relatively low air pressure within chamber 5 operating against piston 7. The increase in pressure is directly proportional to the ratio of the square of the radii of said piston 6, 7. Air from a convenient source as through an air compressor or any other suitable source of pressurized air is directed therefrom through a duct 17 into a pressure reducer 16 from which latter air flows through a passage 15 to air chamber 5 of body 3. The air delivered to said air compressor may be relatively high as in the order of 80 to 90 atmospheres. Pressure reducer 16 is controlled by a hand wheel 18 which limits the amount of air passing from duct 17 to chamber 5 by way of duct 15. The service pressure of the system is controlled through a pressure gauge 19 which is in communication with duct 15 by tubing 20, whereby the pressure directed to chamber 5 may be regulated. By the operation of such system the pressure of the air delivered to chamber 5 is relatively low such as in the order of 3 to 4 atmospheres.

The portion 5a of chamber 5, that being the portion thereof proximate chamber 4, is provided with an exhaust duct 21 for discharge of any air pressure developed therein. Each piston 6, 7 is provided with suitable packing rings, as at 22, to assure a tight seal within the respective chambers 4, 5 so as to prevent the unauthorized escape of liquid or air respectively therefrom.

In operation, said pressure 16 controls the amount of incoming air from a compressor or other source for feeding air through duct 15 into chamber 5 at a relatively reduced pressure. The air pressure acting upon piston 7 will force same to move toward chamber 4 causing piston 6 to move axially within chamber 4 in exerting a proportionately higher pressure upon the hydraulic liquid therein. The hydraulic liquid is directed from chamber 4 through duct 10, nozzle 9, and into conduit 8 for flow into the related hydraulic cylinder a2, a3, as the case may be, for acting upon the related piston b1, b2 so as to bring about the desired spacing between cylinders C2 and C3. The operator may control the pressure of the air entering chamber 5 by suitable manipulation of hand wheel 18 as such may be indicated from a reading of pressure gauge 19 and thereby control the related pressure within hydraulic cylinders a2, a3.

It should be understood that changes and modifications in the formation, construction, and arrangement and combination of the several parts of the hydropneumatic drive and hydraulic pressure control device for the journals of rolls' necks in chocolate milling and refining machines may be made and substituted for these herein shown and described without departing from the nature and principle of my invention.

What is claimed as new, and it is desired to be protected with a patent, is as follows:

1. A machine of the character described comprising a plurality of rollers arranged in axially parallel relation-

ship, bearings within which the end portions of said rollers are journaled, means for effecting rotation of said rollers, means for adjusting each roller toward and away from the adjacent roller, said adjusting means comprising a different hydraulic cylinder and piston located between and connecting the bearings of each adjacent pair of rollers, the hydraulic cylinder being functionally integral with the bearing of one roller of the pair and the piston being functionally integral with the bearing of the other roller of the pair, a device for controlling the pressure of the hydraulic liquid therein, said device comprising a body having a hydraulic liquid-receiving chamber and an air chamber, conduit means connecting said hydraulic liquid-receiving chamber and the related hydraulic cylinder, said air chamber having a greater cross section than said hydraulic liquid-receiving chamber, a piston disposed in said body for movement axially thereof, said piston having a first portion disposed within said hydraulic liquid-receiving chamber and a second portion disposed in said air chamber, a source of air under pressure, a pressure reducing member, means connecting said source of air and said air pressure reducing member, and means connecting said air pressure reducing member and the air chamber of said device whereby upon impingement of air against said second piston portion said first piston portion will be caused to force hydraulic liquid into the associated hydraulic cylinder.

2. A machine of the character described in claim 1 and further characterized by sealing means provided in said device for preventing unauthorized flow of the respective fluids between said chambers of said device.

3. A machine of the character described as defined in claim 1 and further characterized by a hand wheel operatively mounted on said air pressure reducing member for regulating the amount of air passing therethrough, a pressure gauge, and conduit means connecting said pressure gauge to said air chamber of said control device.

4. A machine of the character described as defined in claim 1 and further characterized by said first piston portion defining an elongated stem having a cross section slightly less than the transverse extent of the related chamber, and said second piston portion defining an enlarged flat head of a radius considerably greater than that of said first piston portion whereby the diametral differentials will be productive of a substantial relative increase of the pressure operating against the hydraulic liquid with relation to the pressure of the air within said air chamber.

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MARTIN P. SCHWADRON, *Primary Examiner*.  
R. R. BUNEVICH, *Assistant Examiner*.

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