May 12, 1970 H. PETER 3,511,065

SEALING DEVICE

Filed May 10, 1968 2 Sheets-Sheet 1

Fig. 1

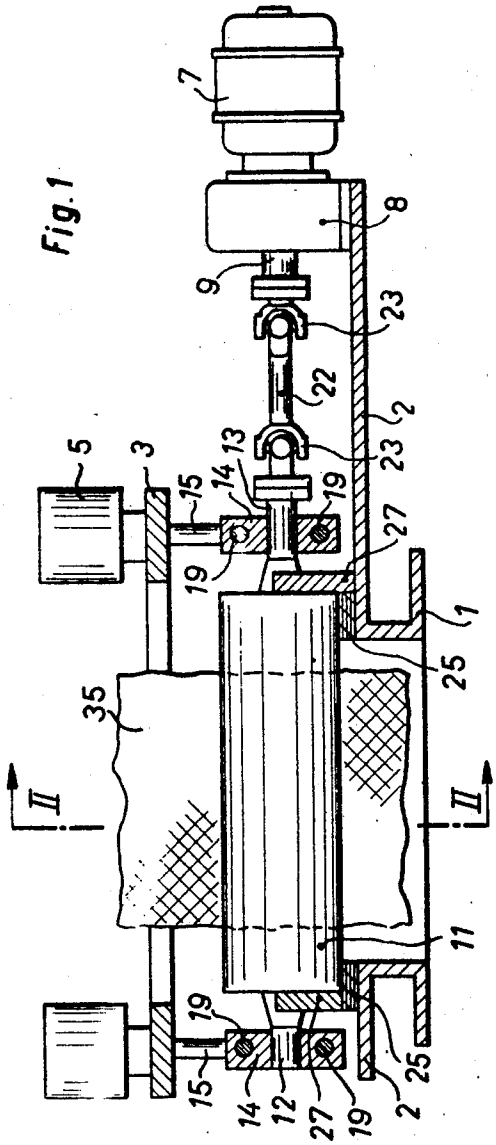

Fig. 3

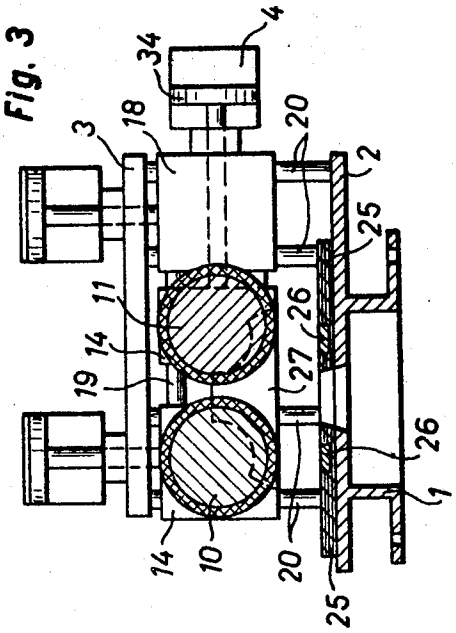

Fig. 2

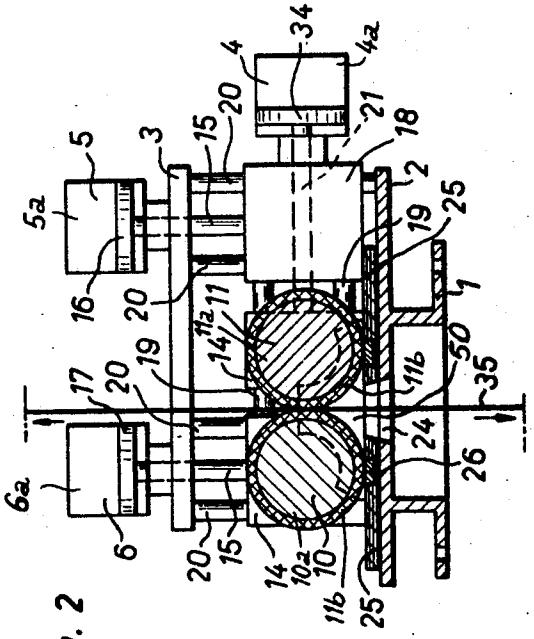

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Fig. 4

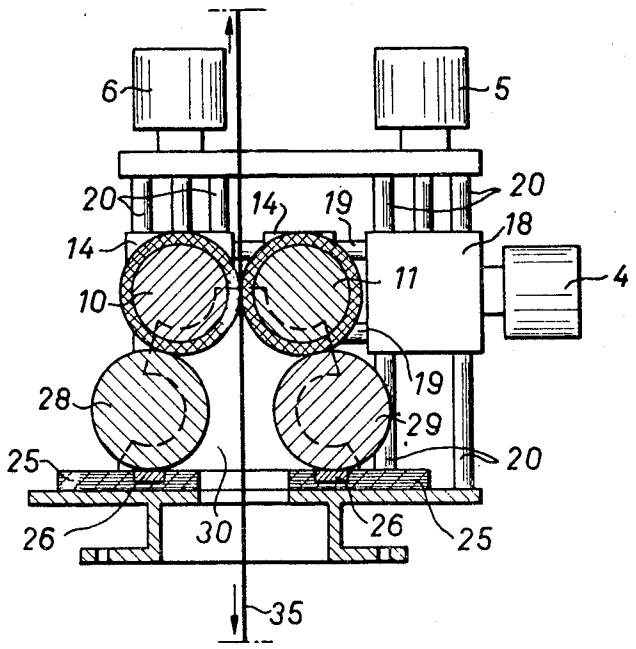
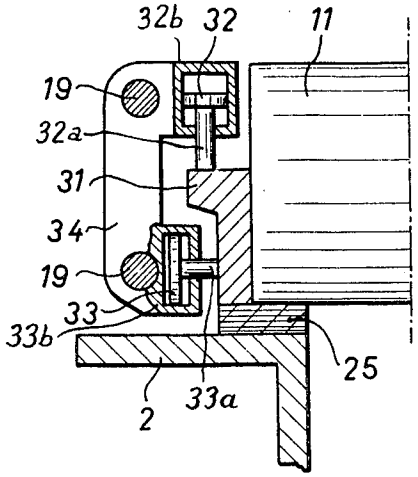


Fig. 5



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SEALING DEVICE

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U.S. Cl. 68—5 12 Claims

ABSTRACT OF THE DISCLOSURE

A sealing device for a web of material during its continuous passage through a pressure container, said sealing device comprising roller means which are rotatably mounted at a frame and which can be pressed against one another. These roller means are disposed at opposite sides of the web of material. Furthermore, such roller means are sealed, on the one hand, by plate members which cooperate with the end faces of said roller means, and, on the other hand, by means which bear with pressure against the outer surface of the roller means. The roller means can be urged directly or indirectly against support means which are fixedly secured to the frame means by utilizing the action of pressurized fluid medium actuated piston means. Thus, when the roller means are urged directly against the support means, the latter define the aforementioned bearing means, and when the roller means are urged indirectly against the support means there are further provided at least two additional rollers. Pressurized fluid medium actuated piston means serve to urge the roller means towards the fixedly secured support means, and at least one additional pressurized fluid medium actuated piston means serve to urge the roller means against one another. The pressurized fluid medium actuated piston means are utilized to selectively space the roller means from the support means.

Background of the invention

The present invention relates to a new and improved sealing device or apparatus for a web of fabric or cloth during its continuous passage through a pressure container or vessel, and is of the type incorporating roller members which are disposed to both sides of the web of fabric. These roller members can be pressed against one another and are rotatably mounted in a frame unit. Furthermore, these roller members can be sealed by plate members which cooperate with the end faces of the roller members and furthermore by means of suitable elements, as will be explained hereinafter, which bear under pressure against the surface of these roller members.

Webs of any suitable material, such as for instance, textile webs can be treated during continuous passage in such pressure containers, whereby these webs are processed, for instance, with saturated steam. It is known to those skilled in the art that the reaction time during fixing of colors or dyes and during bleaching operations is considerably shorter if the temperature of the saturated steam exceeds 100° C. However, this results in an overpressure existing in the container or vessel, so that special sealing problems arise.

Now, the selection of suitable sealing materials is quite limited for chemical and physical reasons. The materials which can be employed are not particularly resistant to wear and, therefore, possess a relatively short life span or longevity during operation.

Summary of the invention

Accordingly, it is a primary object of the present invention to provide an improved sealing device which exhibits a relatively long useful life, and further, insures for a positive sealing action and therefore also considerably contributes to the operational reliability of the system in which the sealing device is employed.

Another, more specific object of the present invention relates to an improved sealing device for a web of fabric during its continuous passage through a pressure container, which not only is extremely effective in carrying out its sealing function, but is constructed in such a fashion that the sealing elements can be easily replaced should they become worn, without necessitating the performance of complicated dismantling operations.

Still a further object of this invention relates to an improved sealing device wherein the sealing locations can be quickly and easily cleaned should it be necessary, for instance, to convert to a different type of treating process.

Yet a further significant object of the present invention relates to an improved sealing device of the type described which renders it possible to quickly and simply replace worn-out sealing elements without undertaking any cumbersome and time consuming dismantling of the machine.

Now, in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the inventive sealing device is manifested by the features that the roller members can be pressed directly or indirectly against support means which are stationarily or fixedly secured at the frame unit of the machine, by utilizing pressurized fluid medium actuated piston means, and further at least one pressurized fluid medium actuated piston means serves to press the roller members against one another. The pressurized fluid medium actuated piston means serve to space the surface or jacket of the roller members from the support means and from one another.

By pressing the roller members in sealing fashion, directly or indirectly, against the support means which are fixedly secured to the frame unit, and owing to the further pressing of the roller members against one another at both sides of the web which is to be treated and continuously transported—this pressing of the roller members in the aforedescribed fashion taking place by the action of the pressurized fluid medium actuated piston means—it is possible to not only optionally vary the contact or bearing forces but also the roller members can easily be displaced in another direction away from the contact or bearing locations. The pressurized fluid medium, which for instance can be air or a suitable liquid, serves to easily displace the roller members. The spacing or removal of the roller members from their sealing locations can be used for inserting or removing the web of material as well as for cleaning the sealing locations, or also for exchanging the components which have been subjected to frictional wear.

Brief description of the drawings

The invention will be better understood, and objects other than those set forth above, will become apparent, when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings, wherein:

FIG. 1 is a schematic longitudinal sectional view through a preferred embodiment of inventive sealing device;

FIG. 2 is a cross-sectional view of the sealing device depicted in FIG. 1, taken along the line II—II thereof;

FIG. 3 is a cross-sectional view, similar to that shown

in FIG. 2, but depicting a different position for the roller means or members;

FIG. 4 is a cross-sectional view, similar to that shown in FIG. 2, but of a further embodiment of inventive sealing device; and

FIG. 5 is a variant of a detail of the sealing device shown in FIG. 1.

Description of the preferred embodiments

Referring now generally to the drawings, it is to be understood that the various embodiments of inventive sealing devices which have been shown, by way of example, are each secured to the upper end of an associated pressurized vessel or container, the latter having been conveniently omitted from the drawings in order to preserve clarity in illustration. The various sealing devices designed according to the invention serve for sealing the drive roller members for a web of material which is moving into or out of the associated pressurized vessel.

Each of the embodiments of inventive sealing device incorporates a stationary frame means or unit which is composed of the members **1** to **6**, as best shown by referring to FIG. 1. By inspecting this figure there will be seen that there has been provided a suitable drive means, for instance an electric motor **7** which is located at the stationary frame portion **2**, as well as a transmission unit **8** equipped with a suitable drive journal or shaft **9**.

Now in the first embodiment shown in FIGS. 1 to 3 inclusive, the sealing device incorporates two roller members **10** and **11**. As best seen by referring to FIGS. 2 and 3, these roller members **10** and **11**, include for instance a steel core **10***a* and **11***a*, respectively, and an elastic covering **10***b* and **11***b* respectively, for instance formed of a suitable elastomeric material such as rubber. The roller journals **12** and **13** are rotatably mounted in bearing block means **14**. Furthermore, the inventive device incorporates four piston rods **15**, each of which carry an associated piston member **16** or **17** which can be acted upon by a suitable pressurized fluid medium, such as air or an appropriate hydraulic medium. These piston members **16** and **17** are displaceably guided for raising and lowering movements in associated cylinders **5***a* and **6***a* respectively, which are stationarily or fixedly secured to the frame portions **5** and **6** respectively.

Now, each piston rod **15** of the two pistons **16** is attached to a bearing block **18** which, in turn, is operably connected with a respective bearing block **14** at each end of the sealing device, through the agency of two respective associated guide rods **19**, as best shown in FIG. 2. The piston rods **15** of the other two piston members **17** are secured to the further bearing blocks **14** which support the roller member **10**. Thus, by means of both piston members **16** and **17** the three bearing blocks **14** and **18** at each end of the device, as shown in FIGS. 2 and 3, together with the roller members **10** and **11**, can be raised and lowered along the associated columns **20**.

The bearing blocks **14** which support the roller member **11** are operably connected via a respective piston rod member **21** with an associated piston member **34**. This piston member **34** can be operated by means of a suitable pressurized medium, such as air or hydraulically. As shown in FIG. 2, the piston member **34** can be horizontally reciprocated back and forth in a cylinder **4***a* provided at the stationary frame portion **4**. Thus, the piston member **34** enables the roller member **11** to be moved along the guide rods **19** towards the other roller member **10** or away from the latter.

Furthermore, by means of the piston members **16** and **17**, both of the roller members **10** and **11** can be raised and lowered, and by means of the piston member **34**, the roller member **11** is only horizontally displaceable. In order to render possible these raising and lowering movements of the roller members **10** and **11** as well as the horizontal displacement of the roller member **11**, a suitable variable length Cardan or universal-joint shaft means **22** provided with two universal joints **23**, as best shown in FIG. 1, is located between each roller shaft **13** and the drive shaft **9**.

Sealing of the roller members **10** and **11** with respect to the non-illustrated pressure vessel or container takes place at its outer surfaces and its end faces. Thus, more specifically, the inventive sealing device is secured to the pressure vessel or container by means of the housing or frame portion **1**. Above this frame portion **1** the stationary frame portion **2** is provided with a slit **24**. Sealing plate means **25** are placed upon the stationary frame portion **2**. Rail-like wearing elements **26** are preferably exchangeably inserted in the sealing plate members **25**, although they could also be non-exchangeably inserted therein.

Now, in the lowered position of the roller members **10** and **11**, as shown in FIG. 2, these roller members bear in sealing fashion against the exchangeable wearing plates or members **26**. Furthermore, plate members **27** are provided for sealing the end faces of the roller members **10** and **11**. These plates members **27** likewise bear in sealing fashion against the sealing plate members **25**. Furthermore, it should be understood that the sealing bearing relationship or position of the sealing plate members **25** and the end plate members **27** against one another either can be undertaken in the manner shown at the right of FIG. 1 where the plate member **27** extends alongside of the associated sealing plate **25** down to the frame portion **2**, or else can be undertaken in the manner shown at the left of FIG. 1 where the end sealing plate member **27** bears upon the associated sealing plate **25**.

Turning attention now to the embodiment shown in FIG. 4, it will be understood that the same structural elements have been designated with the same reference numerals as applied in the previous embodiment of FIGS. 1 to 3. In this embodiment, however, there have been provided two additional rollers **28** and **29**. Furthermore, the end faces of the roller members **10** and **11** as well as the rollers **28** and **29** which are situated at one end are sealed by a common plate member **30**. As best recognized by referring to FIG. 4, the roller members **10** and **28** as well as the roller members **11** and **29** roll upon one another. These additional rollers **28** and **29** sealingly bear against wearing members **26** by means of their outer surface, preferably formed of steel, and such rollers are supported in suitable non-illustrated bearing blocks which can be raised and lowered together with the bearing blocks **14** and **18**, in the aforedescribed manner, by means of the piston members **16** and **17**. Furthermore, the rail-like, exchangeable insert members **26** can be formed of a rubber-elastic or elastomeric material. Since the outer surface or jacket of the additional rollers **28** and **29** is formed of steel in each instance, only a very slight wear occurs during the sealing sliding motion of the jacket surface at the wearing members or elements **26**.

Now, in FIG. 5 there is shown a variant of the sealing arrangement for the end faces or terminal sides of the roller members **10** and **11**. Here, a plate member **31** beams from above upon an associated sealing plate member **25**. The piston rods **32***a* and **33***a* of the piston members **32** and **33**, respectively, operatively engage with the plate member **31**, in the manner shown. The plate member **31** can be pressed in sealing fashion against the sealing plate **25** by means of the piston member **32** which is actuated or impinged by a suitable pressurized fluid medium, such as air or a hydraulic medium, and in similar fashion the piston member **33**, which is likewise actuated by an appropriate pressurized fluid medium, presses the plate member **31** in sealing fashion against the associated end faces of the roller members **10** and **11**. The cylinders **32***b* and **33***b* which slidably receive for reciprocal motion the associated piston members **32** and **33**, are located at a suitable yoke member **34** which is displaceably guided upon the horizontal guide rod means **19**. The yoke **34** is rigidly connected with the bearing block means **14** which supports the roller member **11**, so that

during horizontal displacement of the roller member **11** by means of its associated piston **34** no relative movement takes place at the sealing surfaces between the plate member **31** and the roller member **11**.

When a web of material **35** is inserted in the sealing device, such as the embodiment shown in FIGS. 1 to 3, the roller member **11** is displaced away from the roller member **10** by means of the associated piston member **34**, as shown in FIG. 3. The web of material **35** then moves downwardly, through the recess or slit **24** provided at the frame unit, and in to the non-illustrated pressure container or vessel. This web of material **35**, at its other end, extends upwardly into a likewise non-illustrated apparatus. It will be understood that the movement of the web of material **35** can take place not only downwardly but also upwardly, in other words, can move into the pressure vessel or container or can move out of the latter. Now, when the roller members **10** and **11** have assumed their sealing position they bear against one another, as shown in FIG. 2, and the web of material **35** is intermediate such roller members. Furthermore, by means of the piston members **16** and **17** the roller members **10** and **11** are pressed in sealing fashion against the wearing elements **26**, and the drive motor **7** drives the roller members **10** and **11** and thus the latter serve to transport or convey the web of material **35**. The end sealing plate members **27** (FIGS. 1 to 3) or the plate members **31** (FIG. 5) are likewise pressed in sealing fashion against the end faces of the associated roller members **10** and **11**. When the inventive sealing device is viewed in cross-section, for instance as shown in FIG. 2, for the embodiment thereof, it will be recognized that a substantially triangular-shaped hollow compartment **50** which extends over the entire length of the roller members **10**, **11** is formed between these roller members and the sealing plate members **25**. The pressure which prevails in the pressure vessel or container likewise exists in this triangular-shaped hollow compartment **50**. This pressure is sealed in the pressure gap between both the roller members **10** and **11** as well as in the pressure gap between the roller members **10** and **11** and their bearing locations defined by the wearing elements **26** as well as between the surface of the plate members **27** or **31** and the associated end faces of these roller members **10**, **11**.

Now in order to clean the sealing surfaces, for instance when the manner of treating the web is to be replaced by a different treatment with other means, then the roller members **10** and **11** are spaced from one another through the action of the piston members **16**, **17** and **34**, so that the sealing surfaces can be cleaned and, if desired, can be replaced. The lowering or raising and the horizontal displacement of the roller members **10** and **11** takes place quite simply by means of the driving components, **5***a*, **16** and **6***a*, **17** as well as **4***a*, **34**.

In the physical construction depicted in FIG. 5, any possible lengthwise expansion of the roller members **10** and **11** owing to heat, will be taken up by the plate members **31** which are resiliently pressed by means of the hydraulic or pneumatic fluid medium. Furthermore, it should be understood that by virtue of the piston means which are actuated hydraulically or pneumatically, it is possible to determine and vary, as desired or required, the sealing pressure in accordance with the internal pressure of the pressure container or vessel. The few sealing elements which are subjected to wear can be easily replaced by others.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto, but may be otherwise variously embodied and practiced within the scope of the following claims.

What is claimed is:

1. A sealing device for a web of fabric during its continuous passage through a pressure container comprising frame means, roller means mounted for rotation at said frame means and disposed at opposite sides of the web of fabric, plate means cooperating with the end faces of said roller means, means for bearing with pressure against the outer surface of said roller means, said bearing means including support means fixedly secured with said frame means, said plate means and bearing means acting upon said roller means to seal the latter, pressurized fluid medium actuated piston means for urging said roller means towards said fixedly secured support means, and at least one pressurized fluid medium actuated piston means for urging said roller means against one another, said pressurized fluid medium actuated piston means serving to space said roller means from said support means.

2. A sealing device for a web of fabric as defined in claim **1**, wherein said roller means include a pair of roller members which bear directly against said support means.

3. A sealing device for a web of fabric as defined in claim **2**, further including at least approximately vertical column means along which said pair of roller members are displaceably guided, in order to remove said roller members from contact with said support means, at least approximately horizontal column means along which there is displaceably guided at least one of said roller members in order to space both of said roller members from one another.

4. A sealing device for a web of fabric as defined in claim **1**, wherein said bearing means further include at least two rollers, said roller means including a pair of roller members bearing indirectly against said support means through the agency of said two rollers.

5. A sealing device for a web of fabric as defined in claim **4**, further including at least approximately vertical column means along which said pair of roller members are displaceably guided, in order to remove said roller members from contact with said two rollers, at least approximately horizontal column means along which there is displaceably guided at least one of said roller members in order to space both of said roller members from one another.

6. A sealing device for a web of fabric as defined in claim **1**, said roller means having at least their outer surface formed of an elastomeric material, said support means including substantially rail-like members which are fixedly and non-detachably secured to said frame means, said elastomeric surface of said roller means being pressed against said substantially rail-like members.

7. A sealing device for a web of fabric as defined in claim **1**, said roller means having at least their outer surface formed of an elastomeric material, said support means including substantially rail-like members which are fixedly but detachably secured to said frame means, said elastomeric surface of said roller means being pressed against said substantially rail-like members.

8. A sealing device for a web of fabric as defined in claim **1**, said bearing means further including rotatably mounted rollers possessing an outer metallic surface, each said roller means having an outer surface formed of rubber-like material which is pressed in sealing fashion against said rotatably mounted rollers, said support means being substantially rail-like members which are fixedly but detachably secured to said frame means, the outer surface of said rollers being pressable against said rail-like members.

9. A sealing device for a web of fabric as defined in claim **8**, wherein said outer metallic surface of said rollers is formed of steel.

10. A sealing device for a web of fabric as defined in claim **1**, further including substantially horizontal and vertical operating pressurized fluid medium actuated piston means operably engaging with said plate means which cooperate with the end faces of said roller means, in order to press said plate means against the end faces of said roller means and against said support means.

11. A sealing device for a web of fabric as defined in claim **10**, wherein said horizontal and vertical acting pres-

surized fluid medium actuated piston means comprises at least one pair of piston members which are operable in a respective direction, which is approximately 90° with resect to one another, said plate means including a respective plate member which is actuated by each pair of said piston members, a common yoke means, a respective cylinder provided for each piston member at said common yoke, each of said piston members being displaceably guided in one of said cylinder members.

12. A sealing device for a web of fabric as defined in claim **1**, further including drivable and variable length universal-joint shaft means with which said roller means are operably connected in order to raise, lower and radially displace said roller means.

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U.S. Cl. X.R.

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