Dec. 29, 1959 D. W. MacLEOD ET AL 2,918,905

DOOR CLOSURE FOR RUBBER MIXERS OR THE LIKE

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Fig. 1.

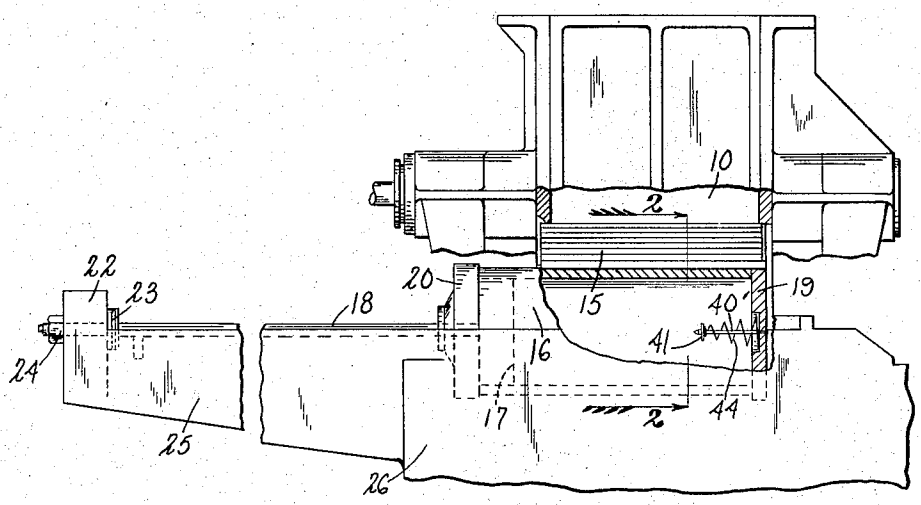
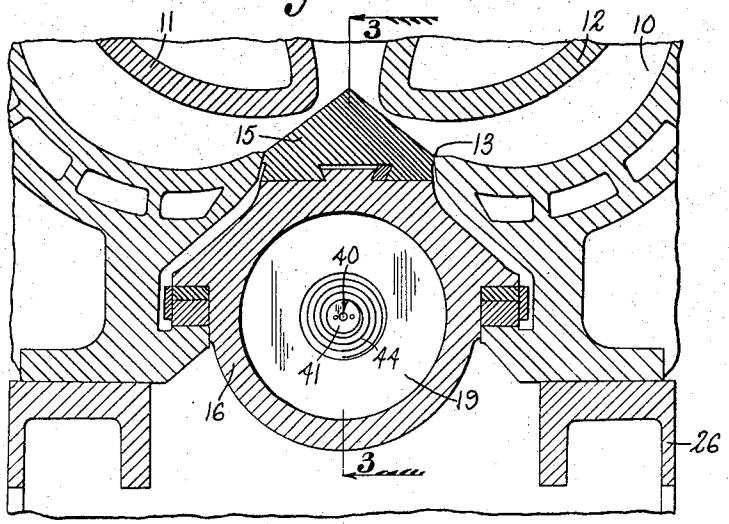


Fig. 2.



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Fig. 4.

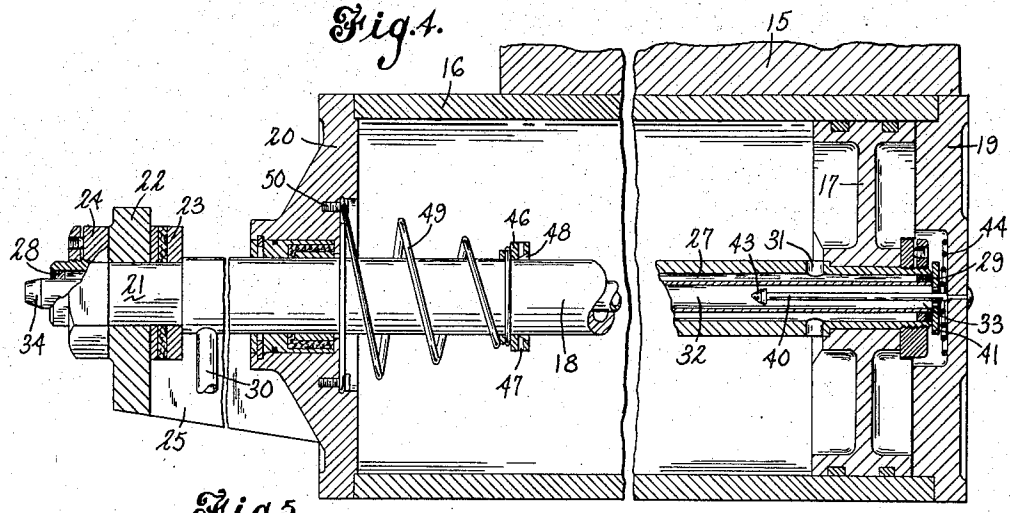


Fig. 5.

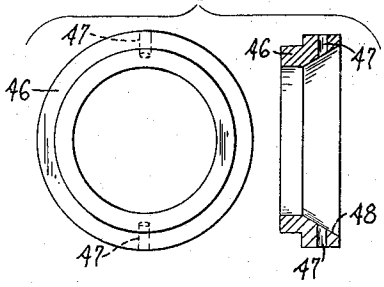


Fig. 3.

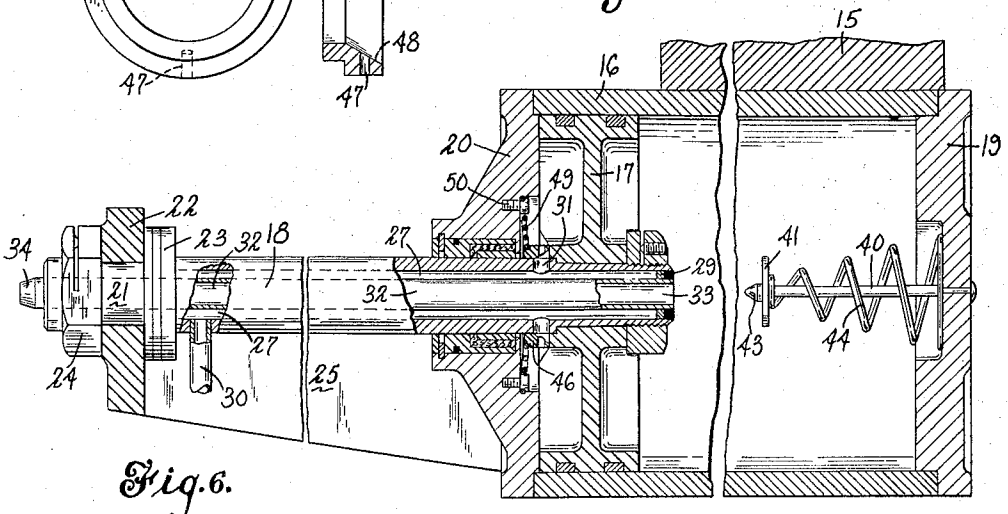
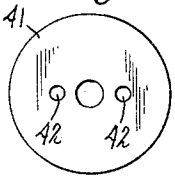


Fig. 6.



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DOOR CLOSURE FOR RUBBER MIXERS OR THE LIKE

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Application November 21, 1956, Serial No. 623,753

3 Claims. (Cl. 121—44)

This invention relates to improvements in door closures for mixers or masticators for rubber and other plastic materials.

In plasticizing and mixing various materials, such as rubber, for example, it is usual to employ a mixing device having a chamber within which is mounted one or more bladed rotors which are rotated to effect the mixing of the material. The mixing chambers of these devices are provided with a discharge opening and some type of closure member to effectively close the opening while the machine is in operation as relatively heavy pressures are developed within the mixing chamber and a tight closure if necessary if the material is to be confined without leakage.

In many instances this closure member consists of a sliding door and is power operated, usually by means of a piston and cylinder arrangement actuated by a fluid under pressure. As illustrated in the present drawings, the door or closure member is secured upon the cylinder and the piston rod is secured to the frame or base of the machine so that the cylinder will move relatively to the chamber and carry the door closure member with it.

In devices of this kind where the closure member is power operated, it sometimes occurs that the cylinder may stick or bind at either end of its stroke, and in that event the air pressure within the cylinder builds up until this binding force is overcome and then the door is actuated with undue and excessive speed. In some cases this speed has been so great that the cross bar to which the piston is secured or the bed plate which carries the cross bar has been broken by the impact of the stopping of the cylinder when such binding has occurred and resulted in excessive speed of operation of the door.

It is contemplated by the present invention to cushion or absorb the shock of the sliding cylinder at the end of its stroke, preferably at each end of the stroke, so as to overcome the shock of impact where for any reason such as that given above the speed of operation of the cylinder is excessive.

Also in order to prevent damage to the parts of the machine the door is normally operated at a relatively slow speed, the air pressure feed to the cylinder being purposely small for this reason. With the use of the present shock-absorbing means, however, larger than normal air valves and feed lines may be employed and the cylinder operated at a speed in excess of that employed heretofore, effecting a reduction in the overall time cycle in using the mixer.

As illustrated, the door is actuated by air pressure, and it is necessary to exhaust the air from one side of the piston when it is admitted to the other side to effect actuation of the door. According to the present invention check means are provided adjacent each end of the cylinder, which means restrict the effective size of the exhaust openings in that end of the cylinder so as to make the venting of the cylinder more gradual and, therefore, act as shock-absorbing means to slow down the movement of the cylinder near the end of its stroke and absorb the shock which would otherwise occur when the cylinder reaches the end of its movement.

These check members are in the form of closure or cover members which cover the exhaust or vent outlets from the ends of the cylinder and each is urged away from its respective cylinder head by a spring so that it will be held outwardly from the cylinder head in position to engage and restrict the vent outlet when the cylinder nears but before it reaches the end of its stroke, and also when so supported the cover or check member will be permitted to travel with respect to the cylinder during the remainder of its stroke.

One object of the present invention is to provide improved operating means for a sliding door closure member for mixers for rubber or other plastic materials.

Another object of the invention is to provide a fluid-pressure-actuated means for operating the door closure member of a mixer for plastic materials comprising a piston and cylinder provided with means for absorbing the shock of the impact of the piston against the cylinder adjacent the end of the stroke.

Still another object of the invention is to provide improved air-pressure-operated door closure means as above described wherein means are provided to restrict the vent opening of the cylinder adjacent the end of its stroke in order to absorb the shock of the impact of the cylinder at the end of its stroke.

A still further object of the invention is to provide door closure means of the character described above wherein air is admitted to one side and vented from the other side of the piston and spring-urged means is provided to engage over and limit the effective size of the vent opening when the piston nears the end of the cylinder.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a side elevational view, partly in section, of a rubber mixer embodying our invention;

Fig. 2 is a partial sectional view on line 2—2 of Fig. 1;

Fig. 3 is a sectional view on line 3—3 of Fig. 1, showing the piston adjacent one end of the door-operating cylinder;

Fig. 4 is a view similar to Fig. 3 showing the piston at the other end of the cylinder;

Fig. 5 represents a side view and sectional view of one of the check members; and

Fig. 6 is an elevational view of the other check member.

To illustrate a preferred embodiment of the invention there is shown in the drawings a rubber mixer or masticator of the Banbury type provided with a chamber **10** of the double-cylindrical type, and within each of the cylinders is mounted a rotor designated at **11** and **12** in Fig. 2. The chamber is provided with a bottom discharge opening **13**, which is closed by a sliding door closure member **15**, the upper surface of which is of substantially inverted V-shaped form so as to cooperate with the blades of the rotors, as the door is located midway between the cylinders of the mixing chamber.

As shown, the door **15** is rigidly secured to a cylinder **16** within which is a piston or piston head **17** secured to a piston rod **18**. The cylinder is closed at one end by the cover **19**, and at the other end by the cylinder head **20** through which the piston rod **18** extends. The outer end of the piston rod is somewhat reduced in size, as shown at **21**, and is secured to a cross bar **22** of the frame by a collar **23** and nut **24**. The cross bar **22** is supported by a bed plate **25** which is rigid with the frame or base **26** of the machine and which carries the chamber **10**.

Thus it will be seen that the piston is fixed against movement and introduction of fluid pressure such as air-pressure into either end of the cylinder will effect movement thereof and, as the door member **15** is fixed to the cylinder, movement of the latter will result in sliding opening and closing movements of the door.

As shown more particularly in Figs. 3 and 4, the piston rod **18** is hollow, having a through annular passage **27**. This passage is plugged or closed at its outer end, as shown at **28**, and at its inner end, as shown at **29**. A pipe or conduit **30** leads into the passage **27** at the outer end of the cylinder, and arrangements (not shown) are provided for connecting this pipe either to a source of air pressure or to the atmosphere so that the passage **27** may be supplied with air under pressure or vented as desired.

A pair of radial openings **31** are provided in the wall of the piston adjacent the inner end thereof, as shown more particularly in Fig. 4, so as to provide communication between the passage **27** within the piston rod and the cylinder at the left or head end of the piston **17**. Thus that portion of the cylinder to the left of the piston will be in communication with the passage **27** in the piston rod and will be either supplied with air under pressure or vented according to whether or not the pipe **30** is connected to a source of air pressure or to the atmosphere.

To supply air to the other end of the cylinder or the portion thereof at the right of the piston **17**, a pipe **32** is provided within the passage **27**, this pipe running entirely through the piston **18** but being smaller than the internal diameter of the piston so that the space **27** inside the piston is of annular form. The pipe **32** extends entirely through the piston and communicates at its inner end **33** with that part of the cylinder to the right of the piston and extends slightly from the piston rod at its other end, as shown at **34**, so that it may be connected with a source of fluid pressure or vented as desired.

It will be understood that suitable valve means is provided to supply fluid pressure to the pipes **30** and **32** and that when one of these pipes is connected to the source of air pressure, it will be understood that the other will be vented to the atmosphere so that when one end of the cylinder is placed under pressure, the other will be vented so that the cylinder may reciprocate upon the piston. As such valve means are of known construction and are not a part of the invention, a detailed showing thereof is unnecessary.

It will be seen that, if for any reason pressure builds up in one side or the other of the cylinder **16**, movement thereof at a resulting excessive speed might cause a considerable impact of the piston against one end of the cylinder with resulting damage as previously explained. Means are provided to absorb the shock of such an impact and to slow down the movement of the cylinder toward the end of its stroke. As shown, for example, in Fig. 3, the means at the cover or right-hand end of the cylinder comprises a stem **40** secured to the cover member **19** and projecting outwardly therefrom axially of the piston. Slidably mounted on this stem is a check member **41** of disk-shaped form having perforations or openings **42** therein. The stem **40** has an enlarged head **43** at its free end and a spring **44** normally holds the check member **41** in extended position at the end of the stem adjacent the head **43**. The spring **44** may be relatively weak as its principal function is to maintain the check member in extended position or against the end of the piston **27** when the latter moves toward the cover end of the cylinder.

If, when the parts are in the position shown in Fig. 3, air under pressure is admitted to the pipe **30**, this will be delivered to the left-hand end of the cylinder through the ports **31** and, as the right-hand or cover end of the cylinder will be open to the atmosphere or vented through the open end **33** of the pipe **32**, the piston will be caused to travel to the right as shown in the drawings. When

the end **33** of the pipe **32** reaches the check member **41**, it will be covered by the latter and the cylinder may only exhaust through the restricted openings or perforations **42** in the member **41**. As the piston continues its travel, the check member will be carried to the right on the stem **41** against the force of the spring **44** which will maintain the check member against the open end of the pipe until the parts reach the extreme position shown in Fig. 4. During this continued movement the spring will maintain the check member against the open end **33** of the pipe **32** and the movement of the cylinder will be retarded and the shock of any impact of the piston against the cover end of the cylinder will be absorbed.

Means are also provided to retard the movement of the cylinder and absorb the shock thereof at the other end of its stroke. This means comprises a cover ring **46** (Fig. 5) slidably mounted upon the piston rod **18**, this ring being adapted to cover the openings **31** when the piston is near the end of its stroke toward the head **20** of the cylinder. The ring is provided with radial openings **47** to provide restricted communication between the ports **31** and the cylinder so that, while venting of the cylinder will continue, it will be restricted so as to retard the movement of the cylinder. This ring may be provided with an inner bevel **48** so that the openings **47** will always communicate with the openings **31** even though the ring may be displaced circumferentially upon the piston.

The ring **46** is secured to one end of a helical spring **49** and the other end of this spring may be secured by screws **50** to the head **20** of the cylinder so that the spring normally holds the cover ring or check member **46** in an extended position away from the cylinder head, as shown in Fig. 4.

When the parts are in the position shown in Fig. 4 and air pressure is admitted to the pipe **32** through the end **34** thereof, this pressure will enter the cylinder at the right-hand end of the piston and, as the other side of the piston is open to exhaust through the openings **31**, the annular space **27** in the piston and pipe **30**, the cylinder will be caused to travel to the right, the piston in effect moving to the left. When the check member **46**, carried to the right by the cylinder **16**, covers the openings **31**, the venting of this end of the chamber will be restricted and can only occur through the restricted openings **47**. From this point on the motion of the cylinder will be retarded, and during this continued movement the check member **46** will be permitted to slide along the piston rod **18** while being held over the vent openings **31** by the spring **49**.

While we have shown and described one embodiment of our invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the claims.

What we claim is:

1. Operating means for a movable element, said means comprising a cylinder and a piston therein, one of which is fixed and the other connected to said movable element, the cylinder having a head at one end and an end wall at the other end, a piston rod connected to said piston and extending without the cylinder through the head thereof, a passage within said piston rod and extending through the inner end thereof to communicate with the cylinder on the far side of the piston, a second passage within said piston rod communicating with the cylinder adjacent the piston on the near side thereof through an opening in the wall of the piston rod, check means provided at each end of the cylinder to restrict the communication between said passages and the respective ends of the cylinder when the piston nears the ends of the cylinder in its movements, the check means at the end of the cylinder remote from the head comprising a stem secured to the inner face of the end of the cylinder and projecting thereinto, a check member slidably mounted on said stem and adapted to engage the inner end of the

piston rod and restrict the opening therethrough into the cylinder, and a spring surrounding said stem and acting between the end of the cylinder and said member to urge the latter toward the piston.

2. Operating means for a movable element, said means comprising a cylinder and a piston therein, one of which is fixed and the other connected to said movable element, the cylinder having a head at one end and an end wall at the other end, a piston rod connected to said piston and extending without the cylinder through the head thereof, a passage within said piston rod and extending through the inner end thereof to communicate with the cylinder on the far side of the piston, a second passage within said piston rod communicating with the cylinder adjacent the piston on the near side thereof through an opening in the wall of the piston rod, check means provided at each end of the cylinder to restrict the communication between said passages and the respective ends of the cylinder when the piston nears the ends of the cylinder in its movements, the check means at the head end of the cylinder comprising a ring slidably mounted on the piston rod within the cylinder and adapted to restrict the effective size of the opening through the wall of said rod, and a spring embracing said rod and connected at one end to the head and at the other end to the ring to hold the latter in place and urge it in a direction toward said opening.

3. Operating means for a movable element, said means comprising a cylinder and a piston therein, one of which is fixed and the other connected to said movable element, the cylinder having a head at one end and an end wall at the other end, a piston rod connected to said piston and extending without the cylinder through the head thereof, a passage within said piston rod and extending through the inner end thereof to communicate with the cylinder on the far side of the piston, a second passage within said piston rod communicating with the cylinder adjacent the piston on the near side thereof through an opening

in the wall of the piston rod, check means provided at each end of the cylinder to restrict the communication between said passages and the respective ends of the cylinder when the piston nears the ends of the cylinder in its movements, the check means at the end of the cylinder remote from the head comprising a stem secured to the inner face of the end of the cylinder and projecting thereinto, a check member slidably mounted on said stem and adapted to engage the inner end of the piston rod and restrict the opening therethrough into the cylinder, a spring surrounding said stem and acting between the end of the cylinder and said member to urge the latter toward the piston, and the check means at the head end of the cylinder comprising a ring slidably mounted on the piston rod within the cylinder and adapted to restrict the effective size of the opening through the wall of said rod, and a spring embracing said rod and connected at one end to the head and at the other end to the ring to hold the latter in place and urge it in a direction toward said opening.

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