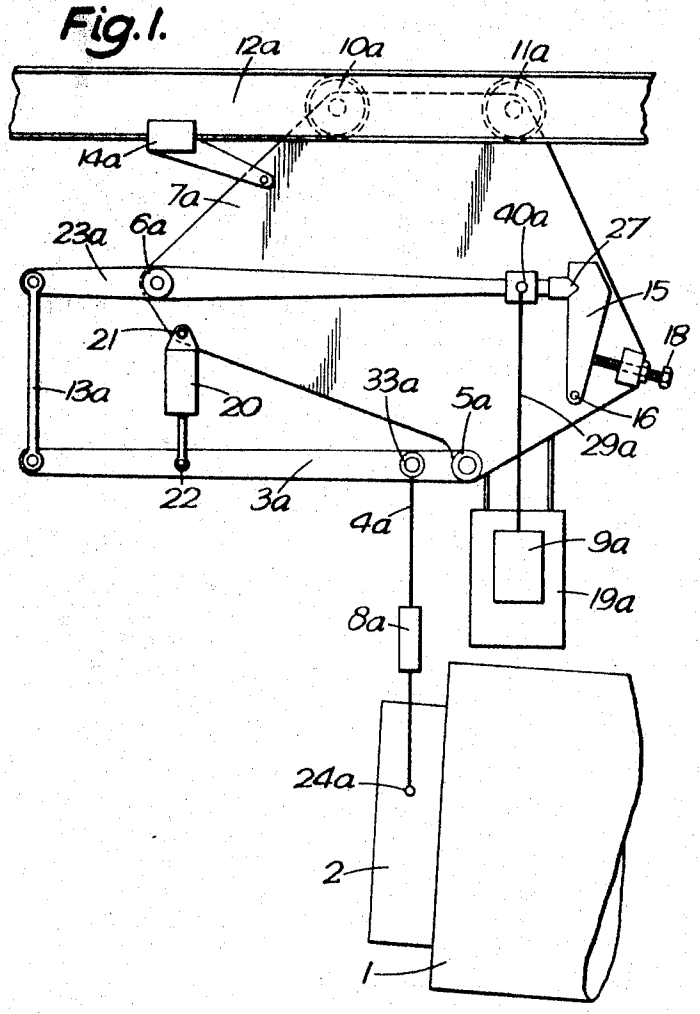
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SUSPENSION MEANS

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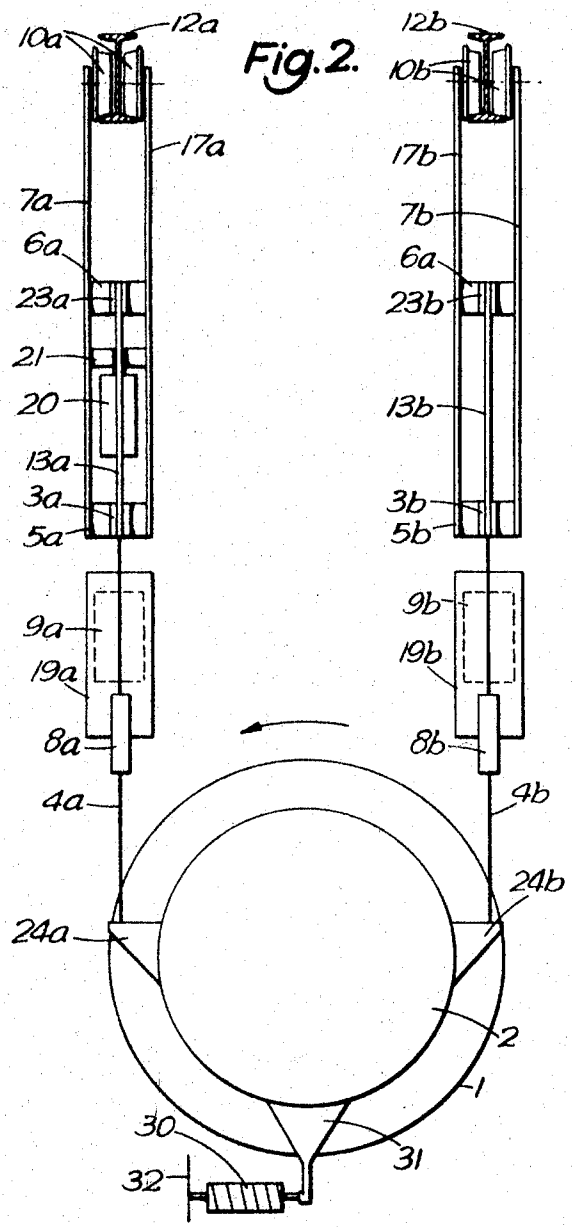
Fig. 1.



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Fig. 2.



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Fig. 3

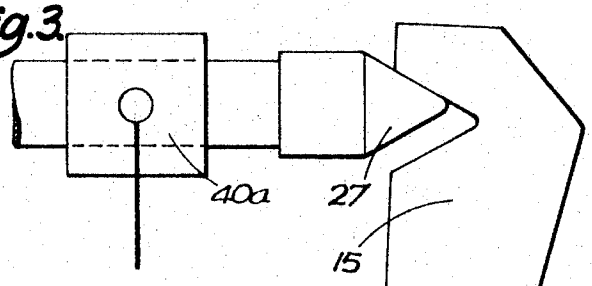
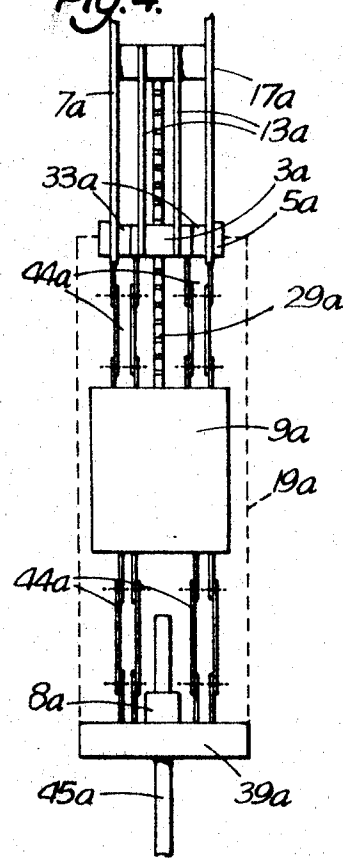


Fig. 4



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SUSPENSION MEANS

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Int. Cl. F27b *7/00;* F23m *7/00;* F16c *1/10*
U.S. Cl. 263—33 8 Claims

ABSTRACT OF THE DISCLOSURE

Suspension means for a non-rotating end cover for sealing a rotary kiln comprising a pair of levers, or lever systems, two frames for mounting the levers or systems respectively, means to mount each frame for horizontal movement along parallel paths whereby each lever or system may be moved individually with its respective frame, means for pivotally attaching an end cover at spaced locations on the cover to one end of each of the levers or systems respectively, and two counterbalancing means attached to the other end of each lever or system, the arrangement of the levers or systems being such that there is a mechanical advantage in favour of the counterweights.

This invention relates to the construction of suspension means for rotary kilns and similar rotary devices.

More particularly it is concerned with suspension means for supporting the stationary end cover or end box which seals one end of such a kiln or device and may be provided with means for feeding materials into the kiln or for removal of a product or products from the kiln, for instance evolved gases.

The effective seal between such an end cover and the kiln generally takes the form of a spigoted joint, one section of which is formed on the end face of the kiln and the other on the end cover, which is necessarily of massive construction.

Together with the necessary gas conduit means, or the like, an end cover may have considerable weight, for instance from four to eight tons.

So that the seal may be effective it is necessary that the height of the end cover may be adjustable within fine limits, and this setting be maintained during operation, while for other purposes, such as assembly and maintenance, larger controlled movement both vertically and longitudinally must also be possible. An automatically maintained pressure between the sealing surfaces of the kiln and the end cover is also desirable. Further, where the kiln is arranged at an angle to the horizontal an end cover may be held suspended at an angle to the vertical correspondingly.

The invention provides suspension means for a non-rotating end cover for sealing a rotary kiln comprising a pair of levers, or lever systems, two frames for mounting the levers or systems respectively, means to mount each frame for horizontal movement along parallel paths whereby each lever or system may be moved individually with its respective frame, means for pivotally attaching an end cover at spaced locations on the cover to one end of each of the levers or systems respectively, and two counterbalancing means attached to the other end of each lever or system, the arrangement of the levers or systems being such that there is a mechanical advantage in favour of the counterweights.

Preferably compound lever systems are employed.

Preferably also there are on the frames support means below the counterweights so that in the event of failure

of the means suspending the counterweights the distance the weights may fall is limited.

There may be means on each frame to lock or limit movement of the levers.

There may be chains or the like to connect the end cover to the levers, the length of which chains may be adjustable.

In one embodiment a damping device is provided on at least one of the systems to damp any sudden downward force applied to the system (e.g. when the kiln is rotated in a direction to produce such a downward frictional force on the end cover).

Preferably the mounting means for the frames comprise pulleys movable along horizontal parallel rails, and there may be means to lock each frame relative to its respective rail.

A specific example of suspension means for an end cover of a rotary kiln will now be described with reference to the accompanying drawings in which:

FIGURE 1 is a side view of the suspension means,

FIGURE 2 is an end view of the suspension means,

FIGURE 3 is an enlarged scrap view of the locking means for the levers, and

FIGURE 4 shows an alternative suspension for the counterweights.

In these figures, **1** represents a rotary kiln and **2** an end cover suspended at **24***a* and **24***b* by chains **4***a* and **4***b* from compound lever systems **3***a*, **13***a*, **23***a* and **3***b*, **13***b*, **23***b* respectively. The levers are pivotally mounted at **5***a*, **5***b* and **6***a*, **6***b* respectively between plate-like frame members **7***a*, **17***a* and **7***b*, **17***b*.

The chains **4***a* and **4***b* are provided with means **8***a* and **8***b* for adjusting their length and thus the height of the end cover **2** and its orientation about its centre.

The two sets of frame members carry paired rollers **10***a*, **11***a* and **10***b*, **11***b* which run upon rails **12***a* and **12***b* respectively, these rails being substantially horizontal and parallel.

Each lever assembly may be locked in position along its rail by an anchoring device, for instance **14***a* attached to the plate-like member **7***a*.

From the free ends of the levers counterweights **9***a* and **9***b* are suspended and their weight is adjustable by addition or removal of supplementary weights. So that the fall of a counterweight should be limited in the event of failure of its supporting chain each hangs freely within a framework (**19***a* and **19***b* respectively) which in turn is securely supported from the plates **7***a*, **17***a* and **7***b*, **17***b* respectively of the corresponding lever assembly.

An alternative method of suspending the counterweights is illustrated in FIGURE 4. In this embodiment the flexible connection **4***a* of FIGURES 1 and 2 between the lever **3***a* at **33***a* and one side of the end cover **2** at **24***a* is replaced by two chains **44***a* linked by a yoke **39***a* from which the connection extends downwards as a bar **45***a* with means **8***a* for shortening or lengthening the extension of the bar from the yoke. The base **14***a* is attached to the end cover at **24***a*.

The counterweight **9***a* is hung by the chain **29***a* from the free end of the lever **23***a*, the point of its suspension (**40***a* in FIGURE 1) from that lever being such that it is nearly vertically superimposed above **33***a*, the point of suspension of the main load (the end cover) from lever **3***a*.

The chains **44***a* pass through the counterweight **9***a*, which is suspended above the yoke **39***a*, and in the event of failure of the chain **29***a* the counterweight can fall only as far as the yoke.

For additional safety an enclosure **19***a* (shown in chained lines in FIGURE 4) may be built upon the yoke **39***a*.

When necessary, for instance if the end cover **2** is to be removed from contact with the kiln **1**, as for maintenance purposes, movement of the lever systems may be prevented entirely by setting an arresting means **15** to lock the free ends **27** of the levers (see FIGURE 3). When the anchoring means **14***a* is freed longitudinal movement along the rails of the while suspension system and the end cover **2** becomes possible without change in the vertical position of the cover and with complete safety.

For normal operation of the kiln, and once counterbalance of the end cover has been adjusted, the knife-edged ends **27** of the levers are released from the notched lever **15** and the levers are thus allowed freedom of movement. The movement can be inspected visually at all times. During fine adjustment of the counterbalance the notched levers **15** may be set as in FIGURE 3, to permit only limited movement of the ends **27** of the levers.

It is apparent that the end cover **2** may be arranged to hang with its bearing face at a desired angle to the vertical by choice of the positions **24***a* and **24***b* on its periphery. These may be adjustable by means not shown in the figures.

A hydraulic damping device **20**, coupled between the points **21** on the plate **7***a* and **22** on the lower lever **3***a* is arranged to restrict sudden downward movement of the lever **3***a* about the pivot **5***a*. Thus when the kiln is started from rest the additional frictional forces tending to rotate the end cover will not cause over-travel of spring-loaded means **30** coupled between **31** on the end cover and **32** on the kiln for the purpose of counteracting normal operational friction of the seal.

From the foregoing description and the accompanying figures it may be seen that a suspension means according to the invention has big advantages over conventional means comprising multiple pulleys and counterweights.

For instance, the invention enables the position of the end cover to be adjusted and maintained within fine limits, and for assembly, maintenance and repair work to be carried out without substantial alteration of adjustments previously made.

The invention also has advantages from the aspect of safety.

I claim:

1. Suspension means for a non-rotating end cover for sealing a rotary kiln comprising a pair of compound lever systems, two frames for mounting the lever systems respectively, means to mount each frame for horizontal movement along parallel paths whereby each lever system may be moved individually with its respective frame, means for pivotally attaching an end cover at spaced locations on the cover to one end of each of the lever systems respectively, and two counterbalancing means attached to the other end of each lever system, the arrangement of the lever systems being such that there is a mechanical advantage in favour of the counterweights.

2. Suspension means as claimed in claim **1** in which there is provided on each frame below its respective counterbalance means support means to limit the distance the counterbalance means may fall if the counterbalance means becomes detached from the system.

3. Suspension means as claimed in claim **1** in which there is means on each frame to lock or limit movement of the levers.

4. Suspension means as claimed in claim **1** in which there are flexible tension members connecting the end cover to the lever system.

5. Suspension means as claimed in claim **3** in which the lengths of the tension members are adjustable.

6. Suspension means as claimed in claim **1** in which a damping device is provided on at least one of the systems to damp any sudden downward force applied to the system.

7. Suspension means as claimed in claim **1** in which the mounting means for the frames comprise rollers movable along horizontal parallel rails.

8. Suspension means as claimed in claim **7** in which there is means to lock each frame relative to its respective rail.

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JOHN J. CAMBY, Primary Examiner

U.S. Cl. X.R.

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