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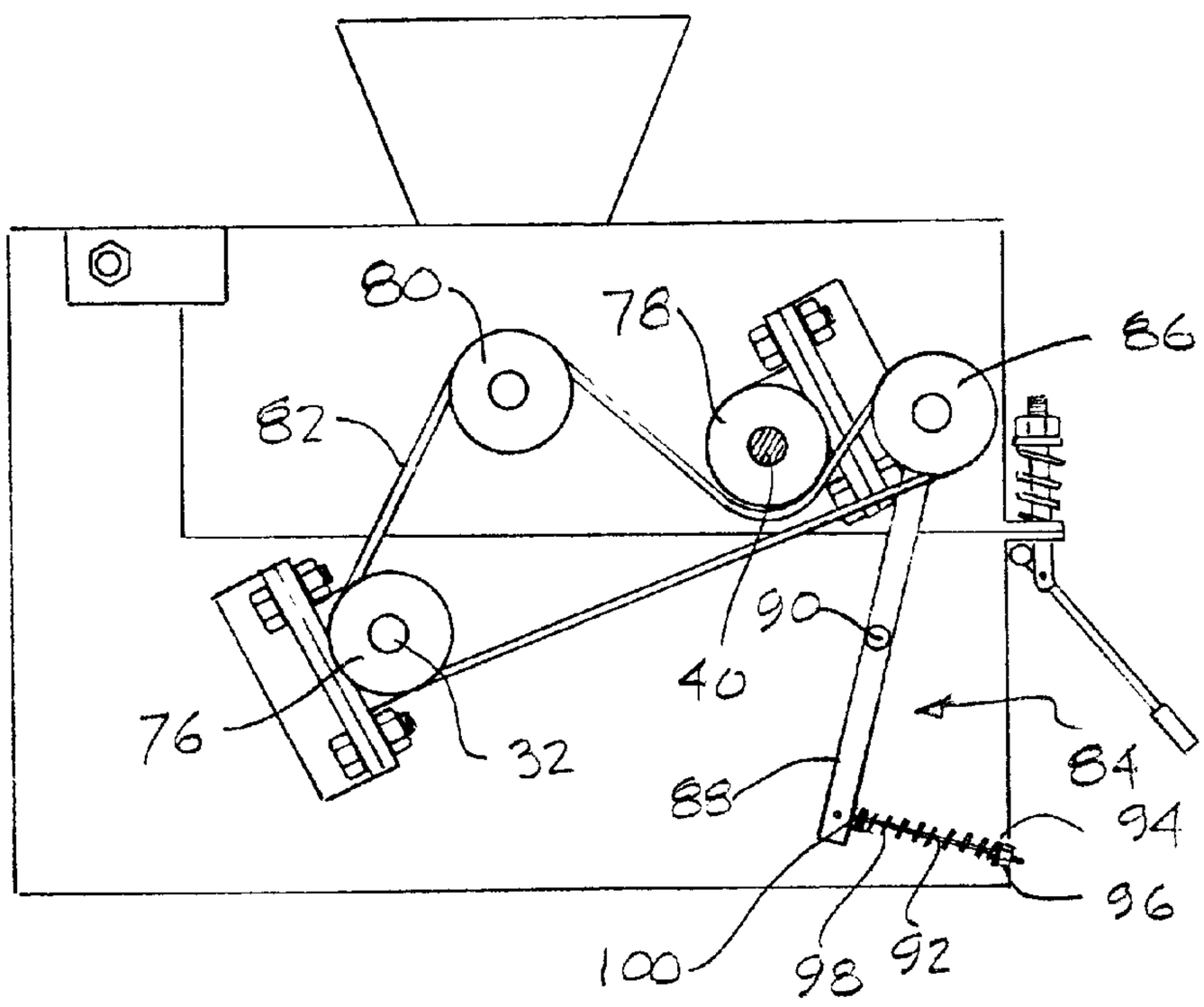
(54) **APPAREIL A CYLINDRES**

(54) **ROLLER MILL**



(57) A rolling mill suitable for rolling seed, for example grains for animal feed and oil seeds, has two pivotally-connected frame components carrying the respective rolls of the mill. A spring-loaded clamp holds the two frame components closed. The rolls themselves have smooth outer surfaces and are fed by a pressure feed mechanism that pressurizes the seed fed into the nip between the rollers.

ABSTRACT

A rolling mill suitable for rolling seed, for example grains for animal feed and oil seeds, has two pivotally-connected frame components carrying the respective rolls of the mill. A spring-loaded clamp holds the two frame components closed. The rolls themselves have smooth outer surfaces and are fed by a pressure feed mechanism that pressurizes the seed fed into the nip between the rollers.

ROLLING MILL

FIELD OF THE INVENTION

The present invention relates to rolling mills for crushing vegetable matter for use as animal feed.

BACKGROUND

In the prior art rolling mills have been used for crushing these types of material. Materials that have been processed include seed, for example grain used as animal feed and oil seeds.

In the rolling mills currently in use, the matter to be crushed is gravity fed into the nip between two rolls and is pulled through the nip by engagement of the roll surfaces with the matter in the nip. In order to do this, and to provide the desired crushing action, the rolls are grooved. Over a period of use, the grooved rolls wear and must be re-machined and eventually replaced. Both machining and replacement are expensive tasks and involve down time for the mill.

With the conventional rolling mill, at least one of the rolls is mounted on spring-biased bearings that urge the rolls together. The resiliency in the system allows the rolls to pass objects such as stones that can be fed into the apparatus with seed to be crushed. When such an object is passed between the rolls, the rolls return rapidly to the closed position, placing an impact loading on the roll shafts and bearings.

The present invention proposes certain novel arrangements for mitigating one or more of these problems.

SUMMARY

According to one aspect of the present invention there is provided a rolling mill, said mill comprising:

a first stationary frame means;

a second movable frame means;

first and second rolls;

first and second roll mounting means mounting the first and second rolls on the respective first and second frame means with a nip between the rolls for crushing matter passing through the nip;

means for rotating the rolls;

a hinge parallel to the nip mounting the second frame means on the first frame means for movement on the first frame means so as to move the second roll away from the first roll; and

biasing means biasing the second frame means towards the first frame means in a direction bringing the rolls together.

The two-part frame, with the rolls mounted on the two frame components, eliminates the large direct stress that is applied to the roll shafts and bearings when a stone or some other object passes through the nip between the rolls.

It is preferred that the bearings for the roll shafts are pillow blocks, with bases that are parallel to a tangent through the roll nip. This makes the loading on the pillow blocks a compression load normal to the bases of the blocks to optimize bearing performance.

According to another aspect of the present invention there is provided a rolling mill for crushing matter to form animal feed, said mill comprising:

two rolls forming a nip therebetween for crushing matter passing through the nip;

means for rotating the rolls; and

feeding means for placing matter to be crushed on one side of the nip and for applying pressure to said matter to force the matter through the nip.

The pressurized feed into the roll nip has been found to increase the mill throughput, even where non-aggressive, smooth rolls are employed. This increases productivity while reducing both down time and the high cost of re-machining the grooved rolls of the prior art.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings, which illustrate an exemplary embodiment of the present invention:

Figure 1 is a front elevation of a mill according to the present invention;

Figure 2 is a plan view of the mill;

Figure 3 is a back elevation of the mill;

Figure 4 is a view along line 4-4 of Figure 2; and

Figure 5 is a view along line 5-5 of Figure 2.

DETAILED DESCRIPTION

Referring to the accompanying drawings, there is illustrated a rolling mill 10 with a box-like frame 12. The frame has a lower component 14 with an upper edge 15 and an upright section 16 at one end of the frame. An upper component 18 of the frame is aligned with and positioned directly above the lower component 14, with its lower edge 19 resting on the upper edge 15 of the lower component. The two components are connected by a hinge 20 along the top of the upward extension 16 of the lower component of the frame. The hinge includes two lugs 22 mounted on the upper frame component 18 at its upper edge, and two bolts 24 connecting the lugs to the upwards extension 16 of the lower component to provide a horizontal pivot axis 26.

The lower frame component 14 carries a lower roll 28 that extends across the inside of the frame. The upper frame component 18 carries an upper roll 30 that also extends across the frame, spaced along the frame and slightly higher

than the lower roller 28. The two rolls are parallel and positioned to form a nip 31 between the two. Both rolls have smooth outer surfaces.

The lower roll 28 is mounted on a shaft 32 that extends through the front and back sides of the lower frame component 14 and is rotatably mounted in two pillow blocks 34. Each pillow block 34 has a base 36 mounted on a flange 37 on the outside of the frame component 14. The pillow block base is parallel to a tangential plane 38 (Figure 5) through the nip 31.

The upper roll 30 is likewise mounted on a shaft 40 that extends through the front and back sides of the upper frame component 18. The shaft 40 is engaged by two pillow blocks 42 with bases 44 parallel to the tangential plane 38.

At the end of the frame opposite the hinge 20, the lower component 14 and upper component 18 of the frame are connected by a clamp 46. This clamp includes a flange 48 projecting from the end of the upper component. A rod 50 slides through a hole in the flange 48 and carries, on its upper end, a spring 52. The end of the spring is engaged by a seat 54, held on the rod 50 by a nut 56. The lower end of the rod 50 is formed into a fork 58, connected by a pin 60 to a handle 62. The end of the handle carries a roller 64. In the closed position of the frame, the rod 50 extends through a slot in a flange 65 secured to the lower frame component 14. When the frame is closed, the handle may be pivoted downwardly to force the roller 64 into engagement with the underside of the flange 65, thus pulling on the rod 50 and compressing the spring 52. This provides a biasing force urging the two frame components and the rolls carried by them into the closed position. The biasing force may be adjusted by adjusting the nut 56.

To feed grain into the mill, an auger 66 extends laterally through one side of the upper frame component 18. Outside of the frame, the auger is housed in a tube 68 and receives seed from a hopper 70. Within the frame, the auger extends

across the top of the nip 31 and is covered by a shield 72 so that seed fed into the mill by the auger will be confined to the area between the shield 72 and the nip 31. Continued operation of the auger with this area full of seed will exert pressure on the seed and force it through the nip between the rolls.

On the back of the apparatus, the shaft 32 of the lower roll carries a pulley 76. A similar pulley 78 is fixed to the shaft 40 of the upper roll. The auger shaft carries a pulley 80. A drive belt 82 is looped around the pulleys 76 and 80 and extends under the pulley 78 to a belt tensioner 84. The tensioner includes a pulley 86 mounted on a tensioner arm 88 connected to the lower frame component 14 by a pivot 90. A rod 92 is connected to the end of the arm 88 opposite pulley 86 and extends through a hole in a flange 94 projecting from the side of the lower frame component. A nut 96 is secured to the end of the rod 92. A compression spring 98 is fitted on the rod between the flange 94 and the arm 88 and acts between the flange 94 and a seat 100 mounted on the rod 92. The spring biases the tensioner pulley 86 away from the pulleys 76, 78 and 80.

When the upper frame component 18 pivots upwards about the hinge 20, for example when a stone or other object passes through the nip 31, the pulleys 78 and 80 will swing upwardly with respect to the pulley 76. The tensioner 84 will compensate for any slackness or tightness in the belt during this movement.

The apparatus is driven by a large pulley 102 mounted on the end of the roll shaft 40, outside of the pulley 78. This drive pulley 102 is driven by a belt 104 from a pulley 106 mounted on the drive shaft of an electric motor 108. The motor is mounted on a bracket 110 carried by the lower frame component.

In use, it is found that pressure feeding the seed into the nip 31 produces an increased throughput from the mill, even using smooth rolls rather than the conventional grooved rolls. The split frame arrangement minimizes impact

loadings on the roll bearings while providing a convenient mechanism for adjusting the roll pressure, using the spring 52.

While one embodiment of the present invention has been described in the foregoing, it is to be understood that other embodiments are possible within the scope of the invention. The invention is to be considered limited solely by the scope of the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A rolling mill, said mill comprising:

a first stationary frame means;

a second movable frame means;

first and second rolls;

first and second roll mounting means mounting the first and second rolls on the respective first and second frame means with a nip between the rolls for crushing matter passing through the nip;

means for rotating the rolls;

a hinge parallel to the nip mounting the second frame means on the first frame means for movement on the first frame means so as to move the second roll away from the first roll; and

biasing means biasing the second frame means towards the first frame means in a direction bringing the rolls together.

2. A mill according to Claim 1 wherein the biasing means comprise a spring.

3. A mill according to Claim 1 wherein the roll mounting means comprise pillow blocks with bases parallel to a plane through the nip, tangential to the rolls.

4. A rolling mill for crushing vegetable matter to form animal feed, said mill comprising:

two rolls forming a nip therebetween for crushing matter passing through the nip;

means for rotating the rolls;

feeding means for placing matter to be crushed on one side of the nip and for applying pressure to said matter to force the matter through the nip.

5. A mill according to Claim 4 wherein the rolls have smooth outer surfaces.

6. A mill according to claim 4 or 5 wherein the feeding means comprise means extending along the nip.

7. A mill according to claim 4 or 5 wherein the feeding means comprise an auger extending along the nip and a shield extending along a side of the auger opposite the nip.

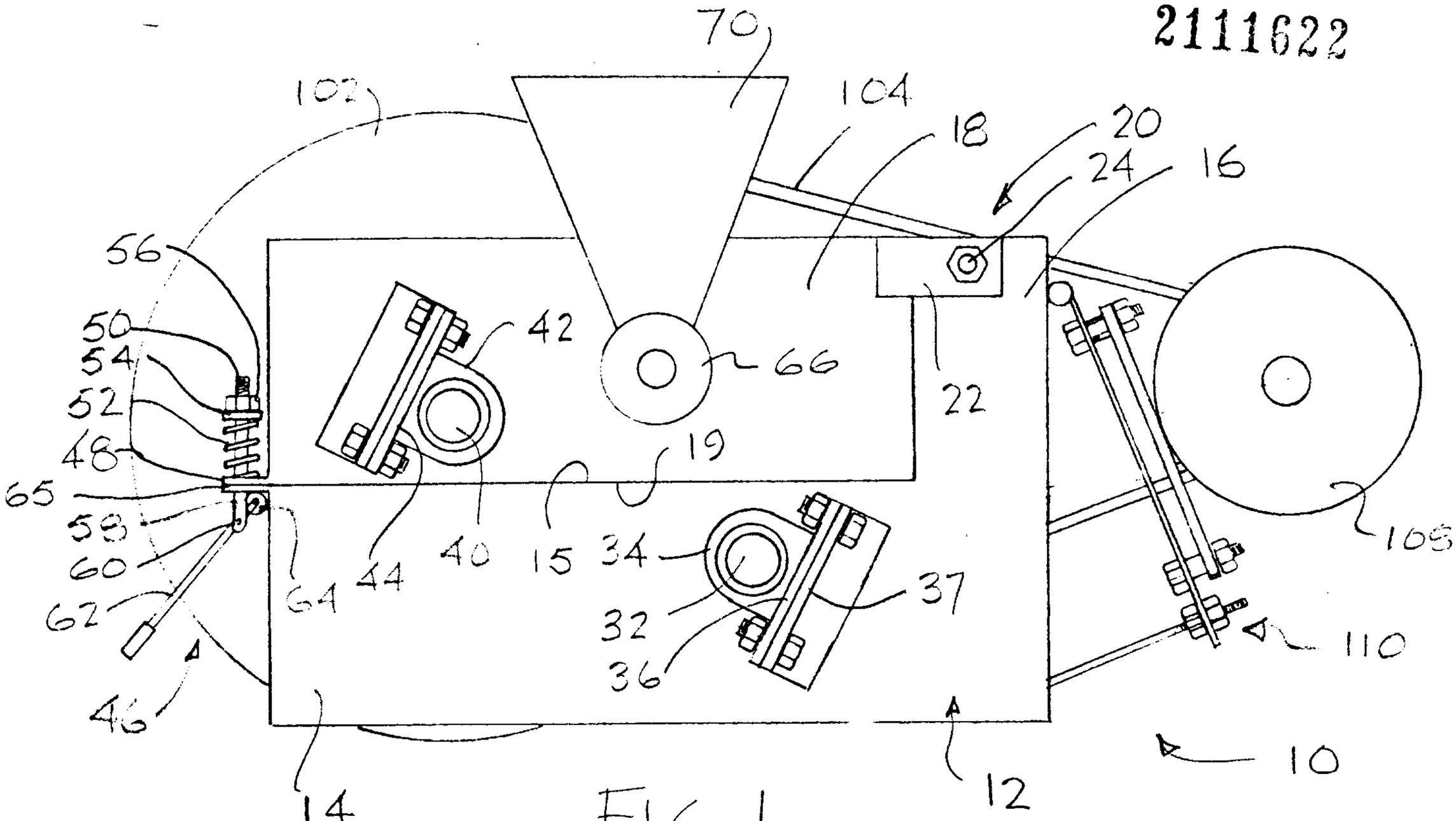


FIG. 1

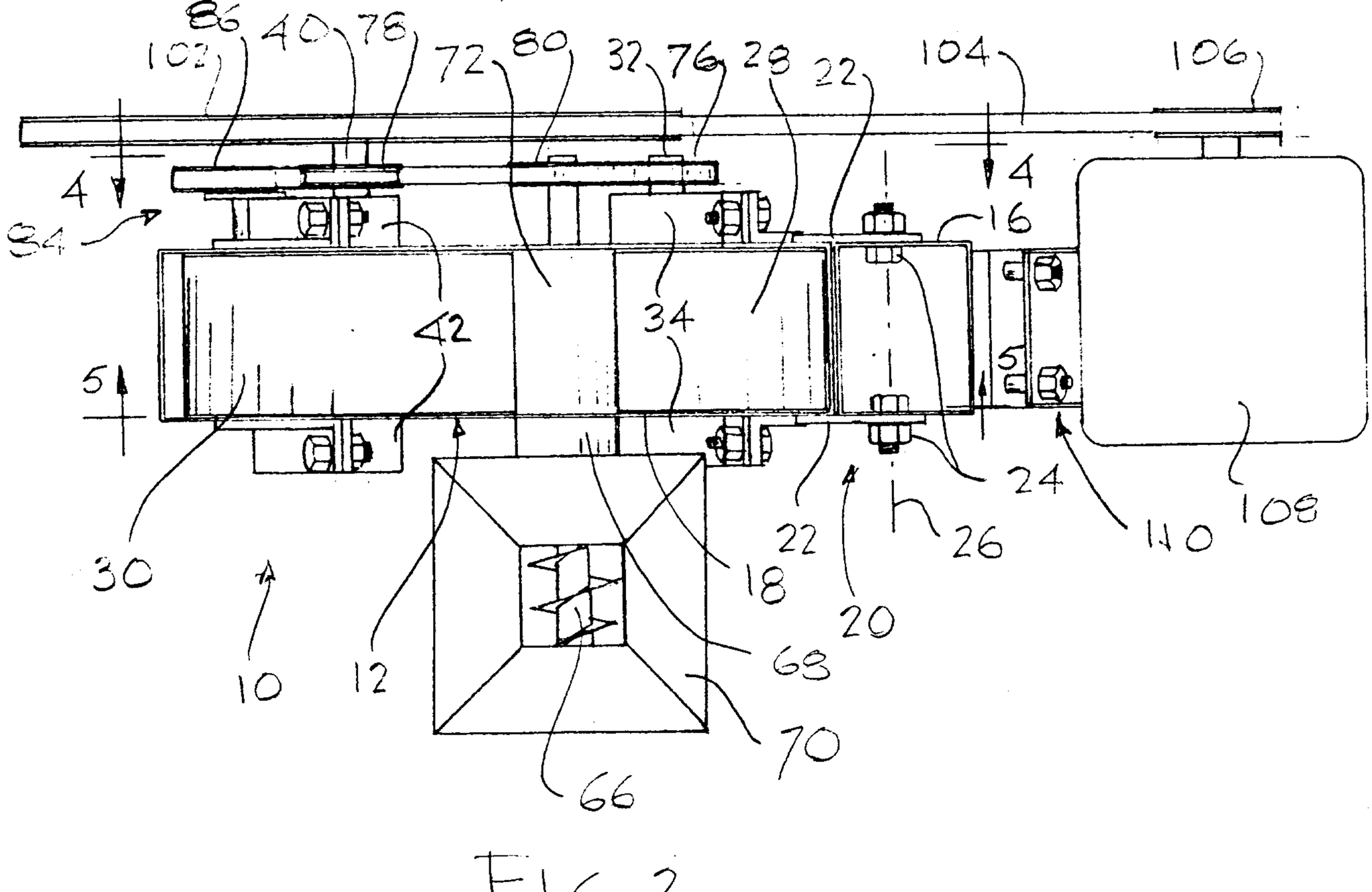


FIG. 2

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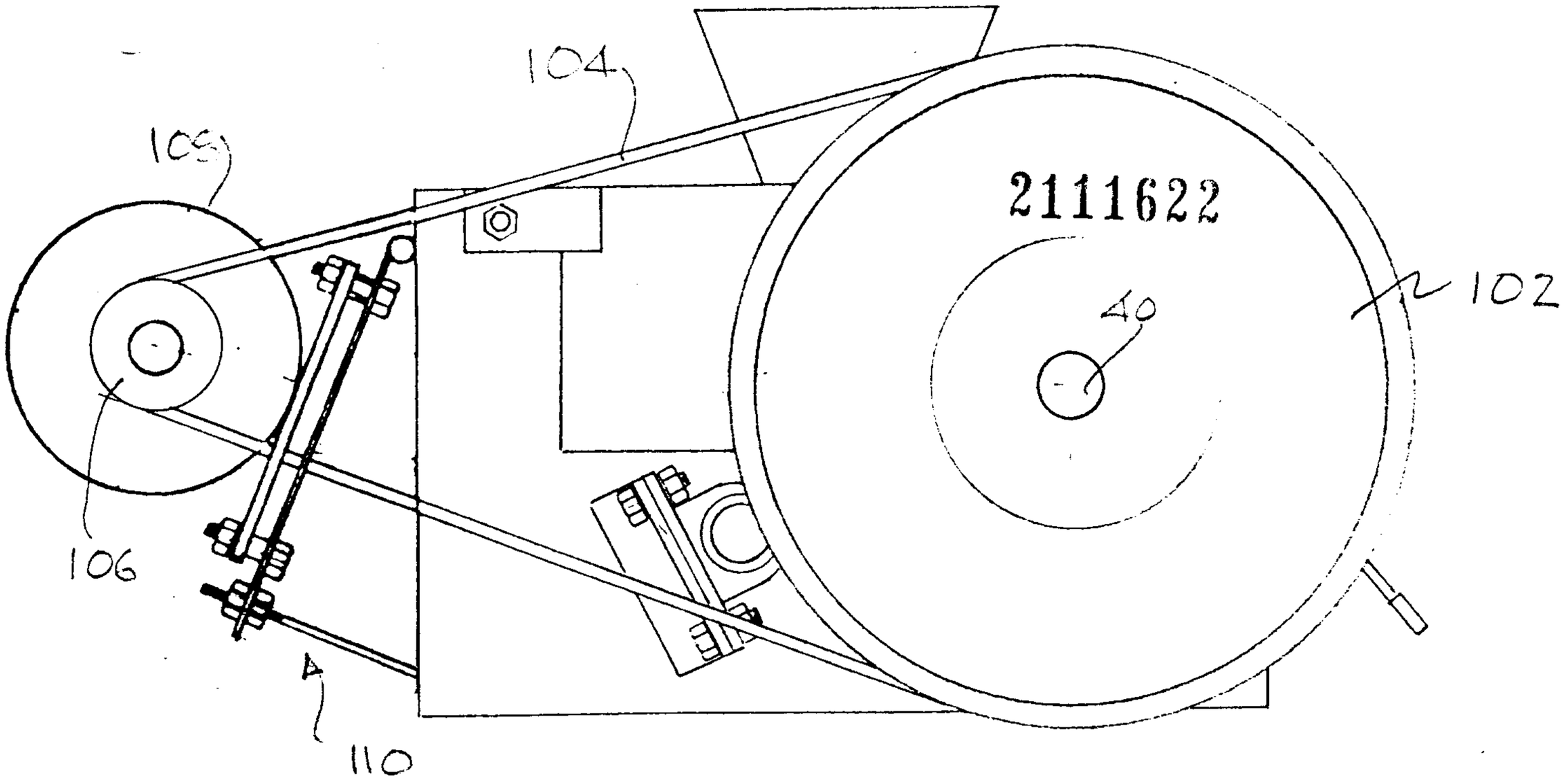

FIG. 3

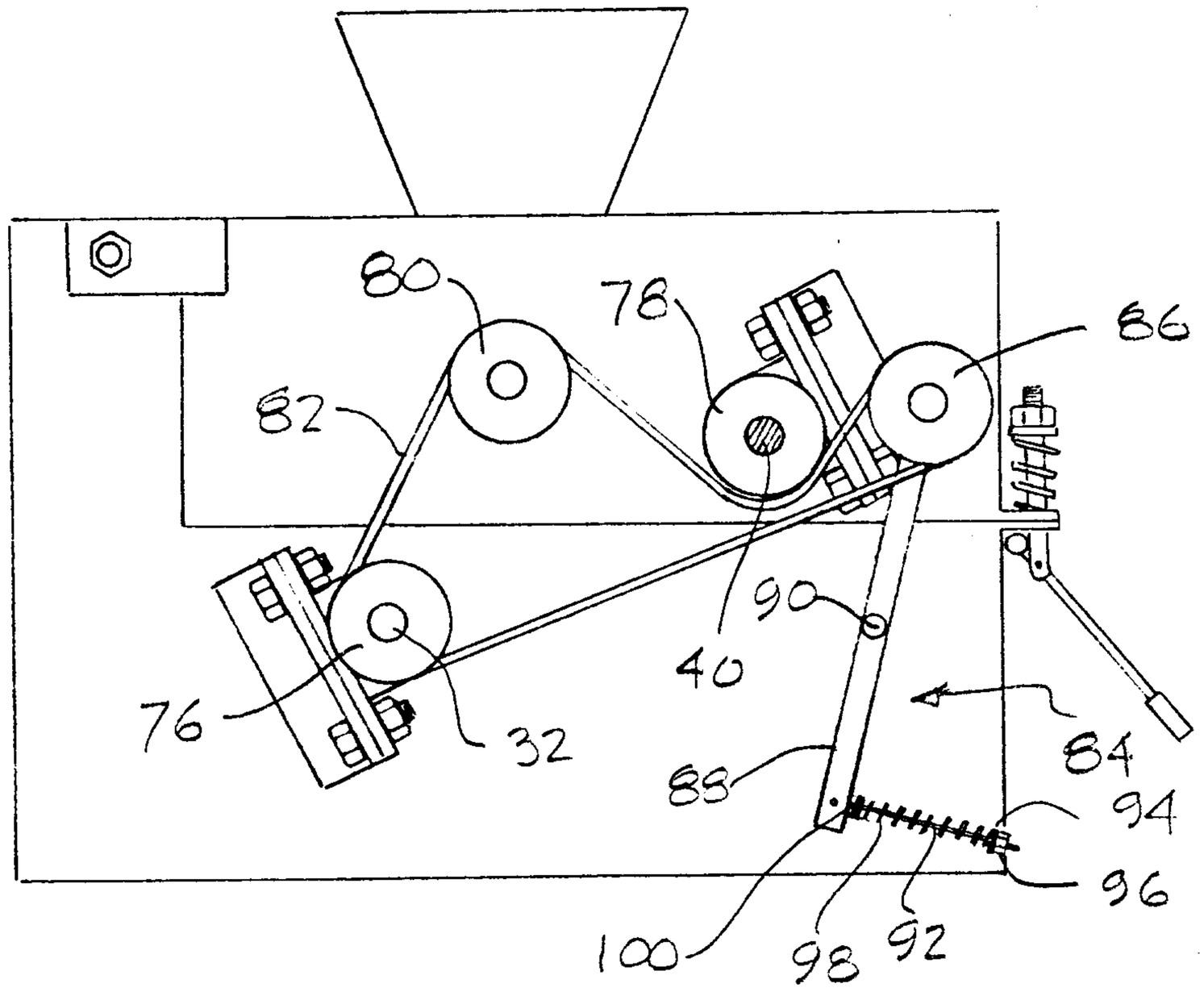

FIG. 4

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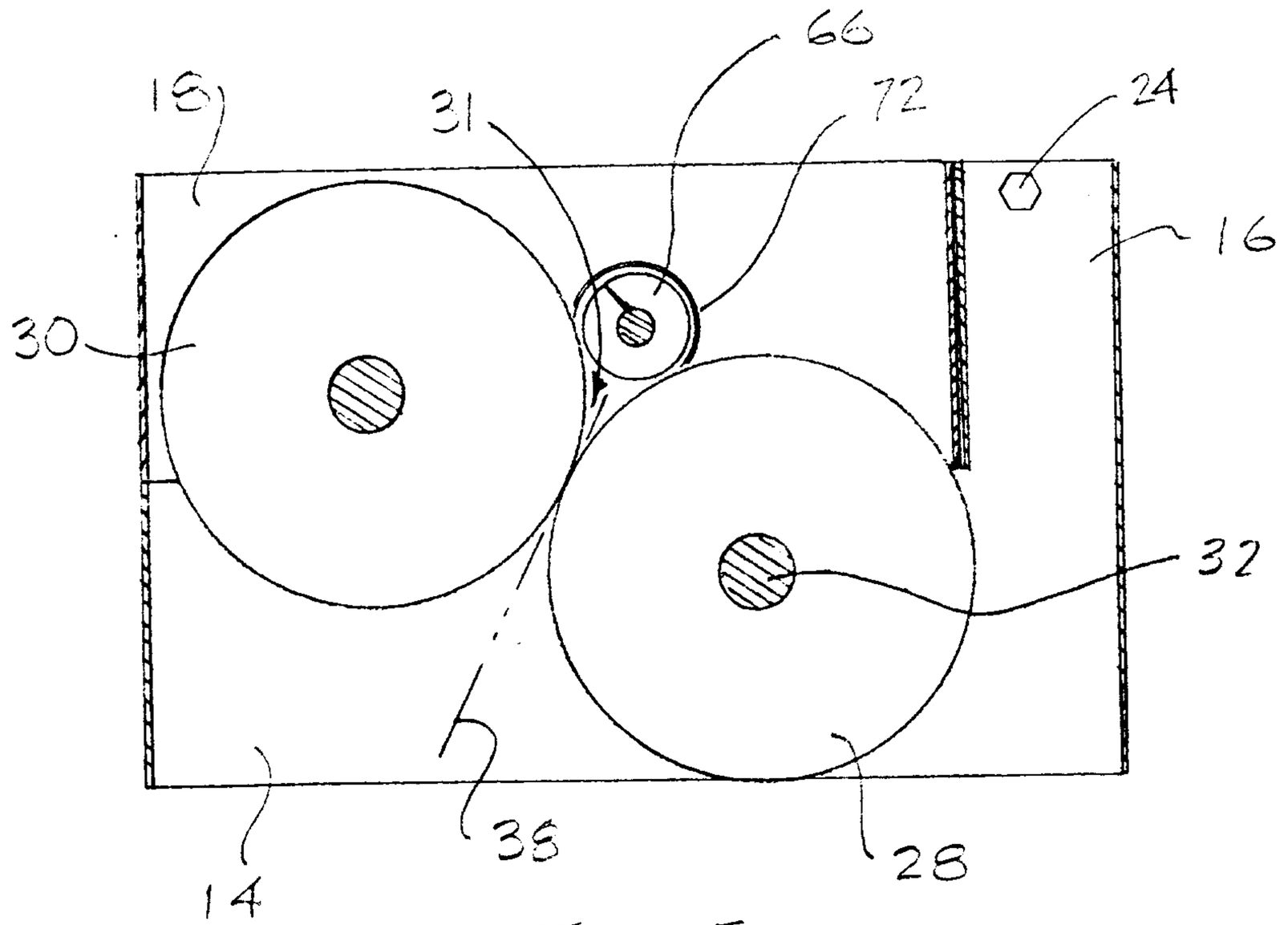

FIG 5

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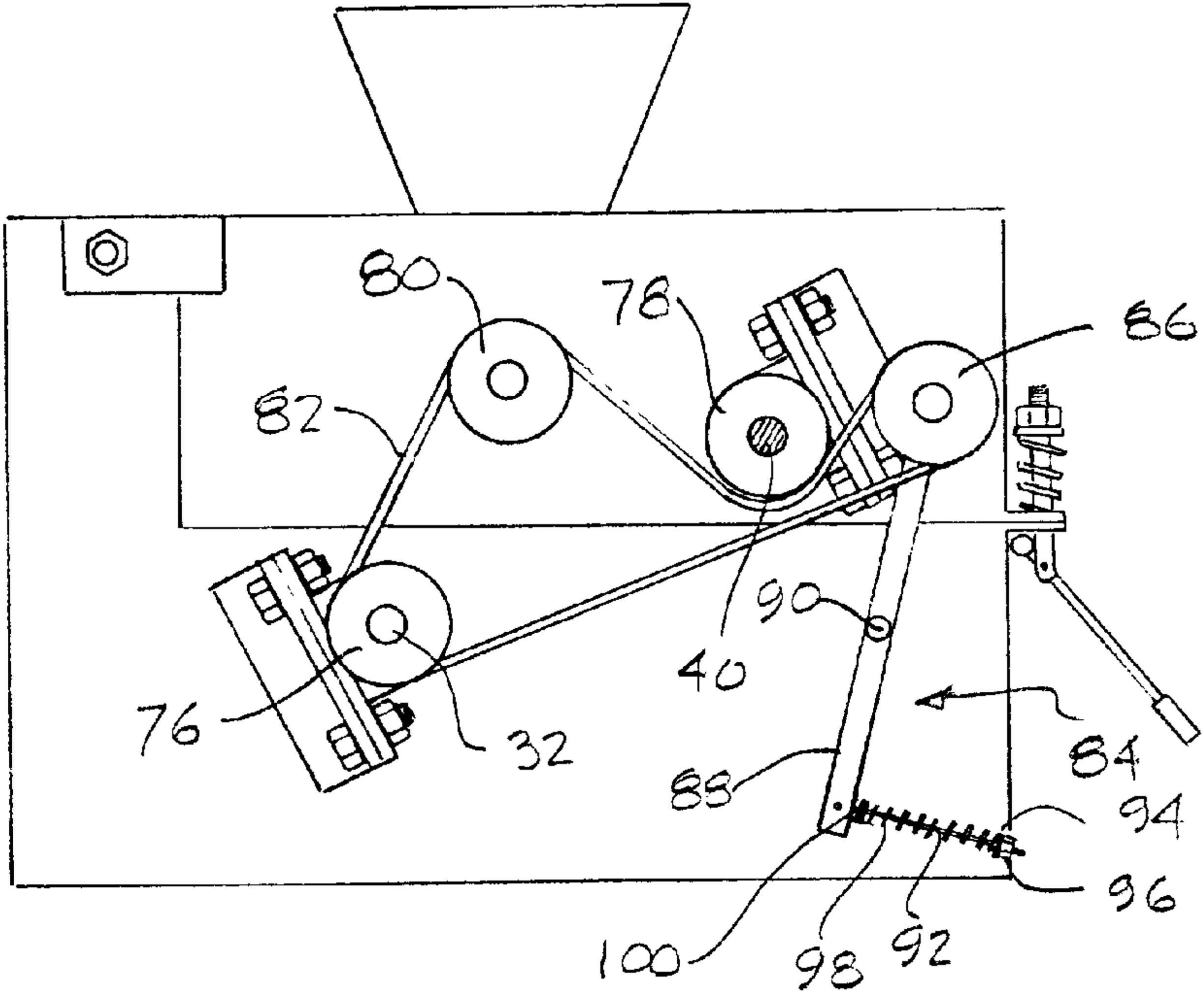
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