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CALENDERS

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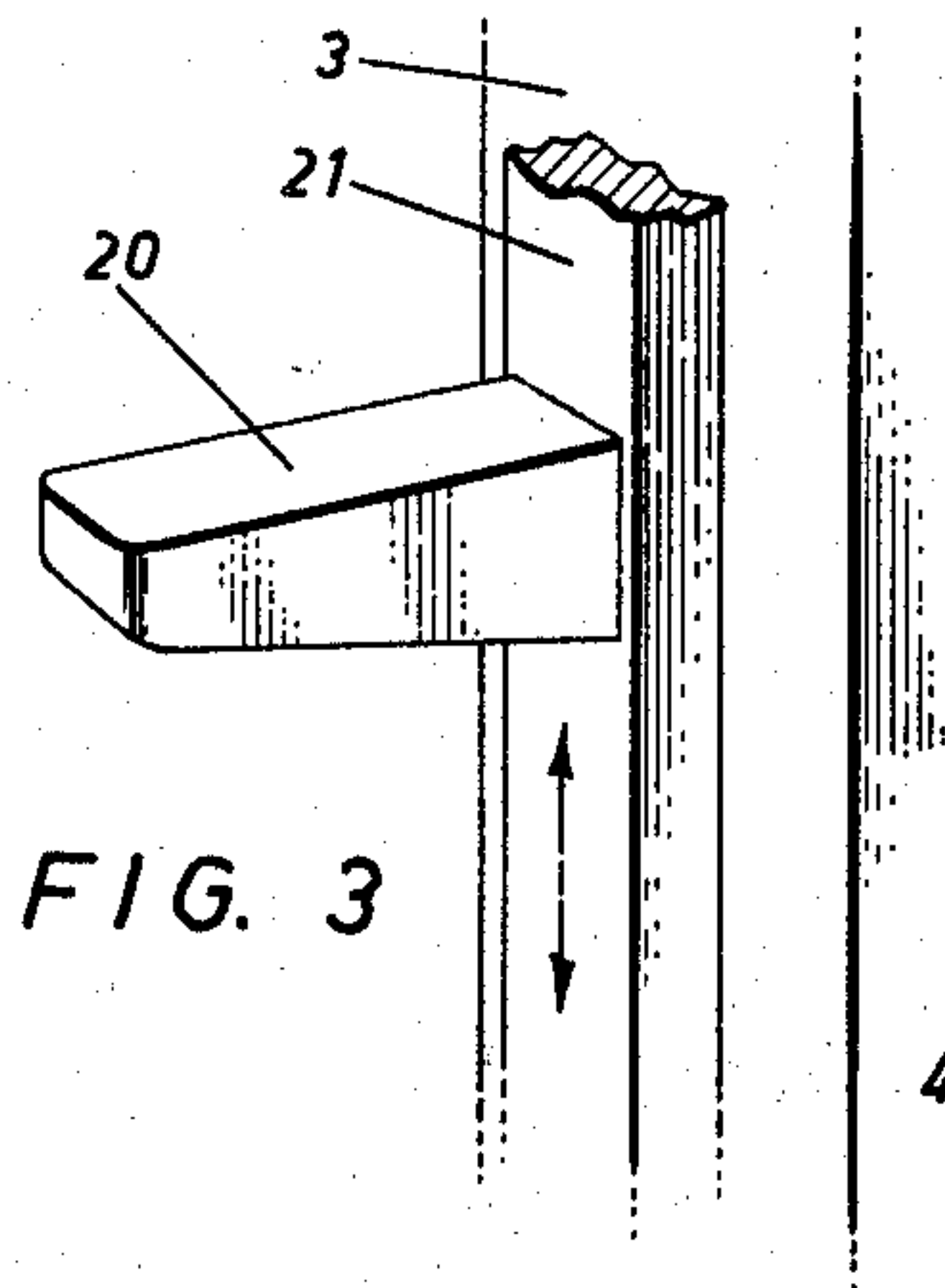


FIG. 3

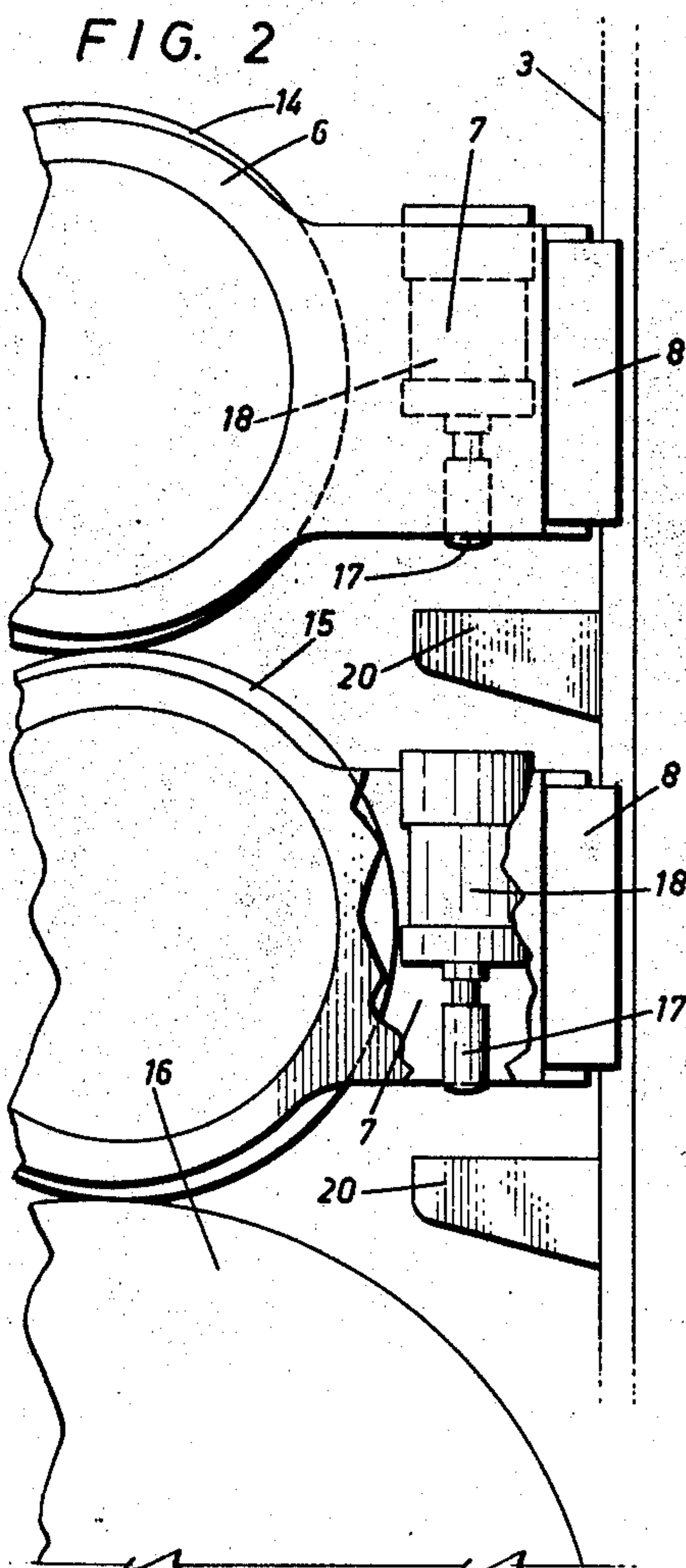


FIG. 2

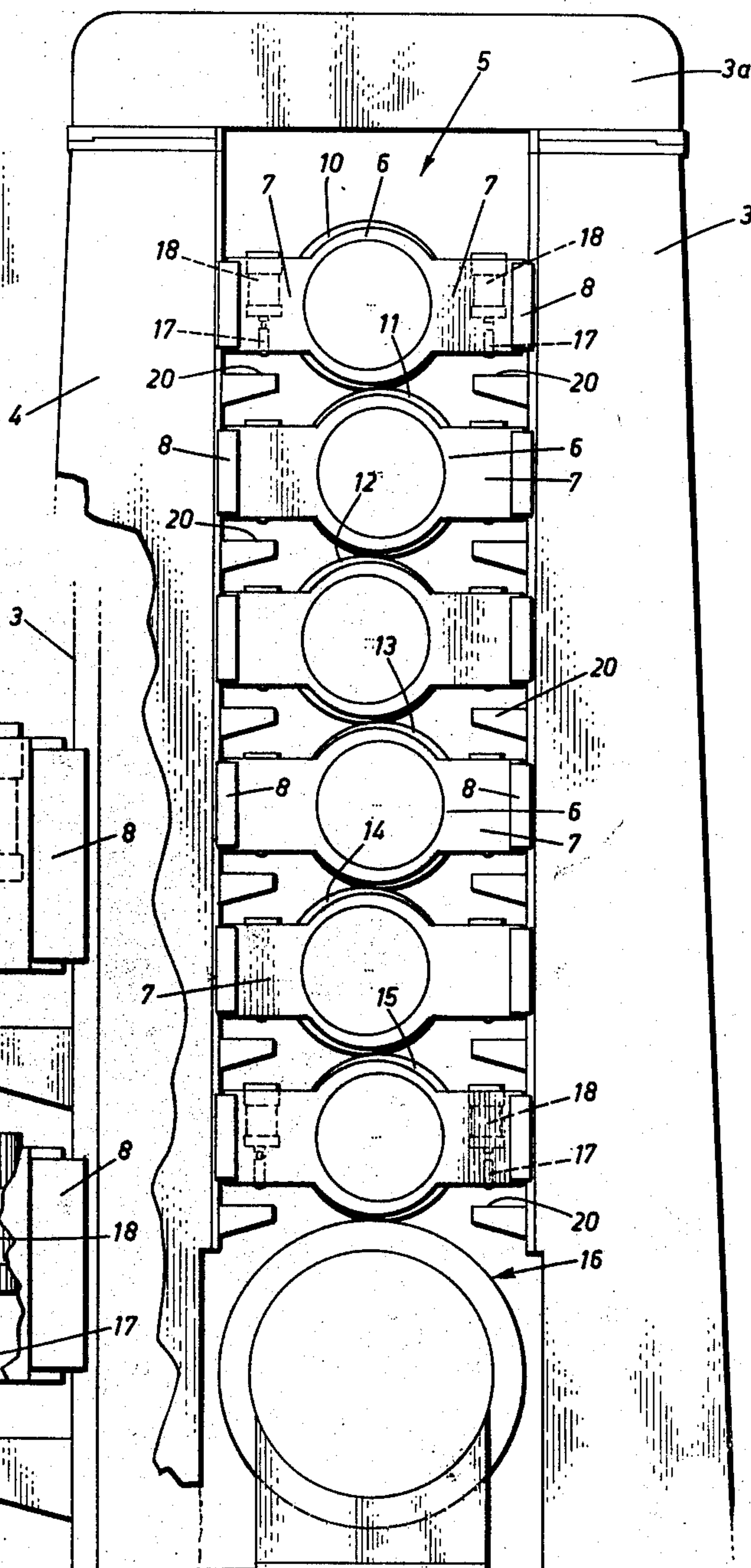


FIG. 1

4a

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3,180,251

CALENDERS

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3 Claims. (Cl. 100-163)

This invention relates to that part of a paper machine known as a calender though it will be understood that the invention is applicable to roll stands of such devices used for other purposes.

The purpose of the calender is to compact the paper at the same time providing it with a fine smooth finish, the effect being obtained on both sides by means of friction and pressure. The calender comprises a plurality of rolls, one above the other, and the necks of the journal boxes in which the rolls are carried are mounted for sliding movement in the end stands, the weight of the upper rolls being carried by the lower rolls so that the bottom or so called king roll bears the weight of the entire stack. The king roll of the stack is driven mechanically and it, in turn, drives the roll immediately above and so on by friction throughout the stack. Some of the rolls and, in particular, the king roll, are usually crowned to a certain extent in order that the pressure will be uniform along the length of the roll, with the result that the product will be of uniform gauge.

The calender is operated by directing a paper web on to the uppermost roll of the stack and then passing the web either over this roll or through the top nip provided by contact with the next roll and the web is then transferred on to the surface of the third roll and so on until it passes through the bottom nip between the king roll and the roll immediately above.

For efficient calendaring of paper the pressures between the rolls must be sufficiently low to prevent crushing of the paper while it is being smoothed but often due to friction thereby producing heat, the rolls expand during operation and their position, one with respect to the other, may alter. This gives rise to variation in pressure and the product will be of non-uniform gauge. In practice the variations in alignment may give rise to an increase in pressure at some places to a point sufficient to cause breakage of the web and to prevent such breaking and production of non-uniform material it is desirable to compensate for the alteration in pressure between the rolls by adjusting their relative position and, furthermore, this should be applicable to each roll. It is desirable to compensate and immediately adjust the rolls and roll journal weight due to addition or subtraction of the rolls and journals; such adjustment should be positive and capable of fractional variation particularly when very thin paper is being treated by the calender.

It is an object of the present invention to effect the requisite fine adjustment in pressure between the rolls by controlling the weight of the upper rolls which must be carried by those below. This is accomplished by providing intermediate of the neck of each pair of rolls stop means attached to each of the end stands and separate independently movable means are provided in each neck of the journals to exert downward pressure on the stop means, with the result that further pressure will lead to upward movement of the rolls to compensate for the increase of pressure.

Other and further objects, features and advantages of the instant invention will become apparent to those skilled in the art from the following detailed disclosure of a preferred embodiment thereof as shown in the drawings attached hereto and made part thereof.

On the drawings:

FIGURE 1 is an end elevational view of a calender embodying the invention;

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FIGURE 2 is a fragmentary elevational view showing the lower part of the calender embodying the instant invention;

FIGURE 3 is a fragmentary elevational view showing an alternative embodiment of the invention.

As shown in the drawings, a calender comprises a pair of vertically extending end stands 3 and 4, which are rigidly spaced apart by members 3a and 4a at the top and bottom respectively to define an opening 5. In the opening 5 a plurality of journal bearings 6 are mounted, each of these being provided with necks 7 which are slidably received in vertical channels or slides 8 secured to the end stands 3 and 4. In the preferred embodiment shown, the vertical channels 8 are attached to the inward faces of the end stands 3 and 4 and mutually opposed to each other, but it will be appreciated that such slides 8 can be attached on the outward side of the end stands 3 and 4, though still mutually opposed, in which case the necks 7 would project through suitable openings in the end stands 3 and 4. It will also be appreciated that the construction of the journal bearings 6 and necks 7 will be the same at both ends of the calender, journal bearings 6 and necks 7 carrying rolls 10, 11, 12, 13, 14 and 15, these being rotatably mounted in the journal bearings 6. A king roll 16 supports the weight of rolls 10, 11, 12, etc., and usually this roll 16 is the only one that is driven though in certain calenders arrangements are made to drive the upper rolls 10, 11, 12, etc., individually.

In the preferred embodiment, the rolls 10, 11, 12, etc., are staggered in relation one to the other so that the centre of any one roll is offset by the same amount in the opposite direction in relation to the centre line as compared with the one immediately below or above, e.g. roll 11 is offset to the right in a predetermined distance whereas rolls 10 below and 12 above are offset to the left by the same distance. This arrangement of the rolls is preferred because it prevents the creation of variable compressive stresses along the rolls giving rise to undesirable vibration, but the invention is equally applicable to the more usable arrangement where the centres of the rolls, stacked one above the other, are in line.

A movable member, preferable a piston 17 cooperating with a cylinder 18, is located in each of the necks 7 of the journals 6 intermediate of the slides 8 and outward of the journal bearings 6. The piston 17 is operated hydraulically in the cylinder 18 by application of fluid pressure, which may be derived from a common source not shown, or else delivered individually. Below the piston 17 and intermediate of the necks 7 of the members 3a and 4a of rolls 10, 11, 12, etc., are stops 20 extending inwardly at least to the same vertical plane in which the pistons 17 are capable of downward movement, and the stop 20 is so positioned as to arrest the movement of the piston 17 before it travels the whole length of the cylinder 18.

Assuming that the roll 11 is exerting too much pressure on roll 10, thus leading to uneven gauge of the paper web, the requisite adjustment will be made by applying fluid pressure to the cylinder 18 located in the neck of roll 11 to actuate the piston 17 which will then proceed downward until it makes contact with the stop 20. Since the piston 17 can proceed no further in a downward direction an increase of pressure in the cylinder 18 will be transmitted through the piston 17 against the stop 20 and will be compensated by an upward movement of the neck 7 in the slide 8. It will be appreciated that the distance of the stop 20 below the neck 7 must be less than the length of travel of the piston 17 in the cylinder 18 by at least the amount of upward movement of the neck 7 which may be necessary to reduce the

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pressure to zero of the rolls 10, 11, 12, etc., on the ones below so that the paper web can be easily withdrawn. Where the pressure on the web exerted by the rolls 10, 11, 12, etc. has been uniform but it becomes necessary to add a further roll at the top of the stack to increase pressure the control of the increase will be accomplished by applying same amount of pressure to each of the cylinders 18 associated with the necks 7 of the opposing journal bearings 6. On the other hand, where some expansion of one of the rolls 10, 11, 12, etc., in relation to the others takes place, it will be necessary to adjust the pressure in cylinders 18 to a varying degree until the proper adjustment has been made.

It will be appreciated that the provision of individual pressure adjusting means in each neck 7 enables fine adjustment of the rolls 10, 11, 12, etc., in relation one to the other, and the invention permits greater flexibility and operation by control of load forces across each calender roll.

Another embodiment of the calender is shown in FIGURE 3 wherein the stop means 20 are not rigidly attached to the end stands 3 and 4, but are instead attached to vertical members 21 dimensioned to slide within the slide 8; these members 21 are attached to a cross piece, not shown, supported by the member 3a and the cross piece is attached to suitable lifting means, also not shown. The position of the stop means 20 is capable of adjustment so that on upward movement of the members 21 the stops 20 bear against the pistons 17 thereby elevating the rolls 10, 11, 12, etc., to provide for rapid addition of further calender rolls without disturbing the arrangement already operating satisfactorily.

While I have shown and described a preferred embodiment of the 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 I claim is:

1. A calender comprising end stands, journal boxes having necks mounted for sliding in substantially vertical

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movement in said stands, a plurality of superimposed rolls each having end portions rotatably mounted in corresponding pairs of said journal boxes, a plurality of arrest means secured to each stand, the arrangement being such that one of said arrest means is provided below each said neck, a downwardly extendable rigid member attached to each of said necks for applying downward pressure against the arrest means positioned immediately below, said application of pressure being balanced by a sliding movement of said journal boxes to adjust the relative position of said superimposed rolls.

2. A calender comprising end stands, journal boxes having necks mounted for sliding in substantially vertical movement in said stands, a plurality of superimposed rolls each having end portions rotatably mounted in corresponding pairs of said journal boxes, a plurality of arrest means secured to each stand, the arrangement being such that one of said arrest means is provided below each said neck, a cylinder rigidly secured in each neck of said journals, a downwardly movable piston co-operating with said cylinder and actuated by fluid pressure to urge it against the arrest means positioned immediately below, said application of pressure being balanced by a sliding movement of said journal boxes to adjust the relative position of said superimposed rolls.

3. A calender according to claim 2 wherein said cylinder is integrally placed in the neck of said journals.

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