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(54) **Apparatus for calibrating granite, marble, and the like in slab form.**

(57) The apparatus for calibrating granite, marble, and the like in slab form, comprises a base frame on which a carpet conveyor (2) for transporting slabs (40) to be calibrated is caused to run and carries a calibrating head (10) which is movable perpendicularly to the plane of lay of the slabs (40). The calibrating head (10) includes a calibrating roller (20) driven rotatively about its own axis and having its axis substantially parallel to the plane of lay of said slabs (40) and substantially perpendicular to the direction of advance of the slabs (40). Furthermore an abrasive form (30), provided on the lateral surface of said roller (20), extends unbroken around the roller (20) into a substantially helical pattern.

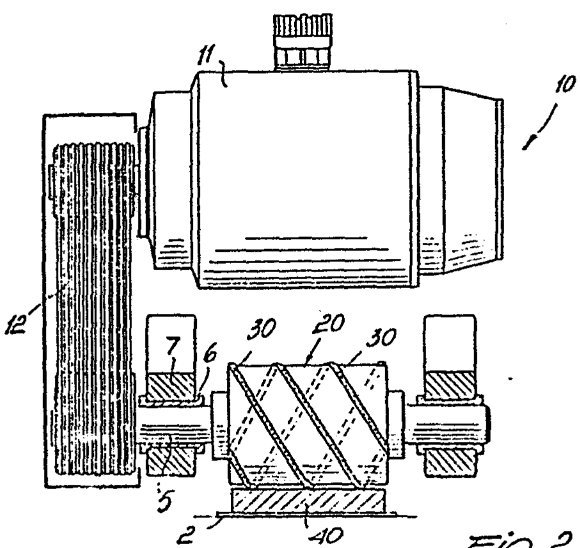

Fig. 2

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"APPARATUS FOR CALIBRATING GRANITE, MARBLE, AND THE LIKE IN SLAB FORM"

This invention relates to an apparatus for calibrating granite, marble, and the like in slab form.

As is known, there is a growing demand for a means of calibrating slabs of granite, marble, and the like, whereby a constant, exactly preset thickness dimension can be imparted to the slabs.

Currently available for the effectuation of said calibration are various machine types which operate on different principles.

With calibrating machines equipped with a substantially horizontal axis roller, i.e. extending parallel to the plane of lay of a slab being processed and perpendicular to the direction of advance of the slab, calibration is currently provided by fitting the roller with abrasive elements or forms which extend axially to the roller and are evenly distributed with respect thereto.

Thus, with this prior arrangement, the abrasive form is caused to work simultaneously across the slab width during the calibrating step.

In working simultaneously across the slab width, a first requirement is the availability of very high power for the calibrating operation, and above all, the slab material is subjected to very high stresses which may be the cause for local burns and cracks through the material structure.

It has been found, in fact, that during the slab calibration process most of the wear occurs at the center portion of the abrasive form on the roller, i.e. at the area where contact between the slab and abrasive form tends to occur in practice.

This is due to that the slabs have in general a substantially constant width, so that the roller, which is normally of a larger size than the slab width, undergoes wear at the middle portion thereof.

Thus, the abrasive form regions at the roller end portions acquire in actual practice with time a larger thickness relatively to the remainder of the form.

Where slabs are to be processed which have a slightly greater width dimension than usually, the slab will contact preferably the roller end portions, which are less worn than the remainder, and develop processing imperfections.

The proposal of solving the problem through the use of a roller having exactly the same size as the slab width has shown to be unpractical because slabs have unavoidably dimensional differences, however marginal, which make it impossible to precisely match the roller axial dimensions to the slab widths in order to obviate the effects of the abrasive form wearing unevenly.

According to other prior approaches, calibration is performed in two successive steps, and specifically, a first step using a horizontal axis roller which has a number of abrasive elements arranged circumferentially on the roller and practically defining a series of grooves on the slab surface which is then precision calibrated by means of an abrasive plate effective to remove the excess material and rotating about a perpendicular axis to the slab plane.

However, this calibration method requires that polishing be carried out on the other side of the slab, which involves overturning of the slab during the processing cycle.

It is an object of this invention to obviate such prior drawbacks by providing an apparatus for calibrating granite, marble, and the like in slab form, which affords perfectly uniform calibration capabilities across the entire slab, while working on the slab at discrete locations which are in practice constantly shifted until the whole slab surface has been thus worked.

Another object of the invention is to provide an apparatus which, by spot working on the slab,can induce no high stresses in the material, thus preventing local damaging due to the high stresses encountered.

It is a further object of this invention to provide a calibrating apparatus which causes no cracking or chipping of a slab, since no shocks are generated between the tool and slab during the slab processing step.

Still another object of the invention is to provide an apparatus for calibrating granite, marble, and the like in slab form which, owing to its peculiar construction, can be highly reliable and safe in operation.

A not unimportant object of this invention is to provide an apparatus for calibrating granite, marble, and the like in slab form, which can make the abrasive form wear substantially uniform and prevent formation of an increased thickness dimension at the calibrating roller end portions.

It is yet another object of the invention to provide an apparatus for calibrating slabs of granite, marble, and the like, which affords accurate processing capabilities, and can prevent any imperfections in the abrasive form from being transferred to the slab by that a relative displacement between the roller and slab is provided at all times whereby any imperfections in the abrasive form are prevented from constantly affecting one and the same slab portion.

These and other objects, such as will be apparent hereinafter, are achieved by an apparatus for calibrating granite, marble, and the like in slab form, according to the invention, comprising a base frame whereon a carpet conveyor for slabs to be calibrated is caused to run, said frame carrying a calibrating head adapted to be moved perpendicularly to the plane of said slabs, characterized in that said calibrating head includes a calibrating roller driven rotatively about its own axis and having its axis substantially parallel to the slab plane and substantially perpendicular to the direction of advance of said slabs, the lateral surface of said roller being provided with at least one calibrating abrasive element extending with a substantially helical pattern around said roller.

Further features and advantages will be more readily understood from the following description of a preferred, but not exclusive, embodiment of an apparatus for calibrating granite, marble, and the like in slab form, according to the invention, with reference to the accompanying illustrative drawings, where:

Figure 1 shows schematically a side elevation view of the calibrating apparatus according to the invention;

Figure 2 is an enlarged scale, partly sectional, view of the calibrating head; and

Figure 3 shows a calibrating head equipped with an axially displaceable roller.

Making reference to the drawing views, an apparatus for calibrating granite, marble, and the like in slab form, according to the invention, comprises a base frame, generally designated with the reference numeral 1, whereon a convention carpet conveyor for slabs to be calibrated is provided which is generally indicated at 2.

Active on the upper stringer of the carpet conveyor 2 are pressure members 3 which hold the slabs close against the carpet surface.

Provided on the base frame is a calibrating head, generally indicated at 10, which includes a drive means for translating it along a substantially perpendicular direction to the plane defined by the slabs, thereby the calibrated thickness may be changed contingent on individual requirements.

It should be noted that the apparatus may include a plurality of calibrating heads arranged to work sequentially to gradually decrease the slab thickness.

A peculiar aspect of the invention is that the calibrating head, generally indicated at 10, is provided with a motor unit 11 which rotatively drives, through drive belts 12, a shaft 5 of a calibrating roller 20 about its own axis, the shaft 5 being supported at its axial ends on plain bearings 6 carried on supporting side members 7 connected to the calibrating head.

The cited calibrating roller 20 is provided on its lateral surface with at least one abrasive element 30 made up of diamond grinders and extending helically around the roller.

The abrasive element thus obtained may be a single-start helix having a pitch selected to provide a given number of contact points between the slab and roller, or alternatively, or multi-start helices may be provided to at all times create a discrete number of contact spots between the roller and slab.

With the arrangement just described, processing, i.e. removal of material from the slab 40, for calibration is always carried out at a number of discrete spots or locations represented by the contact spots between the abrasive element and slab.

It may be appreciated that, with the roller rotating about its own axis at an angular speed selected to produce a considerably higher peripheral speed than the travel speed of the slab 40, the contact spots between the slab and abrasive material will vary in an axial direction relatively to the roller axis, thereby the whole slab surface is affected, i.e. the whole slab surface comes into contact with the abrasive element defining the slab thickness dimension.

Highly important is that processing, i.e. contacting of the abrasive element with the slab, is always carried out in the discrete spot mode, so that no overheated areas or undue stresses are created in the slab material, and accurate working of the slab surface can be achieved to provide calibration to the desired thickness.

As shown in Figure 3, a calibrating roller 20a is provided which rotates together with the shaft 5 and can be displaced axially to the shaft by means of conventional linkages.

More specifically, the roller would be subjected to a reciprocating displacement motion as the roller is being rotated so as to move transversely to the advance or feed direction of the slab 40.

To this aim, the shaft 5 is provided at a middle portion thereof with a piston-like bulge 50 which is received in a cylindrical chamber 51, defined on the interior of the roller, thereby on either sides of the piston 50, first and second regions 51a and 51b, respectively, are created which are in communication with with a pressurized oil supply for alternate delivery to either chamber in order to recirpocate the roller along the shaft direction.

In this embodiment, the roller has an axial length which is substantially equal to the width of the slab 40 being processed plus the magnitude of the roller axial displacement.

Thus, processing will not result in the abrasive 30 wearing solely across the area thereof affected by the the slab width, but rather across a much wider area which corresponds in practice to the slab width plus the displacement length.

This important technique enables wear of the abrasive form 30 to occur evenly at the ends, thus eliminating the problem of processing imperfections with slabs of slightly different widths, while in the event of the abrasive element showing imperfections, the imperfect abrasive element will not be working at all times in the same position because, owing to the combined movements set up by the roller rotation, to the slab travel movement, and to translation of the roller in the transverse direction, any imperfections would be located at different spots on the slab and result in practice in no significant faults in the processed slab.

For completeness sake, it should be added that the areas of the cylindrical chamber located on either sides of the piston 50 are connected by means of oil inlet and outlet conduits, indicated at 53, which extend within the shaft 5 and are connected to the oil supply through a conventional rotary distributor, indicated at 54.

It should be further added to the foregoing that with the arrangement discussed the calibrating roller is substantially connected to the shaft 5 with the interposition, in practice, of an oil chamber which behaves essentially as a damping element effective to reduce the vibrations which can be transmitted to the shaft because of the abrasive element-slab contact, thus contributing toward improved processing and longer machine life.

It may be appreciated from the foregoing description that the invention achieves its objects, and in particular that the invention principle, based on the use of one or more abrasive elements extending in a helical pattern, solves the problem of a calibration process which is free of shocks between the abrasive element and slab by eliminating any breaks in the abrasive element movements across the slab.

Furthermore, the use of a calibrating roller displaceable along its axis allows the abrasive element wear to be made significantly even for the full axial length of the calibrating roller, preventing the occurrence of uneven wear of the element which reflect, with time, in faulty slab processing.

The invention as disclosed is susceptible to many modifications and changes without departing from the scope of the instant inventive concept.

All of the details, moreover, may be replaced with other, technically equivalent, elements.

In practicing the invention, the materials used, as well as the dimensions and contingent shapes, may be any suitable ones to meet individual application requirements.

CLAIMS

1. An apparatus for calibrating granite, marble, and the like in slab form, comprising a base frame (1) whereon a carpet conveyor (2) for slabs (40) to be calibrated is caused to run, said frame (1) carrying at least one calibrating head (10) adapted to be moved perpendicularly to a plane defined by said slabs (40), and including a calibrating roller (20) driven rotatively about its own axis and having its axis substantially parallel to the slab plane and substantially perpendicular to the direction of advance of said slabs (40), characterized in that a lateral surface of said roller (20) is provided with at least one calibrating abrasive element (30) extending with a substantially helical pattern around said roller (20).

2. An apparatus for calibrating granite, marble, and the like in slab form, comprising a calibrating roller (20a) driven rotatively about its own axis and having its axis substantially parallel to a plane defined by slabs (40) and substantially perpendicular to the direction of advance of said slabs (40) to be calibrated, at least over portions of a lateral surface of said roller (20a) there being provided a calibrating abrasive material (30), characterized in that it comprises means (50) of reciprocating said roller (20a) along a substantially parallel direction to said axis.

3. An apparatus for calibrating granite, marble, and the like in slab form, comprising a base frame (1) whereon a carpet conveyor (2) for slabs (40) to be

calibrated is caused to run, said frame (1) carrying at least one calibrating head (10) adapted to be moved perpendicularly to a plane defined by said slabs (40), and including a calibrating roller (20,20a) driven rotatively about its own axis and having its axis substantially parallel to the slab plane and substantially perpendicular to the direction of advance of said slabs (40), characterized in that a lateral surface of said roller (20,20a) is provided with at least one calibrating abrasive element (30) extending with a substantially helical pattern around said roller (20,20a), and that said calibrating head (10) comprises reciprocating means (50) for displacing said roller (20a) along a direction substantially parallel to said axis.

4. An apparatus for calibrating granite, marble, and the like in slab form, according to one or more of the preceding claims, characterized in that said calibrating abrasive element (30) has a single-start helix helical pattern.

5. An apparatus for calibrating granite, marble, and the like in slab form, according to one or more of the preceding claims, characterized in that said calibrating abrasive element (30) has a multi-start helix substantially helical pattern.

6. An apparatus for calibrating granite, marble, and the like in slab form, according to one or more of the preceding claims, characterized in that said calibrating abrasive element (30) comprises diamond grinders.

7. An apparatus for calibrating granite, marble, and the like in slab form, according to one or more of the preceding claims, characterized in that said calibrating roller (20a) is carried rotating with and axially slidable on a shaft (5) supported rotatably on side members (6) of the apparatus frame (1).

8. An apparatus for calibrating granite, marble, and the like in slab form, according to one or more of the preceding claims, characterized in that said reciprocating means comprise a piston-like element (50) defined at a middle portion of said shaft (5) and being slidable sealingly within a substantially cylindrical chamber (51) defined inside said roller (20a), within said cylindrical chamber (51) said piston-like element (50) defining first (51a) and second (51b) regions respectively in communication with pressurized fluid conduits (53) for reciprocating said calibrating roller (20a).

9. An apparatus for calibrating granite, marble, and the like in slab form, according to one or more of the preceding claims, characterized in that said calibrating roller (20a) has an axial length substantially equal to the width of a slab (40) being processed plus the magnitude of the roller reciprocating movement.

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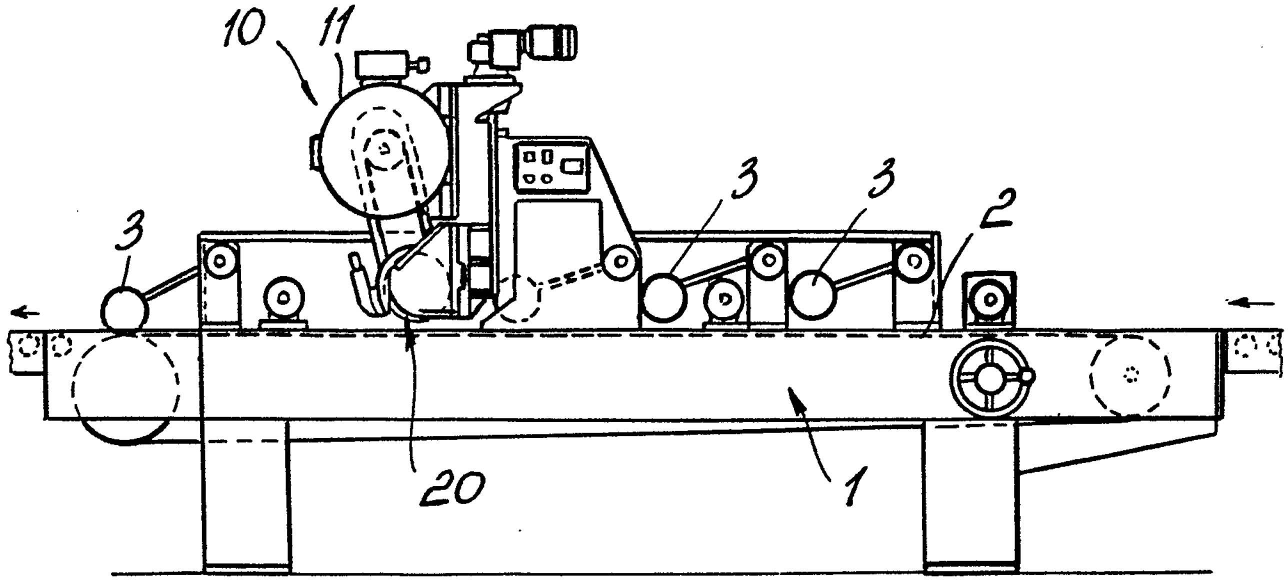

Fig.1

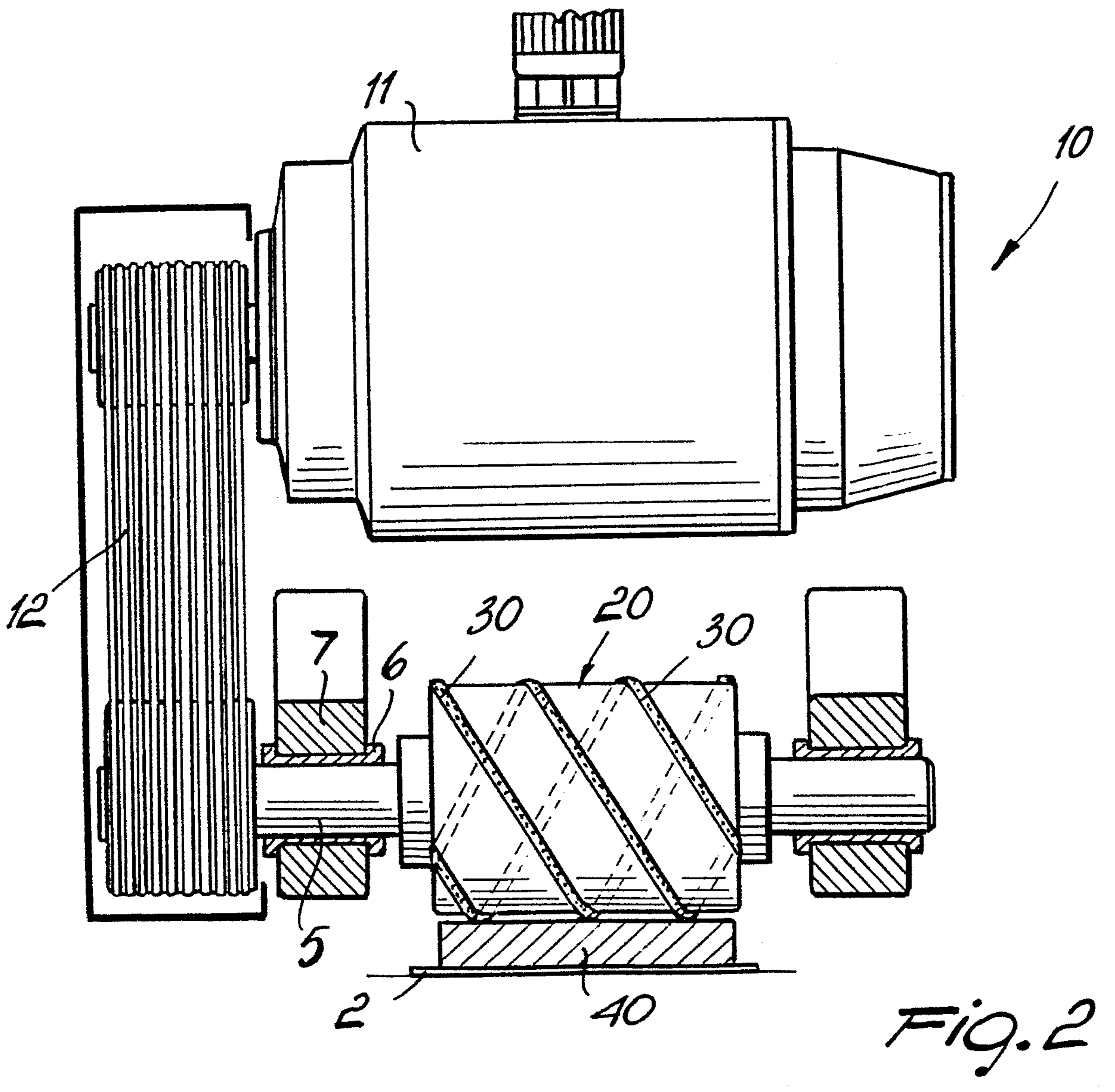

Fig.2

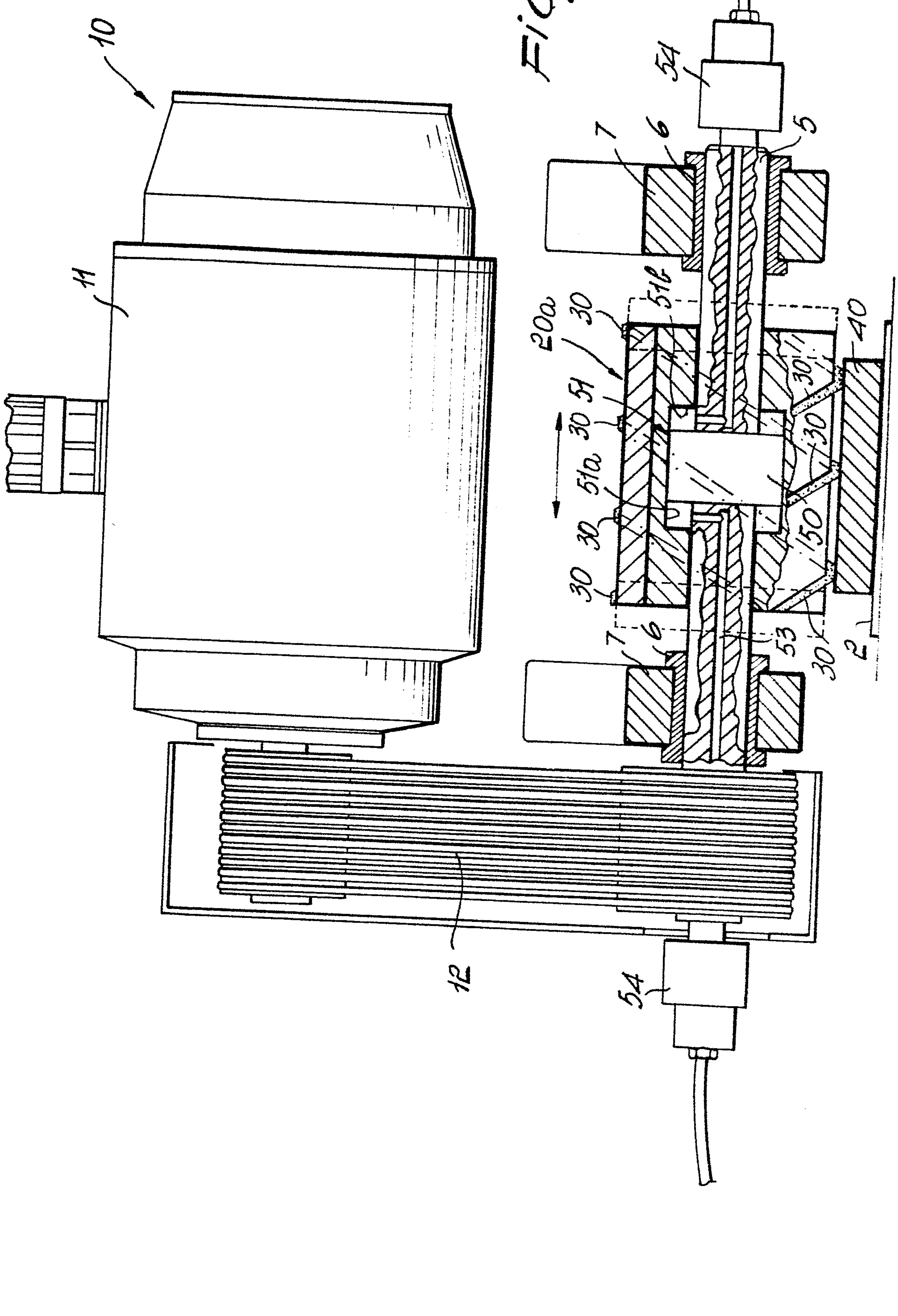

Fig.3