
EUROPEAN QUALIFYING EXAMINATION 2001

PAPER A ELECTRICITY / MECHANICS

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CLIENT'S LETTER

Mr. Arabico Robusta
c/o Bar Centrale

To the attention of:
Mrs. S. Upport

Dear Mrs. Upport,

I am the owner of a small coffee shop in which I serve not only espresso, cappuccino, other beverages and snacks, but also freshly squeezed orange juice. My customers prefer freshly squeezed orange juice because they appreciate its higher concentration of vitamins as compared to orange juice produced from a concentrate.

In processing citrus fruit, such as oranges, lemons or limes to make fruit juice, the fruit pulp must be accessed. Typically, in former days, I achieved this by slicing the fruit in half and then squeezing the fruit pulp within the peel. This process is tiring and time consuming, thus making it impractical for my purposes. I and my customers have therefore welcomed the development of a new machine in which the juice is extracted in a fully automatic manner for immediate consumption.

An example of such a machine is disclosed in the attached document DI. Although this machine is certainly an improvement, it has some serious drawbacks. The juice extraction parts have to carry out combined rotational and translational movements, thus requiring a rather complex construction. Since the machine works discontinuously, the extraction process is slow.

As I am quite creative, I have tried a number of technical changes to this machine. The result of my secret garage experiments is a juice extracting machine of simplified construction and higher yield per time unit.

My machine is easy to keep clean, because each component that comes into contact with the fruit or juice can be easily dismantled and cleaned. It is attractive to customers since the process of juice extraction is visible to them. Thus, the customers know that the served juice is really fresh and authentic.

As you have been recommended to me as one of the most promising new patent attorneys in the field, I would like you to draft a European Patent Application for my invention.

Preferred embodiment of my machine

My machine for squeezing juice from citrus fruits is shown in the accompanying drawings.

It comprises a chute 1 made of a plurality of wires, by which fruits are fed into the machine. Two cylinders 2 are located at the lower end of the chute 1, each cylinder 2 being provided with four hemi-spherical cavities 3. The cylinders 2 are mounted on rotatable horizontal shafts 8, which are able to be synchronously driven in opposite directions by an electric motor, as indicated by arrows A and B in Fig. 1.

A cutting element 4 is provided in the region of the smallest distance between the cylinders 2 (as shown in Figure 1). It has a curved cutting edge (not visible in the drawings) extending in the direction of the axes of shafts 8. This edge may have a concave or W shape. During rotation of cylinders 2, corresponding cavities 3 come to face each other in the region of cutting element 4.

After a fruit has left the chute 1, it is received in one of the cavities 3 of the left cylinder 2 and transported in a clockwise direction (see arrow A in Fig. 1) so that its exposed part enters into one of the cavities 3 of the right cylinder 2. After the fruit has been transported a little less than 180°, it is housed in the respective hemispherical cavities 3 of the left and right cylinders, and forced into the cutting element 4 to be cut into two halves. The cross-section of cutting element 4 has the shape of an inverted V (see Fig. 1) with concave upper surfaces on which the fruit halves can slide, such that they remain lodged in the cavities 3 of the cylinders 2 after cutting.

Underneath the cylinders 2 is provided a pair of drums 5, each comprising three hemispherical protrusions 6. The drums 5 are supported on rotatable horizontal shafts 9 to be driven in opposite

directions by the electric motor. Due to the greater number of cavities 3 compared to the protrusions 6, the rotational speed of the cylinders 2 has to be faster than that of the drums 5. The rotation of the drums 5 is indicated by the arrows C and D in Fig. 1 and is synchronised with that of the cylinders 2 such that a protrusion 6 enters into a respective cavity 3 during rotation. The fruit halves present in the cavities 3 are guided by the concave upper surfaces of the cutting element 4 until the protrusions 6 penetrate into the fruit pulp. At its lower ends, the cutting element 4 is provided with openings for the passage of the protrusions 6. As a result the pulp is squeezed and the juice contained therein is released.

The extracted juice, which in fact contains also pulp, falls onto a filter 10 for filtering the juice, before it drips into a collector funnel 11 provided with an outlet through which the juice pours into a glass 12 ready to be served.

After pressing the fruit halves, the peels remain stuck to the hemi-spherical protrusions 6. To enable the ejection of the peels, each protrusion 6 is provided with a groove 13. Each groove is designed to allow the passage of a blade 7 which, during rotation of the protrusion 6, enters behind a peel remaining on the protrusion 6. As a result, the peel is stripped off by the blade 7 and falls into a collecting receptacle 14 located in the lower part of the machine. The blade 7 includes a plate 26 with an opening for the passage of the protrusions 6 and a pair of rods 28. The blade assembly can easily be mounted by the insertion of the rods 28 into corresponding openings in a partition wall 17.

With citrus fruits, the highest quality juice is found in the pulp closest to the peel. However, the fruit peel generally contains bitter oils and other components. Accordingly, it is desirable to squeeze the pulp as thoroughly as possible without liberating the peel oils and other components. This can be achieved in that the distance between each cylinder 2 and its corresponding drum 5 is such that a small gap 18 exists between the facing surfaces of the hemi-spherical protrusion 6 and corresponding cavity 3. The gap 18 is approximately equal to the thickness of the fruit peel, so that excessive pressing of the peel during engagement of the protrusion 6 with the cavity 3 is prevented.

Machines of this kind are designed to handle citrus fruit of various sizes. This can be achieved by different sets of cylinders 2 and drums 5, each set having cavities 3 and protrusions 6 for a particular fruit size. It could also be achieved by an adjusting mechanism which enables the distance between shafts 8 and 9 to be varied, ie shaft 9 can be translated towards and away from shaft 8.

The cantilevered arrangement of the shafts 8, 9 (see Figure 2) enables the juice extracting machine to be divided by a partition wall 17 into what may be regarded as a drive compartment 15 and a juice extracting compartment 16. Therefore, the juice extracting compartment 16 can be sealed more easily and reliably against the machine oil present in the drive compartment 15, which is extremely important for food use.

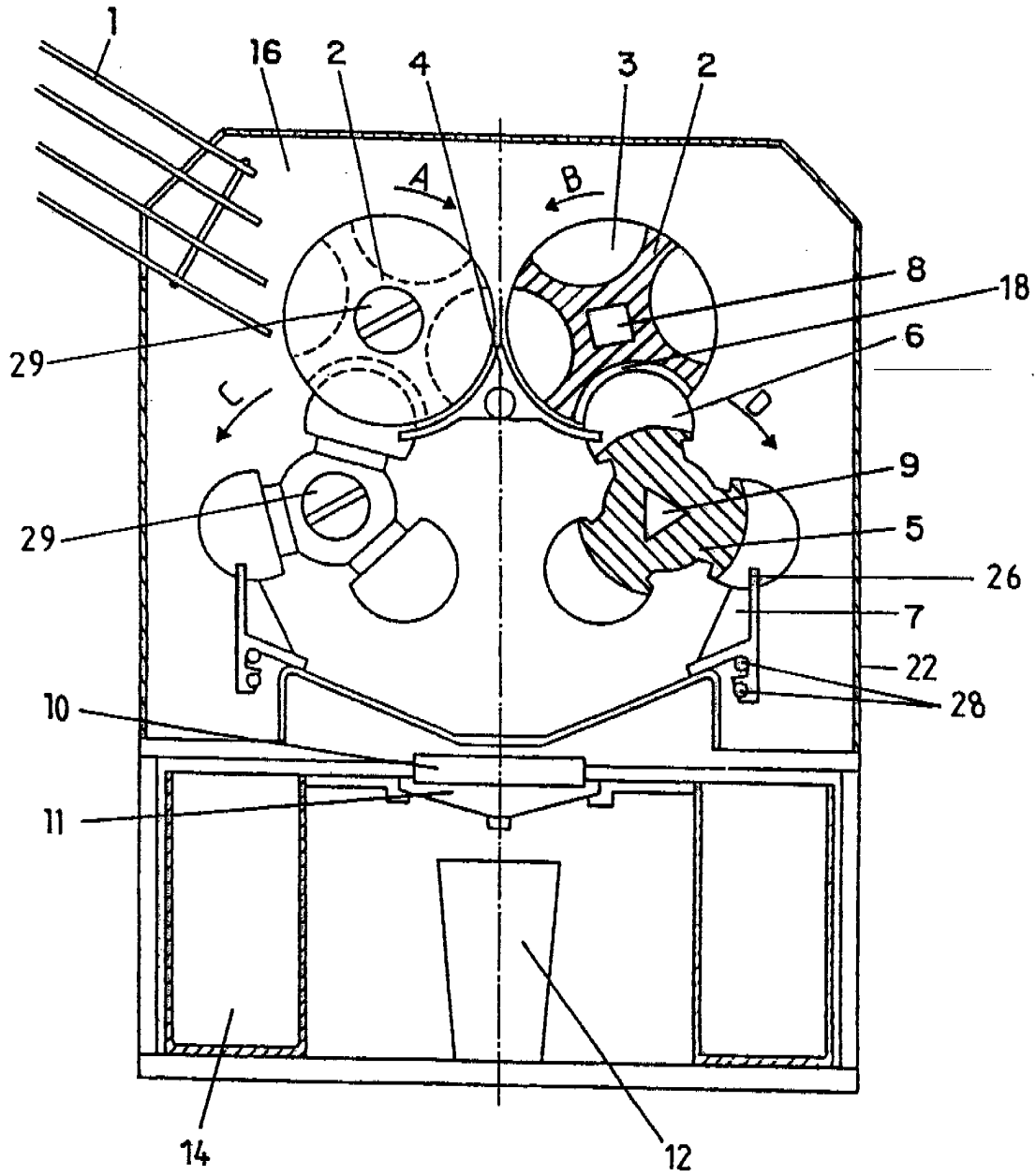
The juice extracting compartment 16 is closed by a transparent hood 22. The cylinders 2 and drums 5 are detachably mounted onto their respective driving shaft 8, 9, and held on by wing-nuts 29. Each cylinder 2 and drum 5 can be slipped off its shaft for cleaning purposes. Errors in remounting may be avoided by differently profiled shafts 8, 9 and corresponding openings in the cylinders 2 and drums 5, eg square cross-section for shafts 8 and triangular cross-section for shafts 9.

The drive compartment 15 houses the electric motor. Its rotary motion is transmitted to the shafts 8, 9 by a gear drive, thus rotating the cylinders 2 and drums 5. It is not obligatory to synchronise the cylinders and drums by means of a gear drive. Instead, each cylinder and each drum may be driven by a respective electrical motor with synchronisation being achieved electronically.

CLIENT'S DRAWINGS

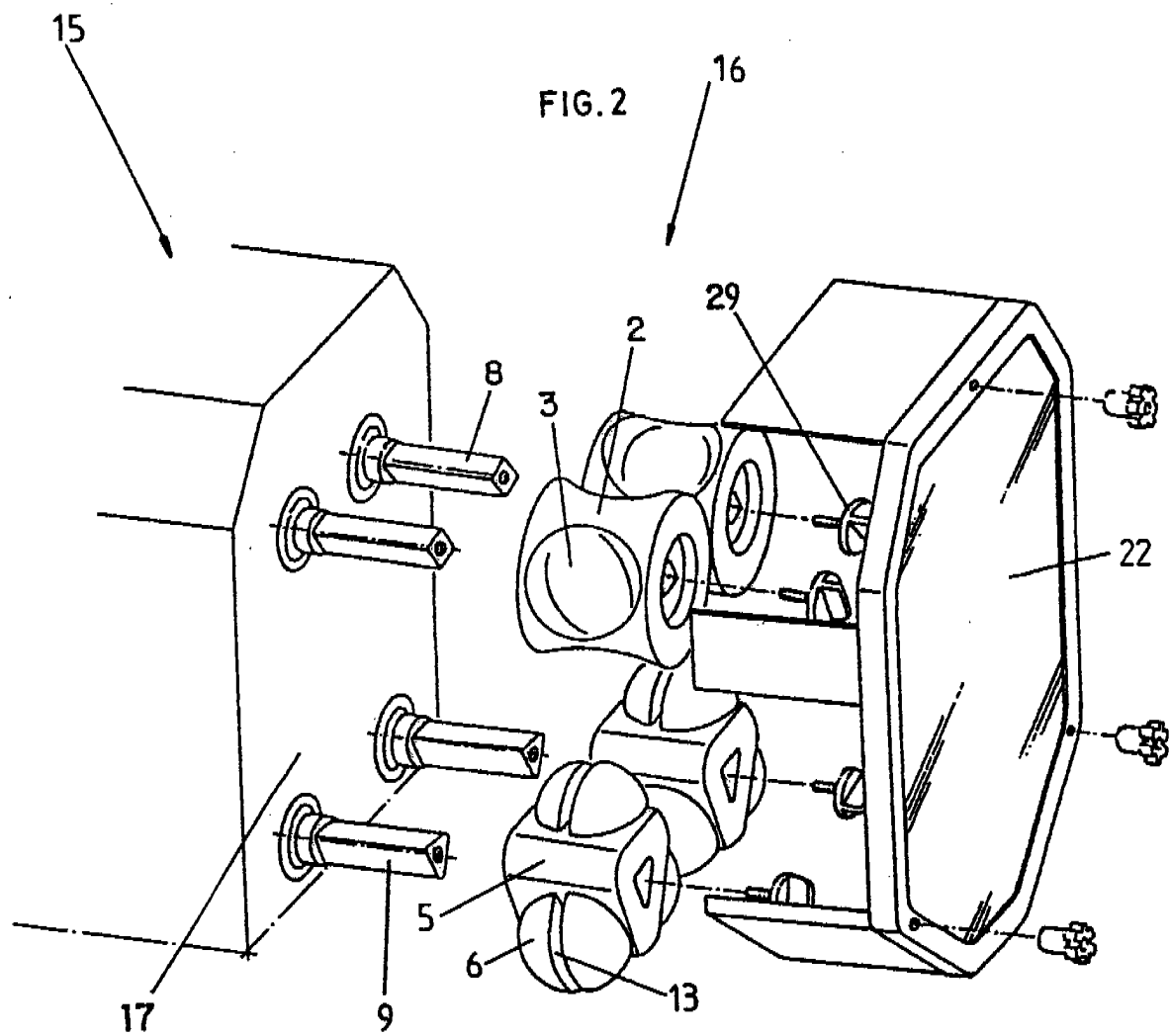
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FIG.1



CLIENT'S DRAWINGS

2/2



DOCUMENT DI (State of the Art)

The invention relates to a machine for squeezing citrus fruit.

Figure 1 shows a front elevation of the machine.

Figure 2 shows a similar view in which the machine is in the fruit squeezing position.

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The machine comprises a supply assembly 1 with a container 2 in which citrus fruit, eg oranges, grapefruits or lemons can be loaded.

Due to the effect of gravity and under the control of a stop member 3, one of the fruits located in
10 the container 2 falls into one of two cups 9. The other cup remains empty. Each cup is located at one end of an arm 10, the other end of the arm being mounted on a driven, rotatable shaft 11. These parts are vertically movable as a result of movement of driven shaft 11 in a guide groove 12 provided in a frame 13.

15 From a first, uppermost position (shown in solid lines in Figure 1), the left and the right cups 9 rotate towards each other. After a rotation of 90° the cups 9 reach a second position (shown in dashed lines in Figure 1) in which they face each other. Here the fruit is cut in two by means of a central blade 14, such that each of the two equal halves is located in its corresponding cup 9. Thereafter the cups 9 rotate a further 90° along slip ramps 15 until they reach a third position (also
20 shown in dashed lines in Figure 1) in which rotation stops. The slip ramps 15 are vertically movable and guided by a central vertical groove 22 in the frame 13. The purpose of the slip ramps 15 is to prevent the fruit halves from falling out of the cups 9. The uppermost ends of the symmetrically arranged slip ramps 15 form an apex on which the blade 14 is positioned. At the other end of each slip ramp 15 is a circular opening 16 which faces a respective squeezing cone 17.

When the cups 9 which contain the two halves of the fruit are in the third position facing the cones 17, they descend vertically downwards together with slip ramps 15 into a fourth and lowermost position (shown in Fig. 2), such that the two fruit halves are thoroughly squeezed by pressing against the cones 17. The juice drips into a filter 19 of a tray 18 and from there through a
5 small tube 20 into a glass 21.

Once the juice has been extracted, the cups 9 rise upwards, leaving two peel halves on the slip ramps 15 above the openings 16. Then, the arms 10 resume their rotation until they have reached their first and uppermost position. The slip ramps 15 rise upwards a certain amount of time after
10 the cups 9, the delay being sufficient for the cups 9 to cover at least half of the way back to their first position. In this position, one of the cups 9 receives another piece of fruit from the container 2. The same cycle is then repeated, the peel halves deposited over the circular openings 16 being moved aside and ejected by means of the cups 9 themselves, which run into the peel halves as they move into their third position.

15 For better juice extraction, the cones 17 could also be continuously rotated around vertical axes 23.

In another embodiment which is not shown, the cups 9 only rotate about shafts 11, and do not descend from the third to the fourth position as described before. The squeezing of the fruit halves
20 is achieved by an upward movement of the cones 17 towards the cups 9.

It should be noted that the juice extracting parts of the machine, ie arms 10 with their respective cups 9, the blade 14 and slip ramps 15, as well as the cones 17, are mounted externally of frame
13. For example, arms 10 are mounted on the free ends of shafts 11. By this arrangement, all
25 components which come into contact with the fruit and juice can be easily accessed and assembled/disassembled in a matter of seconds without the need of tools.

The machine is provided with a manual or coin-operated switch and can accept fruit of various sizes.

DRAWINGS OF DOCUMENT DI (State of the Art)

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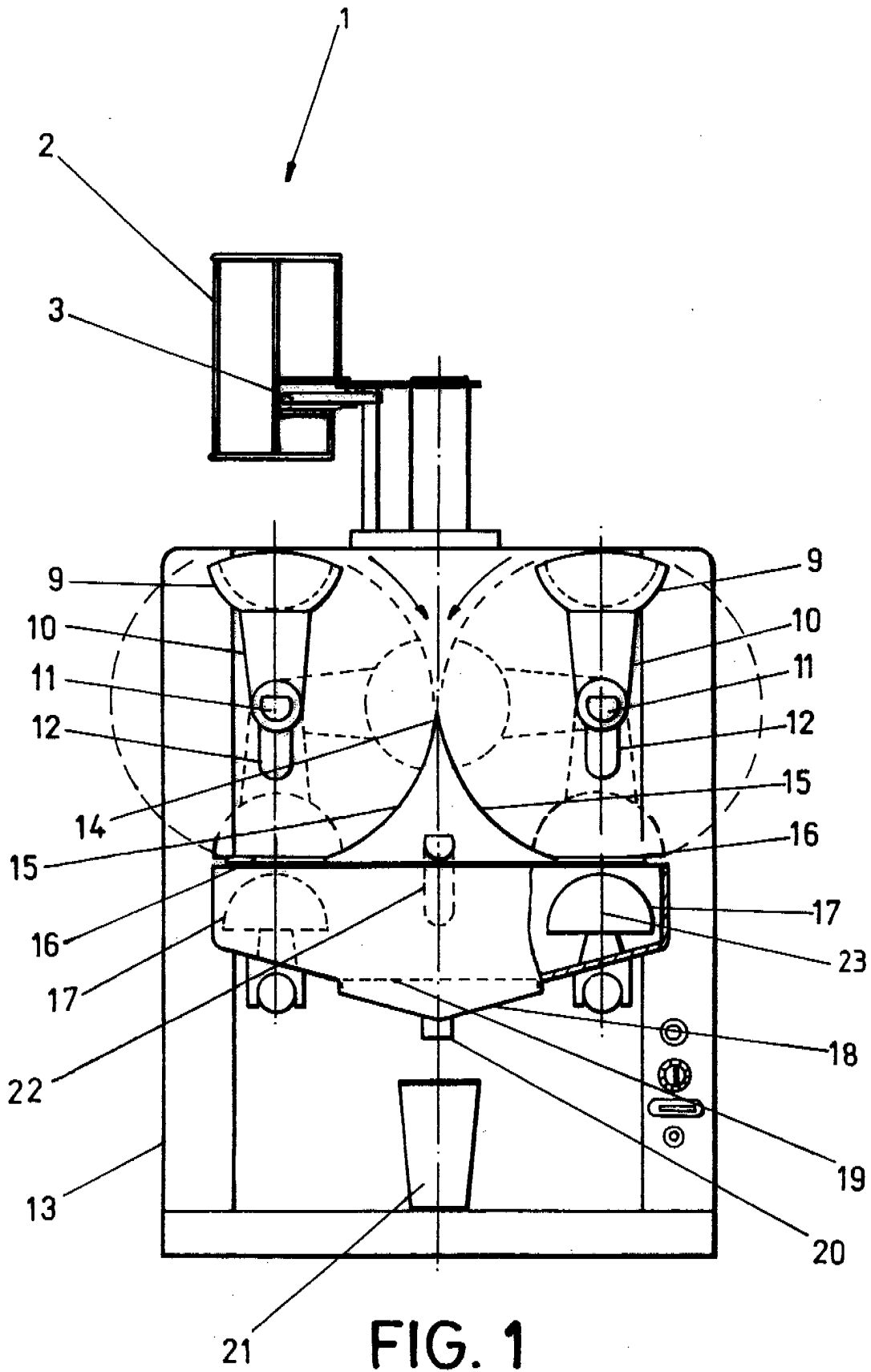


FIG. 1

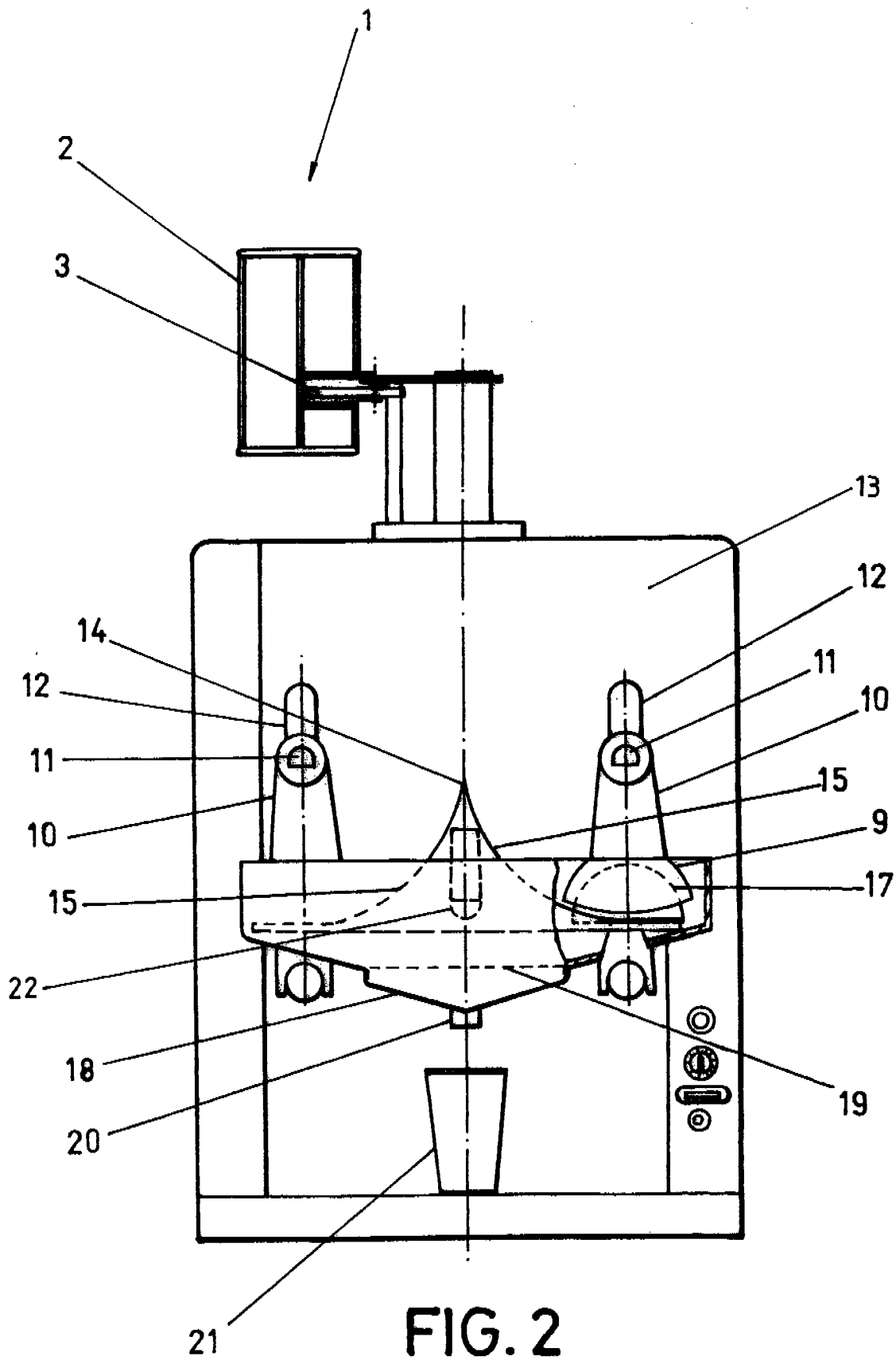


FIG. 2