

**D. S. SILVER**

# CONVEYORS, PARTICULARLY FOR USE IN VENDING MACHINES

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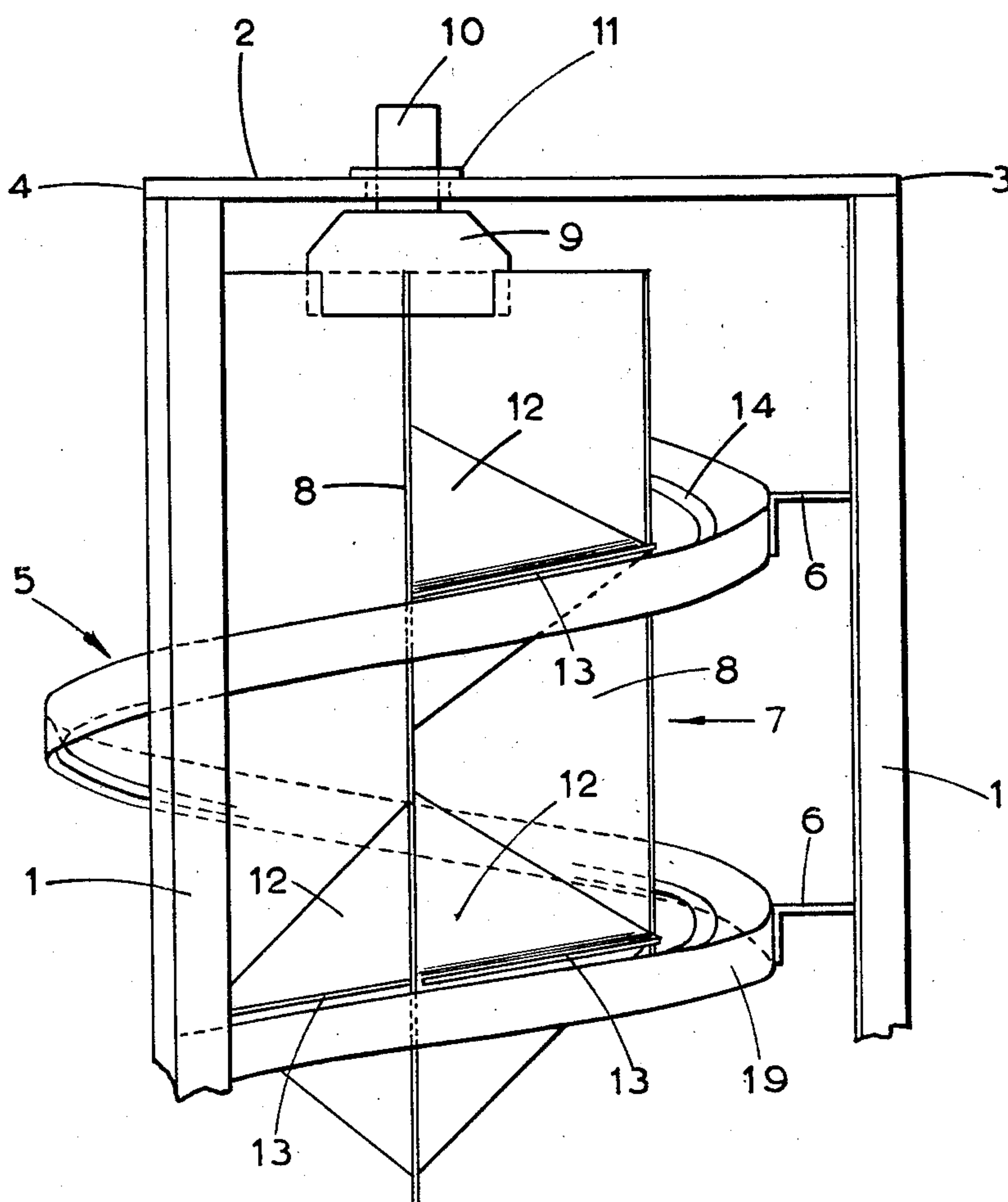


FIG. 1.

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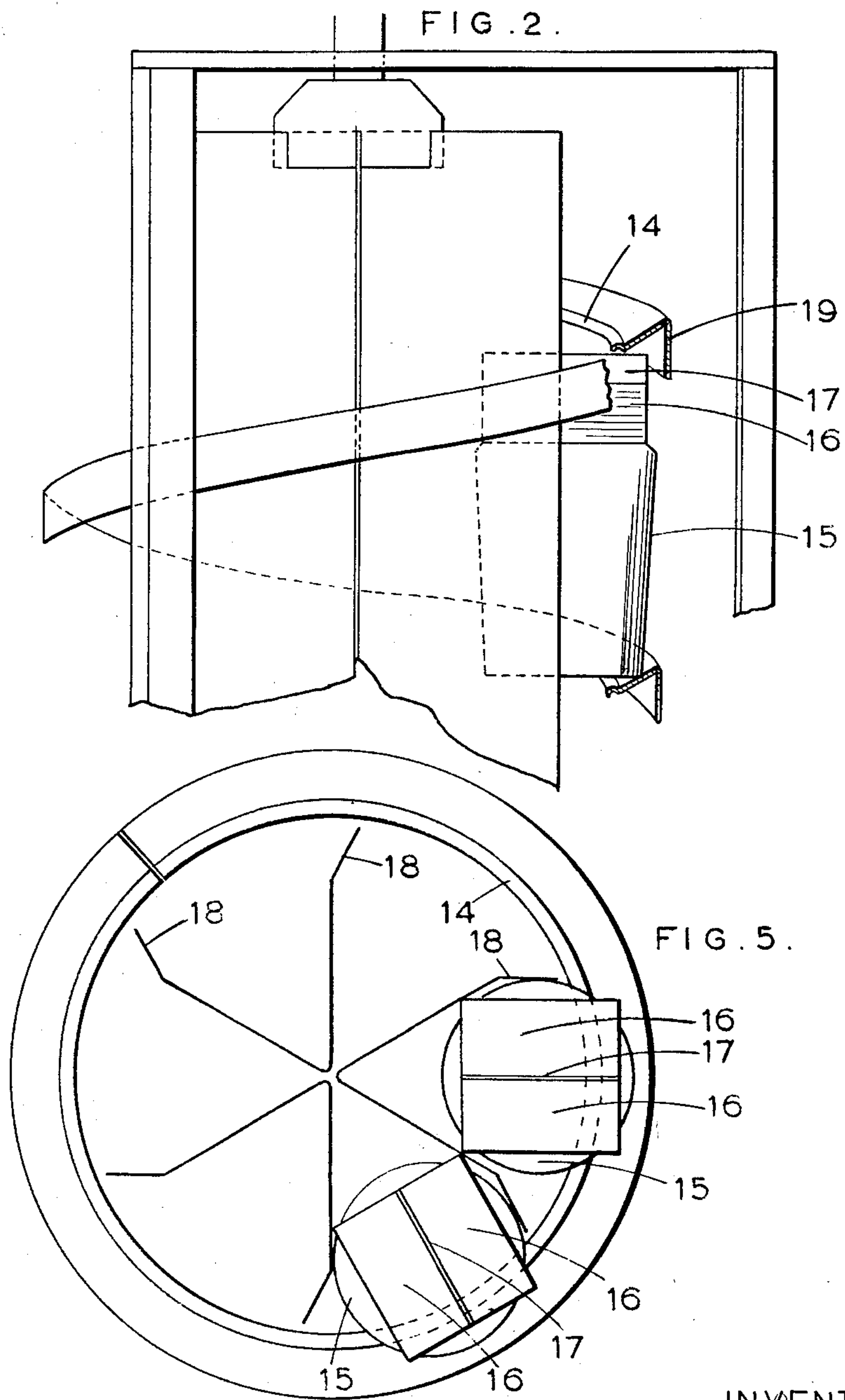
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3,101,829

CONVEYORS, PARTICULARLY FOR USE IN VENDING MACHINES

Filed Sept. 26, 1961

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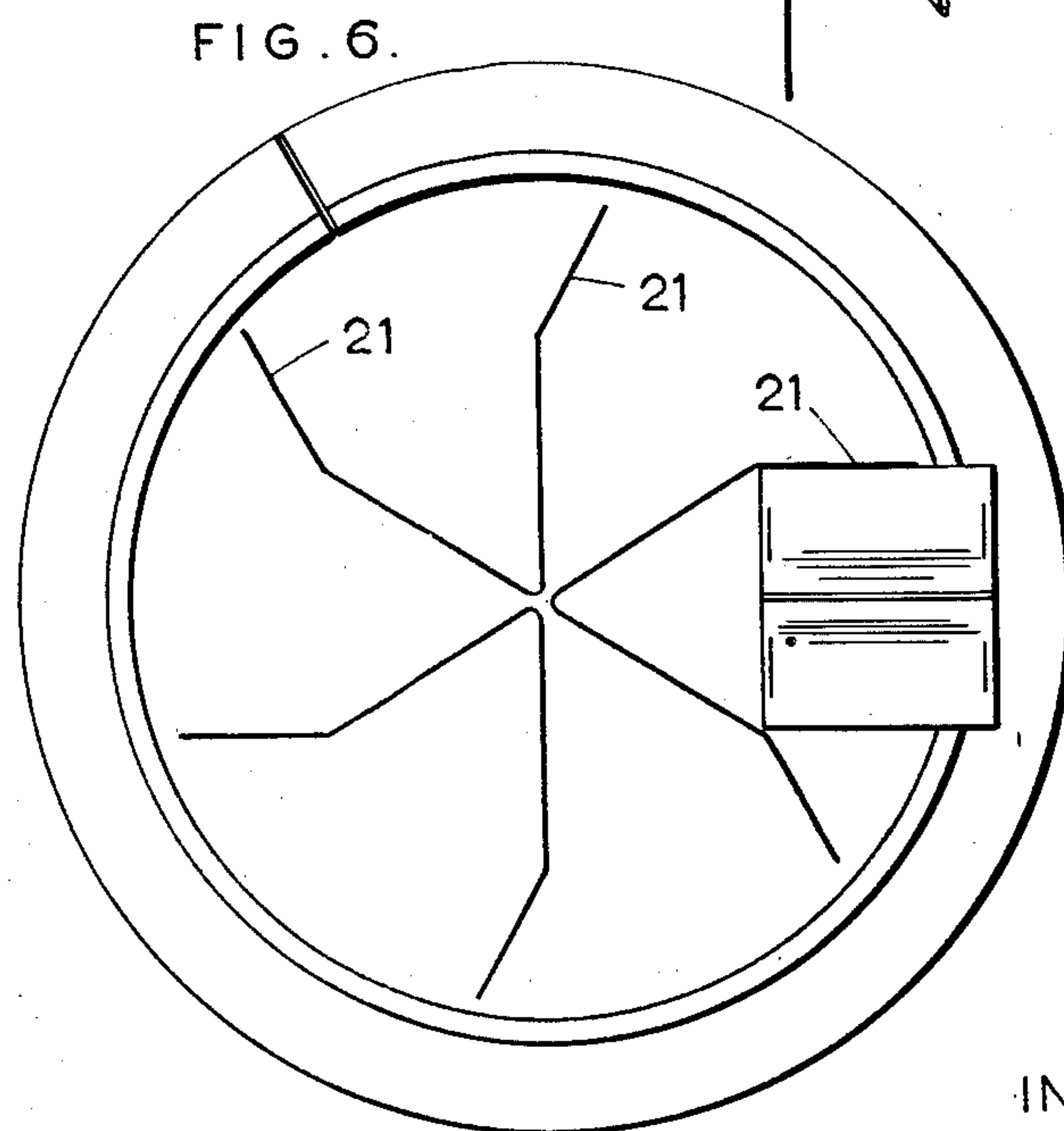
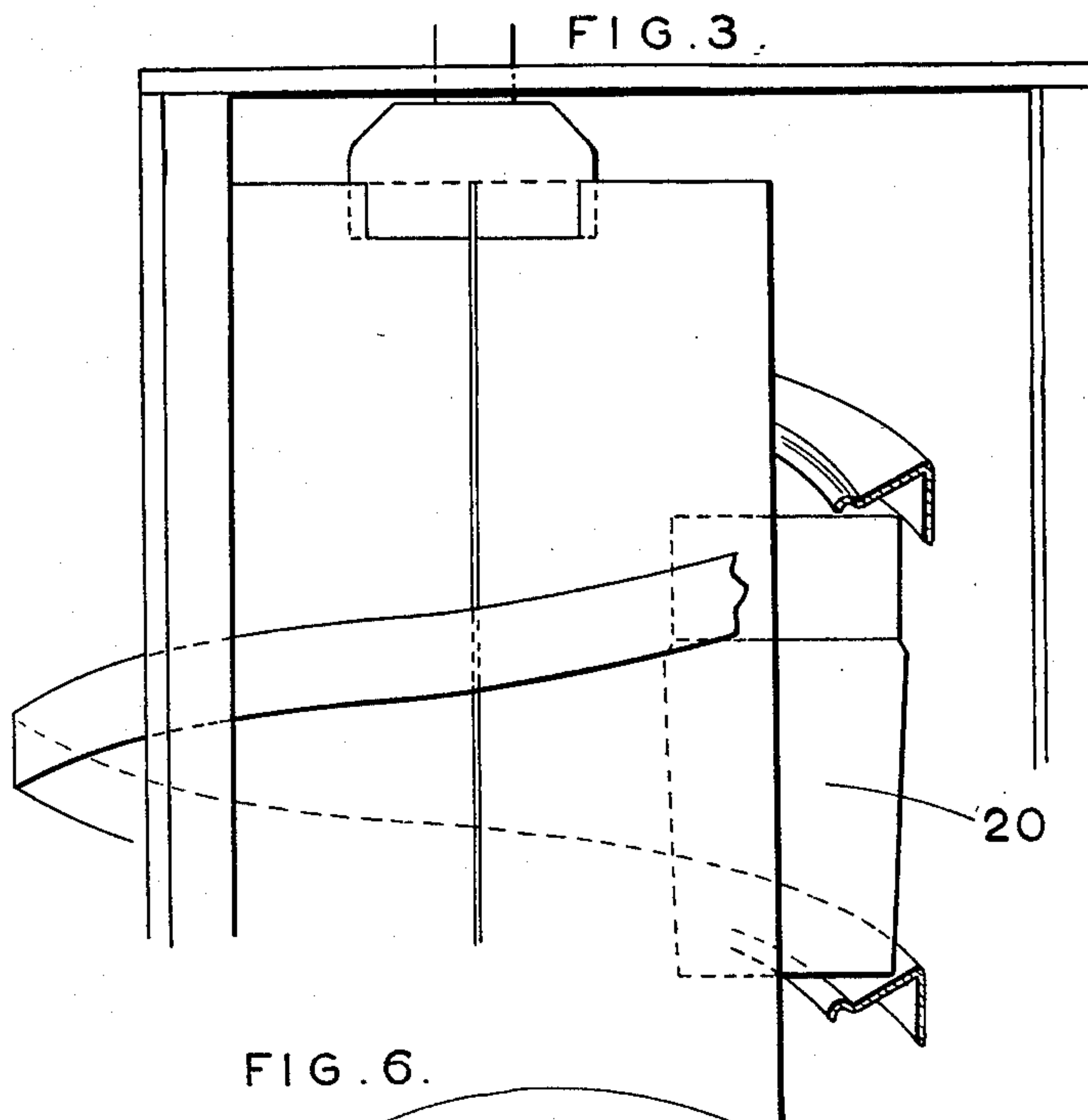
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3,101,829

CONVEYORS, PARTICULARLY FOR USE IN VENDING MACHINES

Filed Sept. 26, 1961

4 Sheets-Sheet 3



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3,101,829

CONVEYORS, PARTICULARLY FOR USE IN VENDING MACHINES

Filed Sept. 26, 1961

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FIG. 4.

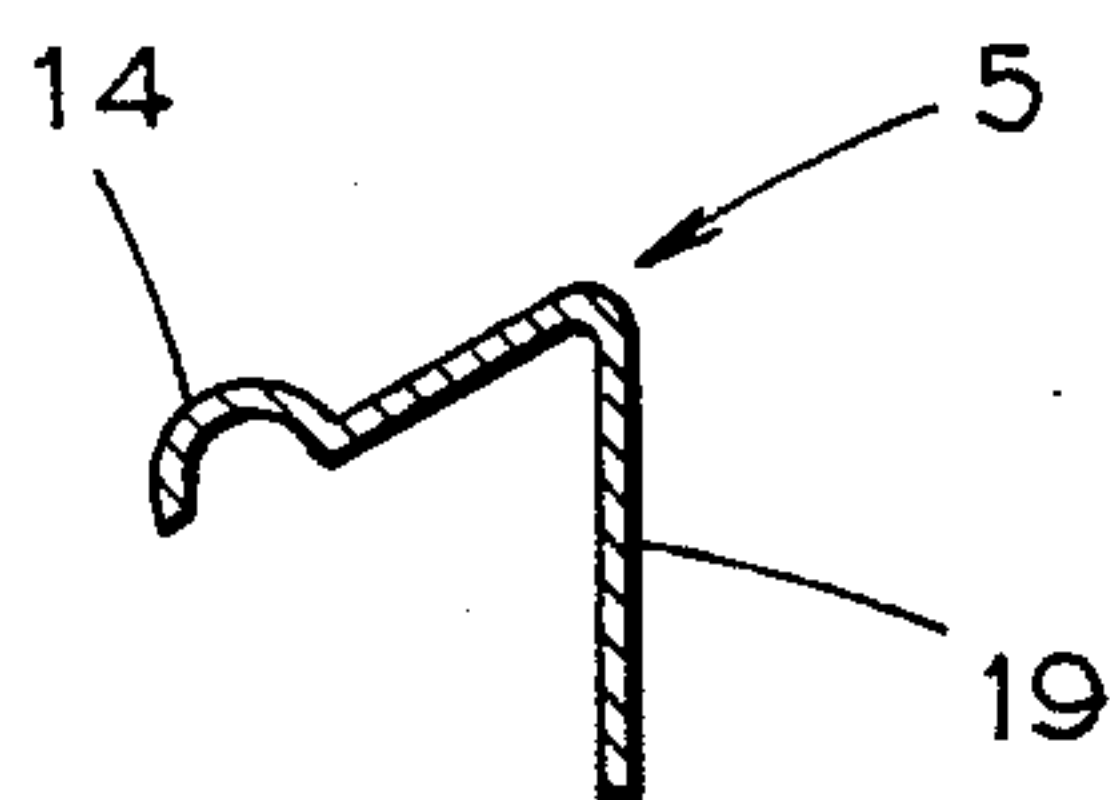
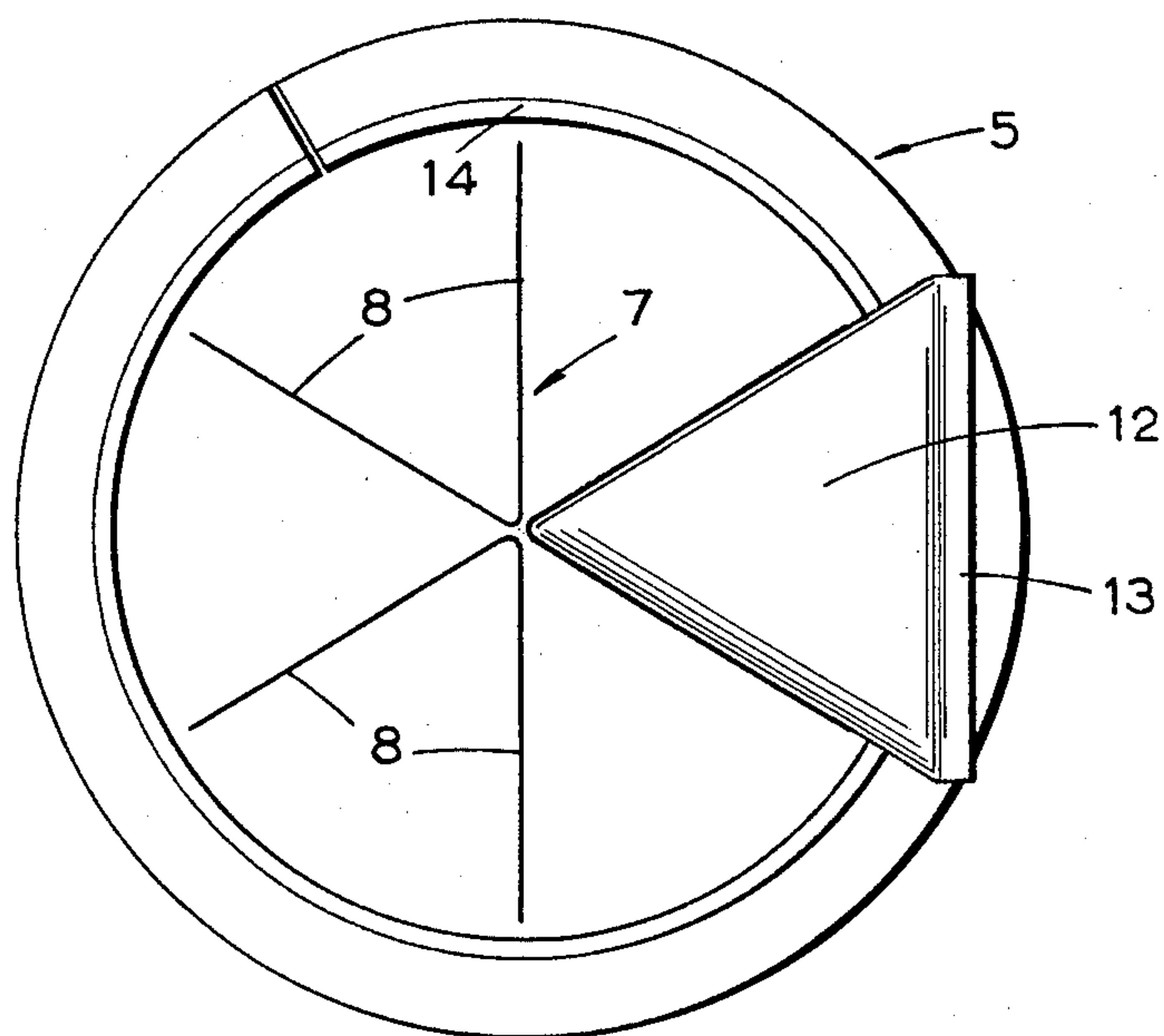


FIG. 7.

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3,101,829

## CONVEYORS, PARTICULARLY FOR USE IN VENDING MACHINES

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Filed Sept. 26, 1961, Ser. No. 140,714  
2 Claims. (Cl. 193—12)

This invention relates to conveyors, particularly for use in vending machines. Conveyors are known in which the objects are fed along a vertical helix as a result of relative rotation, about the axis of the helix, between the helix and an abutment which causes the objects to travel along the helix while they move axially with respect to the abutment. Usually the objects are fed in the downward direction and the abutment is caused to rotate while the helix remains stationary. However, either or both these characteristics may be reversed; that is to say, the objects may be fed upwards, and the helix rotated while the abutment remains stationary. It is most usual for the abutment to be mounted inside the helix.

These conveyor devices are very advantageously incorporated in vending machines, in which they function also as storages for the goods to be sold. The arrangement is then such that the conveyor device is initially charged with as many items as possible, these being distributed along substantially the entire length of the helix and the abutment being arranged to engage all the items simultaneously. Thus, the abutment may consist of a rotor having a number of vertically disposed radial vanes, each engaging a vertical row of items supported respectively on the successive convolutions of the helix. The rotor is rotated through an angle sufficient to discharge one item from the end of the helix each time the vending machine is operated.

The nature of the goods that have to be stored in and conveyed by these devices varies according to circumstances. In the case, for instance, of cartons containing beverages, the cartons can take a variety of shapes. For example, the cartons may be tetrahedrons or they may have round or square cross-sections. The tetrahedral cartons have opposite edges at right angles to one another so that it is convenient to locate the cartons radially in the conveyor device with their inner edges nearly vertical in the angle between two adjacent vanes of the rotor, and their outer edges nearly horizontal and overlying the helix. Thus, each carton is supported by the helix and is prevented from tumbling off the helix by its lying the helix. Thus, each carton is supported by the cartons to fall radially outwards. On the other hand, the aforesaid round or square cartons are most advantageously arranged to stand on the helix so that they would be liable to fall radially outwards in the absence of means for preventing this. One object of the invention is, therefore, to provide a form of helix which can be used for any one of these types of carton.

According to the invention, a helical rail for use in a conveyor system, in which the helical rail is mounted with its axis vertical, is provided with a surface on which the objects to be conveyed rest and depending means, such as a flange, for limiting the radially outward movement of the objects by engaging the upper ends of objects resting on the next lower convolution of the helix. When such a helix is used with tetrahedral cartons, the flange only has the function of giving strength to the helix, but when it is used with the aforesaid round and square cartons the flange engages the tops of the cartons if they tend to fall outwards. Preferably, the helical rail has an angular cross-section presenting an upper surface sloping slightly downwards as it extends inwards from the angle and a substantially vertical flange extending downwards from the angle. The said surface may be formed with an

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embossed or beaded portion along which the objects travel as they progress along the rail. As the cartons usually have waxed surfaces, the embossed or beaded portion, which is preferably at the inner periphery of the upper surface, reduces friction between the cartons and the rail. Moreover, when the helix is made up of arcuate metal sections riveted or welded together, the embossed or beaded surface enables the cartons to clear the rivet heads and joints. A very convenient alternative method of manufacturing the helix is to extrude it from a nozzle having the required cross section, the material then being a thermo-setting synthetic resin, such as a polystyrene resin.

An important feature of the helices according to the invention is that their pitch can be adjusted simply by extending them or compressing them axially and then mounting them on brackets located at positions corresponding to the chosen pitch.

In order that the invention may be clearly understood, conveyor devices in accordance therewith will now be described, by way of example, with reference to the accompanying drawings, in which:

FIGURES 1, 2 and 3 are front elevations of the upper ends respectively of three different conveyor devices;

FIGURES 4, 5 and 6 are plans respectively of similar portions of the devices shown in FIGURES 1 to 3; and FIGURE 7 is a cross-section of a detail.

The conveyor devices shown in the figures are for use in vending machines as described in the specifications of co-pending United States patent application Serial No. 140,713, filed September 26, 1961. The conveyor device shown in FIGURES 1 and 4 includes a frame having three vertical members 1, of angle-shaped cross-section, extending downwards from a triangular plate 2 to a similar plate (not shown) but formed with a notch through which cartons, discharged from the conveyor, fall to be received by a customer. The plate 2 is substantially equilateral and has an apex at 2 and the opposite side at right angles to the paper at 4.

A helix 5 is carried by brackets 6 secured to the vertical members 1, and a rotor 7 is mounted to rotate concentrically within the helix 5. The rotor 7 comprises vertical, radial, equi-distantly spaced abutment vanes 8, the upper ends of which are fitted into slots in a co-axial rotary member 9 having a journal 10 that may be connected to a driving motor and is rotatably mounted in a journal bearing 11 in the plate 2. The lower end of the rotor 7 is mounted on a ball thrust bearing carried by the lower plate.

The conveyor device of FIGURES 1 and 4 is designed to accommodate tetrahedral cartridges 12, each having inner and outer edges at right angles, with the inner edge nearly vertical and located at the junction between two vanes 8, and the outer edge 13 overlying the rail 5. Referring to FIGURE 7, which shows the rail 5 in cross-section, it will be seen that the rail 5 has an angular cross section that slopes downwards from the angle to an embossed or beaded rim 14. Beneath the angle, the rail provides a substantially vertical flange 19, which gives strength to the rail. The tetrahedral cartons rest, somewhat inwards of their edges 13, on the rim 14, the remaining portions of the cartons being clear of the rail 5.

Initially the conveyor device is charged with as many cartons as possible; i.e. six per convolution of the helix. Then, each time the conveyor device is operated, the rotor is turned through sixty degrees of arc to cause the cartons 12 to travel along the helix 5 while descending between the vanes 8 until the lowermost carton falls off the helix.

FIGURES 2 and 5 show an adaptation of the device to cartons having slightly tapered bodies 15 of circular cross section. The walls of these cartons are formed with flat portions 16 that slope towards one another and



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are sealed together at 17. These cartons rest on the helical rail and any tendency to fall radially outwards is resisted by the flange 19 of the convolution above. The ends of the rotor vanes are bent forward at 18, so that each exerts a thrust on the cartons that is tangential to the helix, as viewed in plan.

In the modification of FIGURES 3 and 6, cartons having slightly tapered square bodies 20 are accommodated. The rotor vanes have bent forward ends 21 that make line contact with the cartons while exerting thrusts thereon that are tangential to the helix, as viewed in plan.

When the helix is made of thermoplastic synthetic resin, it may be extruded as aforesaid, means being known by which curved extrusions can be formed. Alternatively the thermoplastic material can be moulded in annuli having the required cross-section, each annulus then being severed on one radius and twisted so that the twisted annuli can be joined together to provide the helix. A similar method can be used for metal helices.

I claim:

1. A helical rail for use in a conveyor device in which the helical rail is mounted with its axis vertical, said rail comprising, in combination, a helical flange on which the objects to be conveyed rest, and a depending, helical flange extending downwards substantially vertically from the outer periphery of said first-mentioned flange for limiting radially outward movement of the objects by engaging the upper ends of objects resting on the next lower convolution of the helical rail, said two helical flanges include an angle, as viewed in cross-section, which is less than a right angle.

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2. A conveyor device including, in combination, a frame comprising upper and lower end members and vertical members extending between said end members, a helical rail mounted vertically within said frame, on said vertical members, and a rotor mounted on said frame, concentrically within said helix, and shaped to feed objects along said helix on being rotated, said helical rail having a helical flange formed along its upper surface with a beaded protuberance on which the objects to be conveyed rest, and a depending helical flange extending downwards substantially vertically from the outer periphery of said first-mentioned flange for limiting radially outward movement of the objects by engaging the upper ends of objects resting on the next lower convolution of the helical rail, said two helical rails including an angle, as viewed in cross-section less than a right angle.

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