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(12) # EUROPEAN PATENT APPLICATION

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(54) **Cutting machine.**

(57) Cutting machine for cutting tube blanks (10) into tubes, with four spindles (1-4) onto which the tube blanks are successively placed, calibrated, cut into lengths, and removed at individual stations for each step. The spindles are mounted on a round turret (5), and as it is rotated in 90° steps, the spindles are moved from one station to the next. By calibration, in which a calibrating ring (20) is pressed over the tube blank (10), the finished tubes are given a very exact diameter and evenness.

EP 0 037 805 A1

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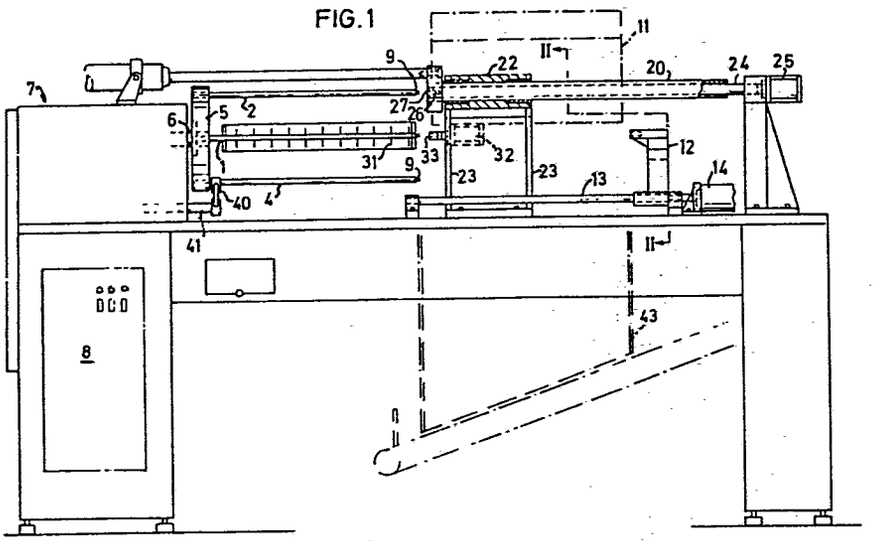
FIG.1



Cutting machine

The present invention relates to a cutting machine for cardboard tubes.

In various office machines, calculators, book-keeping machines, cash registers, telex machines etc., an audit strip is printed or typed on paper delivered in rolls and wound on a tube. Cardboard tubes are used in other areas as well, for example in shutgun shells, fireworks etc. The demands placed on such tubes are quite high and both the length and diameter must have exact dimensions.

Tube manufacture is described per se in our own Swedish Patent Specification 7902333-9, according to which papertube blanks are wound on a spindle in long lengths which are then cut in a cutting machine to exact lengths. These can vary from less than 1 cm up to 15-20 cm or longer.

The cutting machine according to the invention is a further development of the cutting machine described in our above-mentioned patent, but it is of course not limited to use in connection with our tube machine; rather it can be used for spiral-wound tube blanks or for completely different purposes as well.

In our previous cutting machine, tube blanks are slipped on a spindle, cut with rotating knives and then pulled off the spindle.

The cutting machine according to the invention has instead four spindles and therefore permits an appreciably higher cutting speed and a supplementary calibration function.

The invention will be described in detail in connection with the accompanying drawings of which Fig. 1 shows a longitudinal section of the cutting machine according to the invention, Fig. 2 shows a cross section along the line II-II in Fig. 1, and Fig. 3 is a schematic representation of the operating cycle,

Four spindles, 1-4 with the same diameter as the inner diameter of the tubes to be manufactured, are rotatably mounted on a stepwise rotatable turret 5. The turret 5 is fixed to a shaft 6 mounted in a bearing housing 7. A ratchet device for the shaft 6 is also arranged in the bearing housing, so that the shaft can be turned in steps of exactly 90^{o} in response to control impulses from a control unit 8. The spindles each have a short guide pin 9 at the end.

When cutting tube blanks, four operations are performed simultaneously, one on each spindle.

Long tube blanks 10 from the winding machine are collected in a hopper 11 in front of the spindles arranged so that the lowest tube blank lies right in front of the spindle 1. A pusher 12 on tube guides 13 pushes the lowermost tube blank on to the spindle 1 and then withdraws to its resting position, being driven by a pneumatic cylinder 14.

At the same time a tube blank is calibrated on spindle 2. A calibrating pipe 20 or a calibrating ring is slidably mounted in a housing 22 on two uprights 23 in front of the spindle 2. There is a sliding rod 24 inside the calibrating pipe. A pneumatic cylinder 25 presses the rod 24 and the calibrating pipe 20 forward, the sliding rod stopping against the end of the spindle 2 with the guide pin 9 fitting into a corresponding hole 26 at the front of the rod. The calibrating pipe 20 which is bevelled 27 at the front, is then pulled over the tube blank 10 and then returned. The tube blank is prevented from being drawn along with the pipe in the return movement by the front end of the rod. In the last part of the calibration stroke, when the pipe 20 has left the tube blank 10, the rod 24 follows along in the movement thus freeing the guide pin 9.

Calibration evens out and smooths the tube and gives it an exact outer dimension, which is essential for its future use. Small variations in thickness can otherwise arise, caused by unevenness in the paper thickness and by the final wound edge.

Less expensive, less even and poorer quality paper can thus be used for tubes, which will still be more exact than tubes made of the best available paper qualities but made in the usual manner.

On spindle 3, the tubes are cut to the desired length, and the outer ends which may be damaged during calibration are cut off.

A motordriven, rapidly rotating cutting spindle 30 with a number of blades 31, is pressed against the tube blank 10 on spindle 3, at the same time as a supporting center 32 with a hole 33 for the guide pin 9 is advanced into engagement. The spindle 3 is supported in this manner and support rollers can also be placed in contact with the tube blank opposite to the cutting spindle. By virtue of the fact that the spindle 3 is rotatably mounted in the turret 5, it can rotate by itself so that the cuts are made around the entire circumference, but it can also be driven via one of the support rollers or via the support center 32. After the cutting is complete, the supporting center is retracted as are the cutting spindle and the supporting rollers through the operation of pneumatic cylinders.

Finally, in position 4 two jaws 40 grasp around the innermost end of the spindle. The jaws are mounted on a sliding rod 41 which is extended and pushes the cut tubes off the spindle 4. The tubes fall down into a bin 43 arranged under the cutting machine and with a grill bottom with the mesh being large enough to allow the cut-off edge bits to fall through. The tubes are then ready for delivery.

As was mentioned above, the machine is operated by a control unit 8 sending impulses to pneumatic cylinders. Such control of various machines is previously known per se, and is therefore not described in more detail here. Pneumatic cylinders have been mentioned as operating means, but electromagnetic or electric means or hydraulic cylinders can of course be used, even if pneumatic means have proved to be simplest in

our machines which are primary operated pneumatically.

The cutting machine according to the invention has appreciable advantages over cutting machines which we have used previously. The exact calibration and the improved exactness of the tubes, in spite of the use of poorer paper qualities, has very great importance for its use. For example, both shutgun shells and tubes for paper rolls for a telex apparatus are very sensitive to even quite small unevenness. By moistening the tube blanks somewhat and calibrating at elevated temperature, for example 50-70°C, it is possible to achieve a tube with an evenness approaching that of a metal surface.

The cutting machine has also been a bottleneck in tube manufacture, since an ordinary cutting spindle can only make about 20 strokes per minute. In addition to the new spindle for calibration, the cutting machine according to the invention has two additional spindles, which theoretically produces a tripling of the possible speed. In practice, however, the possible speed is even greater, since the shifting between the various steps proceeds more rapidly than the previous ejecting of cut tubes and putting on of a new tube blank. At present, the machine is driven at about 40 strokes per minute, but a capacity of 60-70 strokes per minute has been shown to be possible, even for extended operation.

CLAIMS

1. Cutting machine for exact cutting into lengths of tube blanks, consisting of a shaft-mounted, stepwise rotatable turret (5) with four rotatable spindles (1-4), a push-on arrangement for the tube blanks (12-14), a cutting device (30-32), and a push-off device for the cut tubes (40,43), characterized in that a calibrating device (20-25) is arranged between the push-on device and the cutting device, to even out irregularities and unevenness in the tube blanks, and that each of the spindles (1-4) is arranged upon 90° rotation of the turret (5) to be situated exactly in front of the next processing device.

2. Cutting machine according to Claim 1, characterized in that the calibrating device consists of a pipe or a ring (20) of exact diameter which has a bevelled inner edge (27) at the front end, is rotatably mounted in a housing (22) and is arranged during the calibration to be drawn over the tube blank (10) evening out the same.

3. Method using a cutting machine for tube blanks of cardboard or paper, characterized in that each tube blank is calibrated prior to cutting by a ring of exact diameter being pressed over the tube blank on its spindle.

4. Method according to Claim 3, characterized in that the tube blank is moistened and heated prior to calibration.

FIG. 1

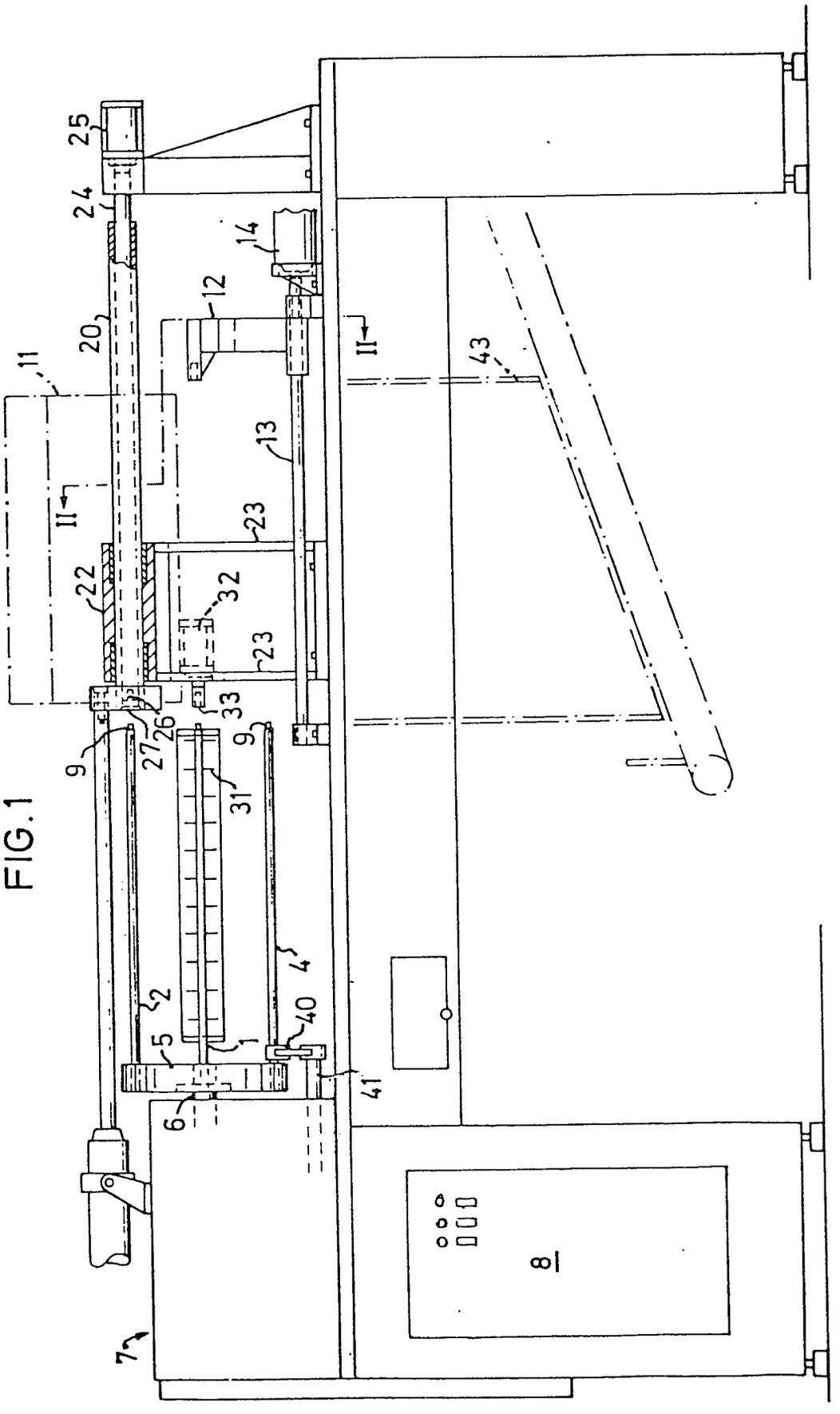


FIG.3

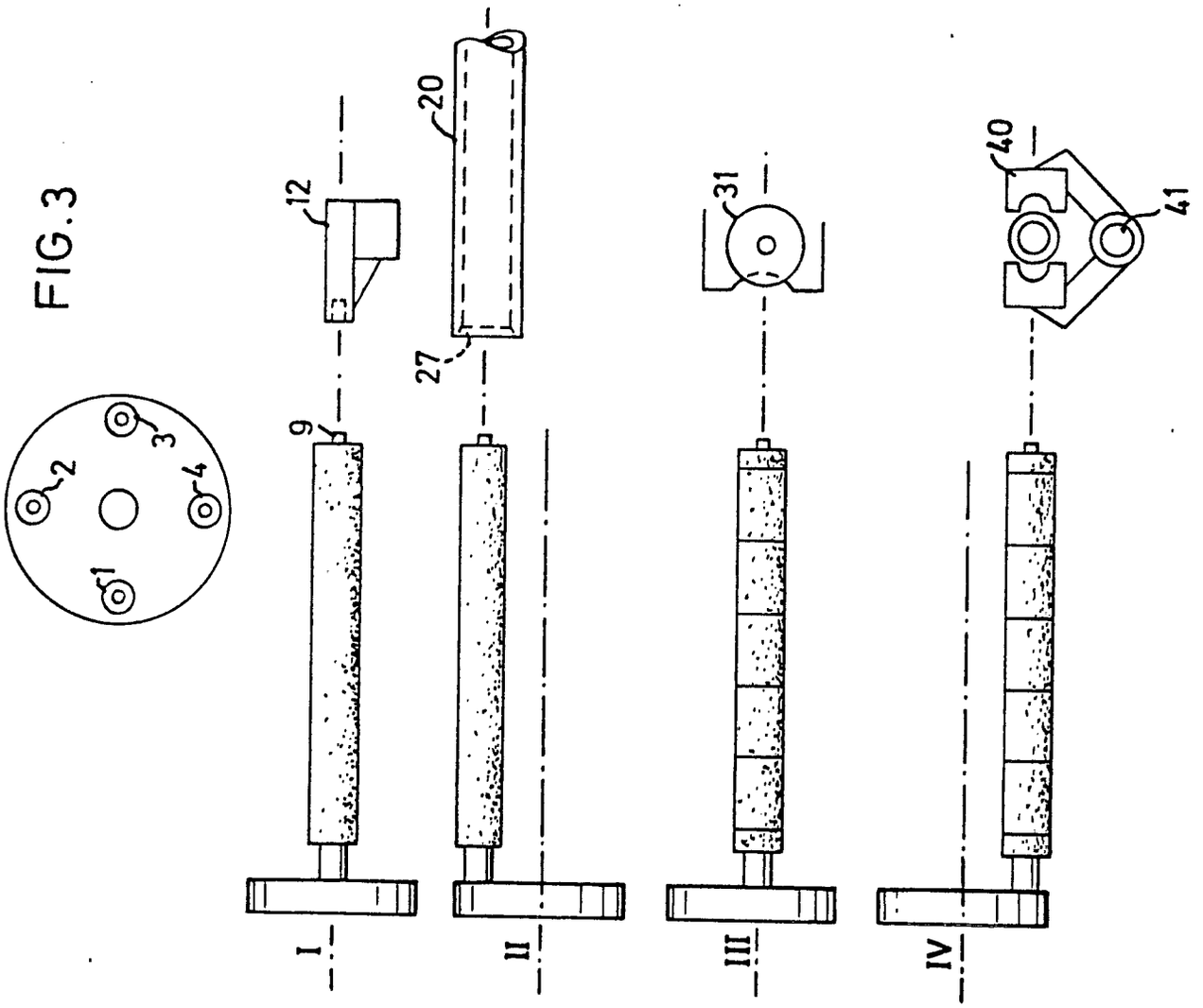
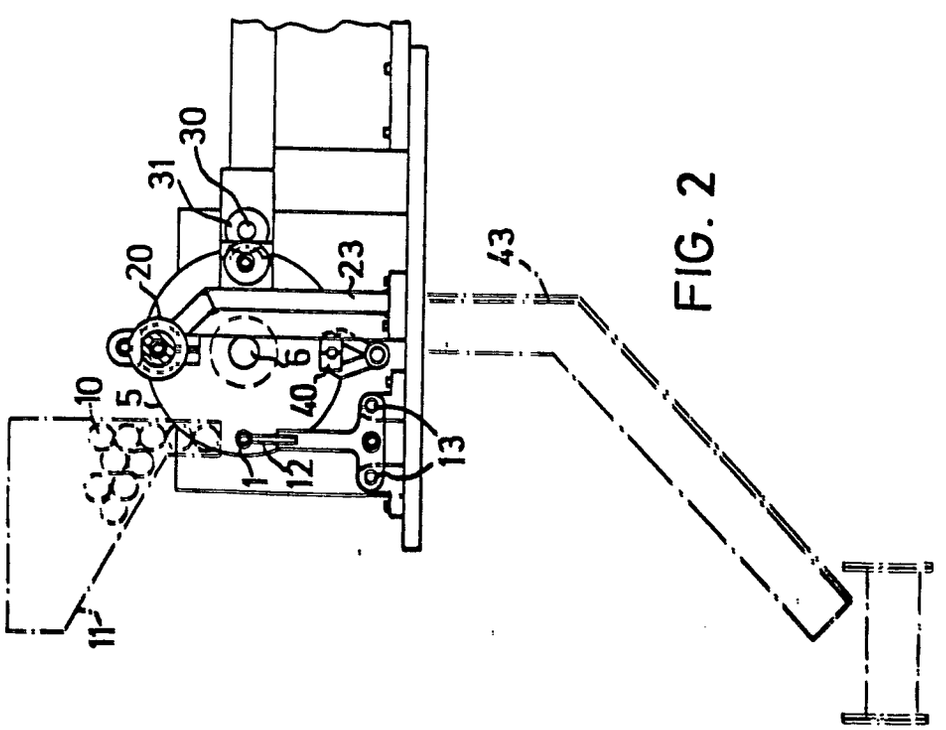


FIG. 2



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EUROPEAN SEARCH REPORT

Application number
EP 81 85 0058

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	US - A - 3 231 445 (PEZZOLI)	1
A	FR - A - 1 569 763 (COMP. IND. NEUVILLE)	
A	FR - A - 1 564 868 (COMP. IND. NEUVILLE)	
A	US - A - 1 575 894 (AYER)	

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 26 D 3/16 //
B 31 C 1/00

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 26 D
B 31 C
B 29 H

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16-07-1981	BERGHMANS