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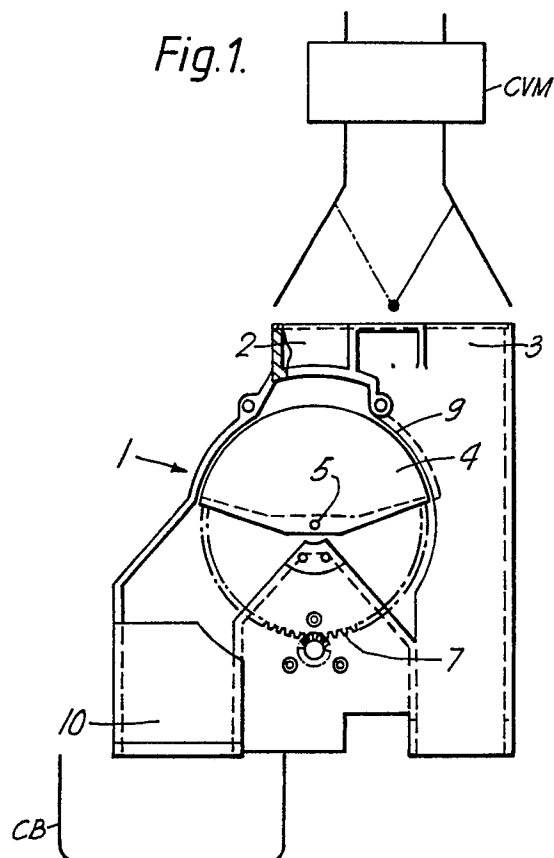
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(54) Coin accepting mechanism.

(57) A coin accepting mechanism includes an escrow comprising a pivoted bucket (4) arranged to receive coins from a coin entry (2), and an ironless rotor motor (6) arranged to rotate the bucket (4) around its pivot (5) in a clockwise or anticlockwise direction to tip coins out of the bucket (4) into a cash box (10) or into a reject chute (3). The low inertia and operating current of an ironless rotor enable a coin accepting mechanism for a telephone to be line powered.

*Fig.1.*



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## Coin Accepting Mechanism

In coin accepting mechanisms forming part of coin freed apparatus, it is desirable to include an escrow in such apparatus and this is particularly useful in coin payment telephones. The operation of an escrow will subsequently be described with reference to coin payment telephones but it also has application to other coin freed apparatus. An escrow provides a temporary store for coins fed into a coin receiving mechanism until a sufficient number of coins have been accumulated to pay for a particular telephone call or other service. The dialling mechanism is then enabled to allow the user to dial the required telephone number and then, once a connection has been established between the coin payment telephone and the required number the coins held in the escrow are transferred to a cash box of the telephone. If the call is not established the coins held in the escrow are returned to the user. An existing escrow used in a telephone comprises a coin holding chamber with a generally horizontal flap at its base in which the coins are initially stored and then below the coin holding chamber a passageway divides into two, one part leading to the coin box of the telephone and the other part leading to a reject chute. A flapper is mounted generally vertically and pivots to the left or the right to close off the chute leading to the coin box or the reject chute so that when the generally horizontal flap is lowered the coins from the holding chamber are directed towards the coin box or to the reject chute. The flaps are solenoid operated using large high current solenoids and typically a 110 volt pulse is fed from the exchange to operate the solenoid to accept or reject coins. Such escrow mechanisms are used particularly widely in Canada and the United States of America.

DE-A-3500537 describes another form of coin accepting mechanism having an escrow including a bucket pivoted around an axis and arranged to receive coins from a coin entry, an electric motor arranged to rotate the bucket around its pivot in a clockwise or anticlockwise direction to tip coins out of the bucket into a cash box or into a reject chute. In the arrangement described in this specification three buckets are mounted on a turntable rotatable about a horizontal axis and indexing means are provided always to stop the turntable in a position with one bucket beneath the coin entry slot.

According to this invention such a coin accepting mechanism is characterised in that the electric motor is of the ironless rotor type.

Preferably only a single bucket is provided which is pivoted at its lowest point. This arrangement requires relatively little energy to tip the bucket into one of its extreme positions. An iron-

less rotor motor has a very low inertia and, because of the lack of iron in its rotor and stator no "cogging" takes place resulting from residual magnetism in the iron core. Accordingly an ironless rotor motor has very small resistance to rotation. A normal small sized DC powered motor containing iron typically requires a driving current of between 70 and 80 milliamps. An equivalently sized ironless rotor motor requires only two or three milliamps to drive it. Thus, by using such a pivoted arrangement and an ironless rotor motor it is possible to provide an escrow mechanism which can be line powered directly from the normal holding current present on a telephone line which typically has a maximum of around 23 milliamps at a voltage around 8 volts.

Preferably the coin accepting mechanism includes a coin validating system located between the coin entry slot and the bucket to determine the validity of coin after insertion in the coin entry slot and before they are stored in the bucket of the escrow. It is especially preferred that the coin validating mechanism is of the electronic type including a microprocessor.

The escrow may include an indexing mechanism such as a sprung detent which holds the bucket in its central position in which it receives coins.

Preferably the escrow includes position sensors which provide a first output when the bucket is in its central position and further outputs when the bucket is tipped into its extreme clockwise or anticlockwise position. In this case it is preferred that the escrow is controlled by the microprocessor associated with the coin validating part of the coin accepting mechanism and that the microprocessor receives outputs from the position sensors. In this way the microprocessor can control the direction of rotation and the starting and stopping of the ironless rotor motor thereby to control the operation of the escrow. Preferably the microprocessor applies a dynamic braking to the ironless rotor motor by, for example, shorting out its terminals to reduce the movement of the ironless rotor motor and hence the movement of the pivoted bucket.

The position sensor may be formed by two holes formed in the side of the bucket and photo emitter detector pairs aligned with the holes so that when the bucket is in its central position an output is obtained from both photodetectors whereas, when the bucket is in its extreme position output is obtained from a respective one of the photodetectors.

The bucket may be spring biased into its reject position so that, in the event of a total power failure of the coin receiving apparatus any coins held in

the escrow may be returned automatically via the reject chute. Alternatively, a manually operated mechanism may be included to tilt the bucket into its reject position in this event.

A typical example of escrow in accordance with this invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a front elevation;

Figure 2 is a rear elevation;

Figure 3 is a side elevation with the motor omitted;

Figure 4 is a plan with the motor omitted;

Figure 5 is an under plan with the motor omitted; and,

Figure 6 is an exploded perspective view.

The escrow 1 forms part of a coin validating and receiving apparatus for a coin box telephone. The escrow 1 is located between a coin validating mechanism CVM and a coin box CB and outlet of a reject chute. The coin validating mechanism CVM is conventional in construction is only illustrated in outline and may be based on the electronic coin validating system described in EP-A-0203702. In the coin validating mechanism CVM coins are divided into two streams, a stream of acceptable coins which enter the coin validator mechanism through the chute 2 and invalid coins which bypass the escrow 1 along a reject chute 3 leading the reject outlet.

The escrow 1 comprises a coin holding bucket 4, shown most clearly in Figure 6 which is pivoted about a pin 5 having a horizontal axis. An ironless rotor motor 6 is arranged to pivot the bucket 4 in a clockwise or anticlockwise sense via a rack 7 and pinion 8 connection. The bucket 4 is located in a generally circular aperture in a main body 9 of the escrow 1 which, together with the bucket 4 defines a coin receiving chamber which receives coins entering the escrow 1 via the aperture 2. When the bucket 4 is in a generally horizontal position as shown in Figure 1 the coins are held in this chamber and cannot escape. However, upon tilting the tray 4 in the clockwise direction as seen in Figure 1 the coins tip out of the bucket 1 into the reject chute 3 and so are directed towards the reject outlet of the coin validator whereas tipping in the anticlockwise direction as seen in Figure 1 tips the coins down chute 10 which leads to the coin box CB. The side of the bucket 4 includes the curved rack 7 which is engaged by the pinion 8 mounted on the shaft of the ironless rotor motor 6. Normally the bucket 4 is held in a substantially horizontal position. The housing 9 is formed of a resilient plastics material. The motor 6 may have its rotary shaft connected directly to the pinion 8. Alternatively the motor 6 may be of the type that includes an integral reduction gearbox. The motor 6 is located in a cylindrical aperture 11 formed

integrally in the housing 1.

The side of the bucket 4 includes a pair of holes 12 and 13 which are shown only in Figure 6. The escrow 1 also includes two photoemitter photodetector pairs which are mounted on the housing 9 and aligned with the holes 12 and 13 respectively when the bucket 4 is in its substantially horizontal position. When the bucket is tilted into its extreme anticlockwise position to tip coins into the coin box the hole 12 is then lined up with the photodetector photoemitter pair that when the bucket is horizontal line up with the hole 13. Equally, when the bucket is tipped into its extreme clockwise position to tip the coins into the reject chute 3 the aperture 13 is aligned with the photodetector photoemitter pair that is aligned with the aperture 12 when the bucket is in its horizontal position. The outputs from the photodetectors are fed to a microprocessor and the drive for the motor 6 is controlled by the microprocessor. The microprocessor can sense when the bucket is in its horizontal state and stop the rotation of the motor 6 to keep the bucket in a generally horizontal position and then, after suitable amount of money has been collected in the bucket 4 when the microprocessor decides that the money is either to be transferred to the coin box or returned to the caller the microprocessor controls the direction of rotation of the motor 6 to tilt the bucket in the clockwise or anticlockwise direction and continues to drive the motor until the appropriate photodetector photoemitter pair outputs a signal to show that the bucket has reached its extreme position. The microprocessor then again stops the motor 6. Typically the microprocessor stops the motor by partially shorting its terminals to provide a dynamic brake.

## Claims

1. A coin accepting mechanism having an escrow including a bucket (4) pivoted about an axis and arranged to receive coins from a coin entry (2), and an electric motor (6) arranged to rotate the bucket (4) around its pivot (5) in a clockwise or anticlockwise direction to tip coins out of the bucket (4) into a cash box (10) or into a reject chute (3), characterised in that the electric motor (4) is of the ironless rotor type.

2. A coin accepting mechanism according to claim 1, in which only a single bucket (4) is provided and it is pivoted at its lowest point.

3. A coin accepting mechanism according to claim 1 or 2, which also includes position sensors which provide a first output when the bucket (4) is in its central position and further outputs when the bucket (4) is tipped into its extreme clockwise or

anticlockwise position.

4. A coin accepting mechanism according to any one of the preceding claims, which includes a coin validating system located between the coin entry and the bucket (4) to determine the validity of coins after insertion in the coin entry and before they are stored in the bucket (4) of the escrow. 5

5. A coin accepting mechanism according to claim 4, in which the coin validating mechanism is of the electronic type including a microprocessor. 10

6. A coin accepting mechanism according to claim 5 when dependent upon claim 3, in which the escrow is controlled by the microprocessor associated with the coin validating part of the coin accepting mechanism and in which the microprocessor receives outputs from the position sensors whereby the microprocessor controls the direction of rotation and the starting and stopping of the ironless rotor motor (6) thereby to control the operation of the escrow. 15 20

7. A coin accepting mechanism according to claim 6, in which the microprocessor applies a dynamic braking to the ironless rotor motor (6) by shorting out its terminals to reduce the movement of the ironless rotor motor (6) and hence the movement of the pivoted bucket (4). 25

8. A coin accepting mechanism according to claim 3 or any claim dependent upon claim 3, in which the position sensor is formed by two holes formed in the side of the bucket (4) and photo emitter-detector pairs aligned with the holes so that when the bucket (4) is in its central position an output is obtained from both photodetectors whereas, when the bucket is in its extreme position an output is obtained from a respective one of the photodetectors. 30 35

9. A coin accepting mechanism according to any one of the preceding claims, in which the bucket is spring biased into its reject position so that, in the event of a total power failure of the coin receiving apparatus any coins held in the bucket (4) are returned automatically via the reject chute (3). 40

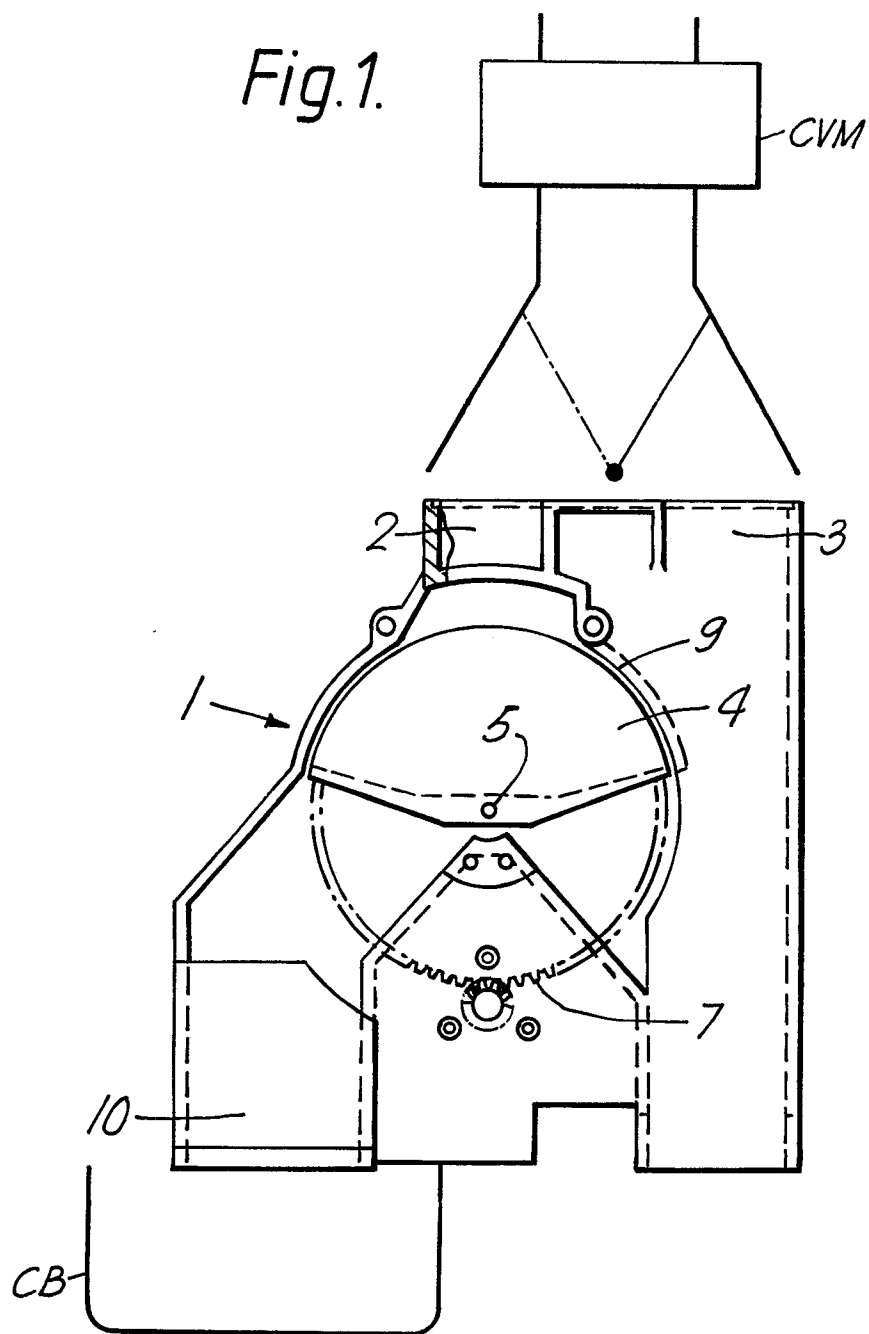
10. A coin accepting mechanism according to any one of claims 1 to 8, which includes a manually operated mechanism to tilt the bucket (4) into its reject position in the event of power failure. 45

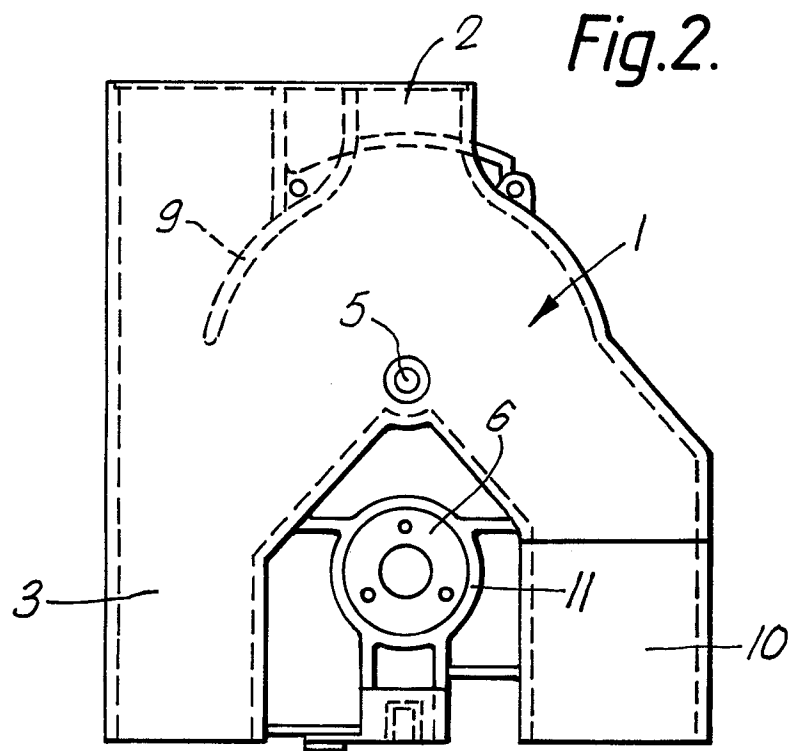
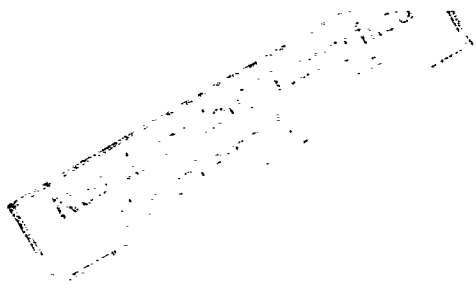
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Fig.1.





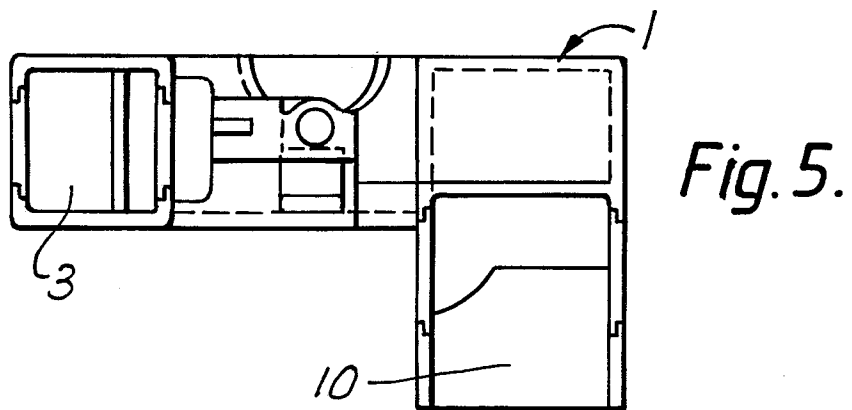
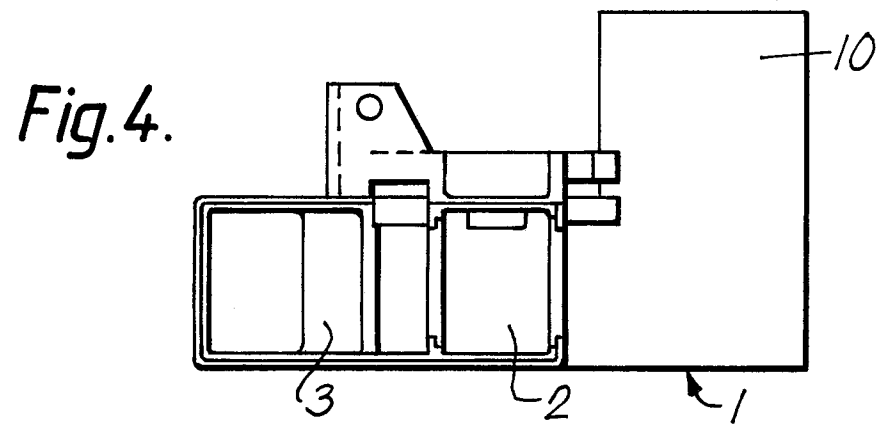
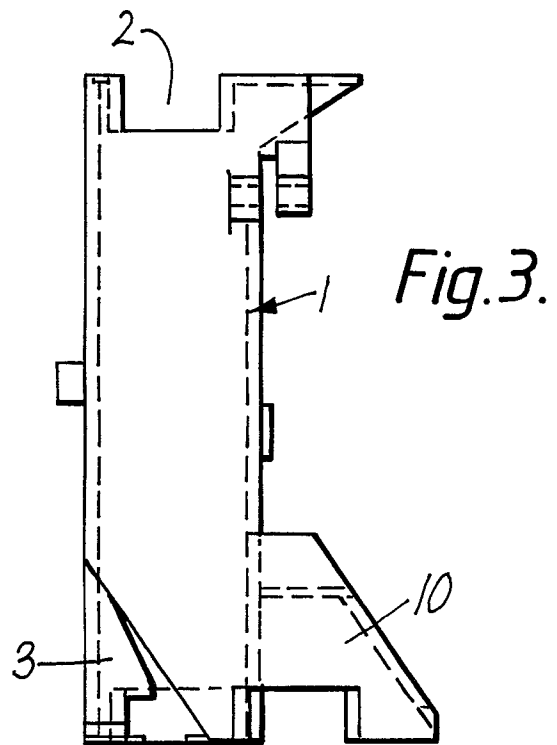
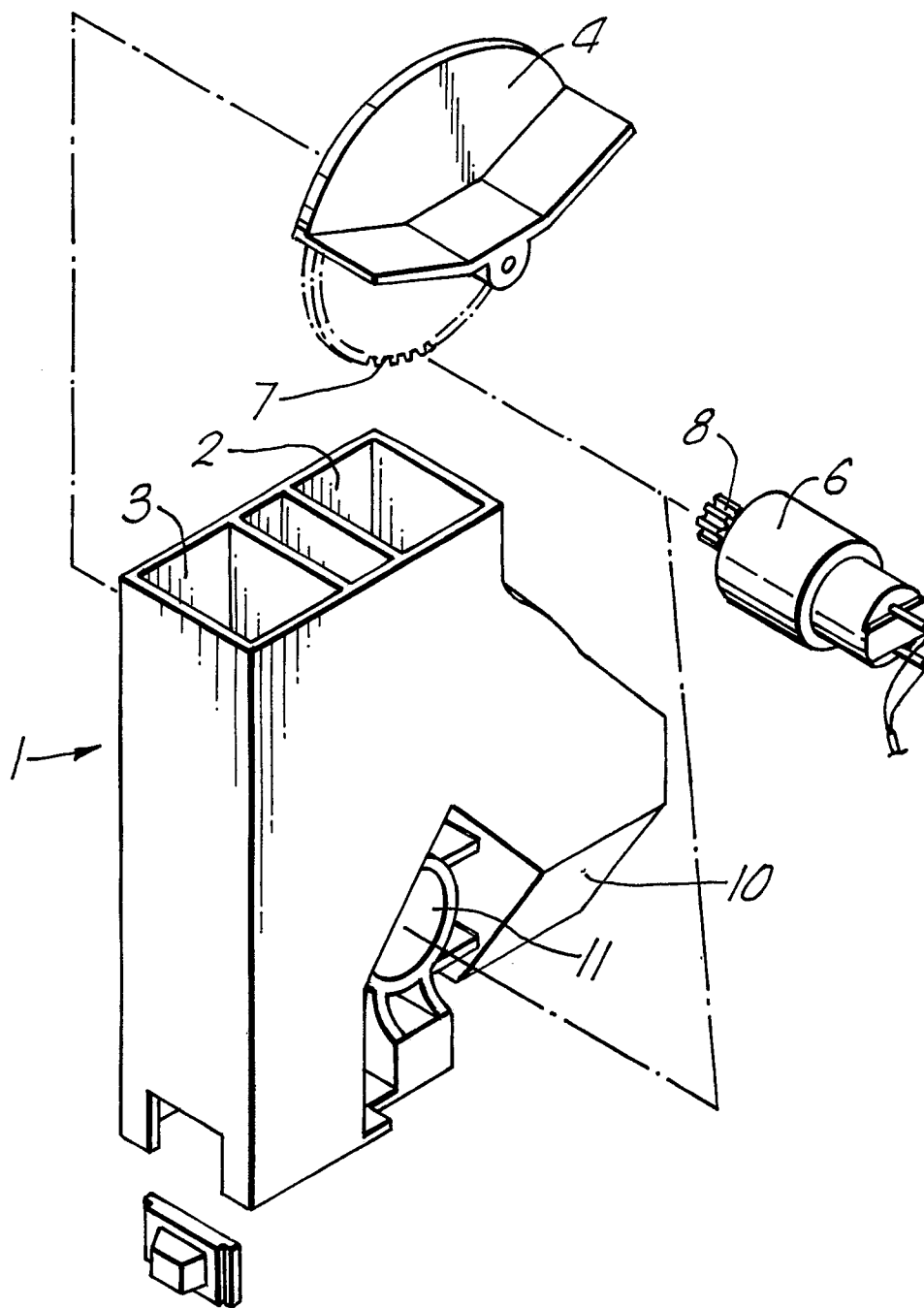


Fig. 6.







DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,A	DE-A-3 500 537 (SIELAFF) * Abstract; figures; claims; page 13, lines 13-21 * ---	1-4,8	G 07 F 9/04
A	GB-A-2 140 187 (KNIGHT TECHNOLOGY) * Abstract; figures 1,4; page 4, lines 87-99; claim 13 * ---	1,4-6	
A	EP-A-0 049 753 (SIELAFF) * Abstract; figure 2 * ---	1,10	
A	WO-A-8 001 126 (SODECO-SAIA) * Abstract; figures; page 3, lines 1-22 * ---	1,4-6,9	
P,A	GB-A-2 206 986 (THE PLESSEY CO.) * Abstract; figure; page 2, line 11 - page 3, line 14 * -----	1-3	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			G 07 F H 02 K
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 09-02-1990	Examiner DAVID J.Y.H.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document			