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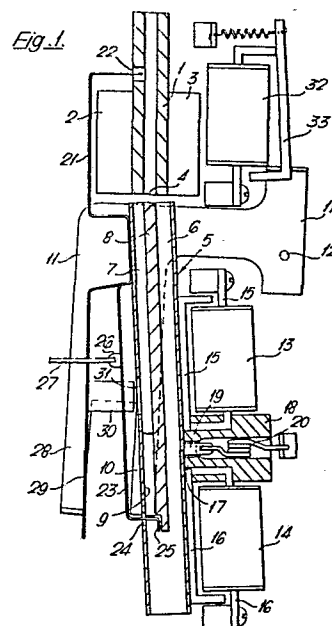
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54 A coin accepting device.

57 A coin accepting device includes a coin runway extending from a coin entry to a cash box and to a reject coin outlet. The coin runway includes a coin validation chamber (1) in which the coins are received and held in a fixed reference position whilst they are checked for validity, and a pivoted portion (5) which is divided into two channels, a reject channel (6) and an accept channel (7). The pivoted portion (5) is biased into a first position in which a part of it blocks an outlet (4) from the coin validation chamber (1) to define the fixed reference position for the coin in the validation chamber (1) but is pivotable into a second position in which the reject channel (6) is aligned with the outlet (4) of the validation chamber (1) to receive rejected coins and channel them towards the reject outlet, and is pivotable into a third position in which the accept channel (7) is aligned with the outlet (4) of the validation chamber (1) to allow accepted coins to pass into the accept channel (7). The device also includes a first gate (9,10) located at the downstream end of the accept channel (7) and operable to allow accepted coins to move towards the coin box, and a second gate (23) at the downstream end of the accept channel (7) operable to allow coins to pass out of the accept channel (7) towards the reject outlet.



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A COIN ACCEPTING DEVICE

This invention relates to coin accepting devices which are used in coin-operated metering devices, for example coin-operated telephone and coin-operated television sets or a meter supplying a particular commodity, like gas or electricity. Coin accepting devices are also used in vending machines where a particular article or articles are dispensed automatically upon receipt of one or more coins.

All coin accepting devices include a coin runway extending from the coin entry to a cash box, also it is normal for the coin runway to include a reject coin outlet. The coin accepting device includes some means to check the validity of any coin introduced into its coin entry and then, depending upon the result of the validity check, accepts the coin and channels it towards the cash box or rejects the coin and channels it towards the reject coin outlet. Recently, it has been possible to reduce the mechanical complexity of such coin accepting devices by checking the validity of the coin and channelling it through the device using electronic devices instead of using an entirely mechanical device. This introduction of electronics into the device has, amongst other things, facilitated the separation of the steps of identifying and validating a coin and allowing valid coins to enter the coin box. Thus, with such devices, it is possible to build up a number of accepted coins in the coin runway without allowing any of them into the coin box. The passage of the accepted coins into the coin box then can be controlled by electronic circuits to permit

one or more accepted coins in the coin runway to enter the coin box when they become due, for example to permit the metering device to operate for a further period of time or, when a particular quantity of

5 coins are located in the coin runway corresponding to the purchase price of an article to be purchased. In such devices, it is desirable to be able to recover accepted coins from the device which, whilst having been accepted, have not entered the coin box either

10 because the period of time or the quantity of a commodity to be dispensed has not taken all the coins that were initially inserted or, for example, if the purchaser changes their mind or finds that they do not have sufficient coins to complete the purchase.

15 According to this invention a coin accepting device includes a coin runway extending from a coin entry to a cash box and to a reject coin outlet, the coin runway including a coin validation chamber in which the coins are received and held in a fixed

20 reference position whilst they are checked for validity, a pivoted portion which is divided into two channels, a reject channel and an accept channel, which is biased into a first position in which a part of it blocks an outlet from the coin validation chamber

25 to define the fixed reference position for the coin in the validation chamber, which is pivotable into a second position in which the reject channel is aligned with the outlet of the validation chamber to receive rejected coins and channel them towards the

30 reject outlet, and which is pivotable into a third position in which the accept channel is aligned with the outlet of the validation chamber to allow accepted coins to pass into the accept channel, the device also including a first gate located at the downstream end

35 of the accept channel and operable to allow accepted

coins to move towards the coin box, and a second gate at the downstream end of the accept channel operable to allow coins to pass out of the accept channel towards the reject outlet.

5 Preferably the first position of the pivoted portion of the coin runway into which it is biased is its central position and, in this position, it is a divider between the reject and accept channels which is aligned with the outlet of the validation chamber to block the outlet of
10 the validation chamber. With the device arranged in this way, the pivoting portion of the coin runway then pivots from its first central position in one direction into its second position and in the other direction into its third position.

15 Preferably the device includes means to pivot the pivotable portion of the coin runway into its second position in which the reject channel is aligned with the validation chamber and simultaneously, open the second gate. Upon operation of the means, coins
20 from all parts of the coin runway are channelled towards the reject outlet irrespective of whether they are present in the validation chamber or in the accept channel. The means may be manually operated from, for example, a manual reject button, or alternatively, the
25 means may be interlocked with a portion of the apparatus associated with the coin accepting device, for example with the rest of a handset of a telephone or with an on/off switch of any apparatus use of which is controlled by the coin accepting device. In this case, the means
30 is automatically operated when the handset of the telephone is replaced on its rest or, when an apparatus controlled by the coin accepting device is switched off so that any coins remaining in the coin runway are channelled towards the reject outlet and returned on
35 replacement of the handset or upon switching the apparatus off.

Preferably the coin accepting device also includes a first coin retainer upstream from the coin validation chamber arranged to detain any coins upstream from the coin validation chamber as the pivoted portion of the coin runway moves into its third position and so allow only the single coin that has just been checked in the validation chamber to pass into the accept channel, the first coin retainer moving out of the coin runway upon the pivoted portion of the runway returning to its first position to allow a subsequent coin to enter the validation chamber once the pivoted portion of the coin runway has returned to its first position. Preferably the first coin retainer is formed by a spring arm attached to the pivoted portion of the coin runway and arranged so that upon pivoting of the runway from its first to its third position the spring arm passes through an aperture in the side wall of the coin runway upstream from the coin validation chamber to engage a coin located upstream from the coin validation chamber or, in the absence of any coin upstream, to block the coin runway upstream from the validation chamber and so prevent any subsequently inserted coin from entering the validation chamber until the pivoted portion of the coin runway has returned to its first position.

When the coin accepting device forms part of a coin operated metering device arranged so that coins from the acceptance channel are allowed to pass one at a time into the coin box upon demand from the apparatus associated with the coin accepting device, the coin accepting device preferably includes a second coin retainer associated with the acceptance channel upstream from the first gate, the second coin retainer being operated together with the first gate to hold subsequent coins in the acceptance channel whilst the downstream coin passes through the first gate.

A particular example of a coin accepting device in accordance with this invention will now be described with reference to the accompanying drawings; in which:-

5 Figure 1 is a partly sectioned plan of the coin runway of the device in its first position;

Figure 2 is a diagrammatic view of the coin runway of the device in its second position;

Figure 3 is a diagrammatic view of the coin runway in its third position;

10 Figure 4 is a diagrammatic view of the coin runway of the device in its first position showing its coin accept gate open; and,

15 Figure 5 is a diagrammatic view of the coin runway in its position in which coins are rejected from all parts of the coin runway.

This particular example of coin accepting device has been specifically developed for use with a table top coin-operated telephone although it is believed that it can be used with other types of coin-operated devices.
20 In this example the coin runway is inclined to the horizontal at approximately 19° so that coins run forwards down the runway from a coin slot in the top face located towards the rear of the apparatus and then into a coin box located beneath the coin runway or to a reject
25 outlet at the front of the apparatus.

The coin runway includes a coin validation chamber 1 located beneath a coin entry slot (not shown) which is arranged to receive coins having a variety of different denominations. A pair of coils 2 and 3 are located on
30 each side of the downstream end of the coin validation chamber 1 and these coils 2 and 3 form part of an electronic coin identification and validation apparatus which can identify the denomination of a particular coin and check to determine the validity of any coin. The
35 base of the coin validation chamber 1 is inclined at a

greater angle to the horizontal than the remainder of the runway and, in this example, is inclined at 30° to the horizontal. The coin validation chamber 1 includes an outlet 4. A pivoted portion 5 of the coin runway is located
5 downstream of the outlet 4 of the coin validation chamber 1 and includes a reject channel 6 and an accept channel 7. The reject channel 6 and the accept channel 7 are separated by a central divider 8. An aperture 9 is provided in the base of the accept channel towards its downstream end and
10 this aperture is closed by one limb 10 of a bifurcated pivoted cranked arm 11 which is pivoted on a pivot 12.

Accept and reject solenoids 13 and 14 are located beside the pivoted portion 5 of the coin runway and the movable part of armatures 15 and 16 of the solenoids 13 and
15 14 are connected to the pivoted portion 5 of the coin runway. A projection 17 extending forwards from a fixed mounting block 18 fits between adjacent ends of the movable parts of the armatures 15 and 16 to provide a location for the pivoting portion 5 of the coin runway. A tag 19 connected
20 to the pivoted portion 5 of the coin runway includes a hole through which a coil torsion spring 20 is threaded and which is arranged so that the movable parts of the armatures 15 and 16 are urged against the fixed parts of the armatures 15 and 16. Thus, the spring 20 pulls the pivoting portion
25 5 of the coin runway against the fixed parts of the armatures 15 and 16 and so biases the pivoted portion 5 into a central position whilst allowing the pivoted portion 5 to pivot on the fixed parts of the armatures 15 and 16 in a clockwise or an anti-clockwise direction as seen in Figure 1. Upon
30 actuation of the reject solenoid 14 the movable part of the armature 16 of the reject solenoid 14 is attracted towards the fixed part of the armature 16 of the solenoid 14 so causing the pivoted portion 5 of the coin runway to pivot in an anti-clockwise direction whereas upon actuation of
35 the accept solenoid 13 the movable part of the armature 15 of the accept solenoid 13 is attracted towards the fixed part of the armature 15 of the accept solenoid 13 so causing the pivoted portion 5 of the coin runway to pivot in a

clockwise direction. A clearance between an inside face of the mounting block 18 and the coil torsion spring 20 threaded through the hole in the tag 19 is sufficient to enable the pivoted portion 5 to pivot in both directions but the spring 20 engages the inside face of the mounting block 18 to prevent the pivoted portion 5 from being displaced sufficiently to allow the adjacent ends of the movable parts of the armatures 15 and 16 to disengage from the projection 17.

With the pivoted portion 5 of the coin runway in its central position the divider 8 is aligned with the outlet 4 at the downstream end of the coin validation chamber 1 to prevent any coins leaving the validation chamber 1. A spring arm 21 is connected to the pivoting portion 5 of the coin runway and arranged to move through an aperture 22 in the wall of the coin validation chamber 1 as the pivoting portion 5 of the coin runway pivots. A second spring arm 23 passes through an aperture 24 in the wall of the accept channel 7 of the pivoted portion 5 of the coin runway and bears against the divider 8. The arm 23 blocks the downstream end of the accept channel 7 adjacent the aperture 9 in its base, and forms a stop against which coins in the accept channel 7 are retained. The spring arm 23 includes a cranked end portion 25 and a lug 26 connected to a linkage 27 which is, in turn, connected to the cradle of the handset of the telephone. The other limb 28 of the pivoted cranked arm 11 bears against a third spring arm 29. The spring arm 29 includes a tab 30 which is arranged to pass through a hole 31 in the wall of the accept channel 7 upstream from the aperture 9. A coin accept solenoid 32 has the movable part of its armature 33 coupled to the pivoted cranked arm 11.

When it is wished to make a telephone call, the user first picks up the handset of the telephone from

its cradle and with the handset off its cradle the pivoted portion 5 of the coin runway occupies its centre position as shown in Figure 1 with the divider 8 blocking the outlet 4 of the coin validation chamber 1.

5 The person wishing to make a telephone call then inserts one or more coins through the coin slot and these are received in the coin validation chamber 1 and the downstream one abuts the end of the divider 8. The coin at the downstream end of the coin validation chamber

10 1 is checked by applying an oscillating signal to the coils 2 and 3 to determine the denomination of that coin and determine if that coin is a valid coin. If the result of this determination is that the coin is not a valid coin the electronic circuits associated with the coils 2

15 and 3 actuate the reject solenoid 14 to cause the pivoting portion 5 of the coin runway to pivot in the anti-clockwise direction into the position shown in Figure 2. In this position the reject channel 6 is aligned with the outlet 4 of the coin validation chamber 1 and all the coins

20 present in the coin validation chamber 1 pass through the outlet 4 and along the reject channel 6 to the reject outlet (not shown). After a predetermined time has elapsed the solenoid 14 is de-actuated so that the pivoted portion 5 of the coin runway returns to its central position.

25 If the result of the determination of the coin is that it is a valid coin of a particular denomination then the accept solenoid 13 is actuated to cause the pivoted portion 5 of the coin runway to pivot in a clockwise direction into the position shown in Figure 3. In this

30 position, the accept channel 7 is aligned with the outlet 4 of the coin validation chamber 1 so that the coin that has just been checked moves through the outlet 4 and into the accept channel 7 where it rolls down until it reaches the end portion of the spring arm 23.

35 As the pivoted portion 5 of the coin runway is moving

in the clockwise direction the spring arm 21 passes through the aperture 22 in the side wall of the validation chamber 1 and engages any coin present in the validation chamber 1 upstream from the coin that has just been checked and holds the upstream coin or coins to allow only the single coin that has been checked to pass into the accept channel 7. If no other coins are present in the validation chamber 1 the spring arm 21 passes through the aperture 22 and blocks the passage through the coin validation chamber 1 to prevent any subsequently inserted coins passing through the coin validation chamber 1. After a predetermined time has elapsed to allow the coin that has been checked to pass into the accept channel 7 the solenoid 13 is de-actuated to allow the pivoted portion 5 of the coin runway to return to its central position. As this occurs, the spring arm 21 releases any coin that it is holding or, alternatively, moves out of the passage through to the coin validation chamber 1 to permit the next coin or a subsequently inserted coin to enter the coin validation chamber 1. When the next coin enters the coin validation chamber 1 this once again abuts the divider 8 and is checked to determine if it is valid and to determine its denomination and, if the next coin also proves to be genuine, the pivoting portion 5 of the coin runway is once again pivoted in a clockwise direction to allow the next coin to enter the accept channel 7. This process continues for each coin that is inserted in the coin entry slot until the electronic circuits associated with the coils 2 and 3 determine that the accept channel 7 is full of coins and, once this point is reached, the electronic circuits prevent the pivoted portion 5 of the coin runway from pivoting to receive further coins from the validation chamber 1 even if they are tested and found to be valid coins.

35 Once one or more coins having a value greater than

the minimum call charge are present in the accept channel 7 the telephone is then enabled so that the user can dial the number that they are trying to obtain. As soon as a connection is established between the telephone and the number to be obtained, the coin accept solenoid 32 is actuated so that the movable part of its armature 33 is attracted towards the fixed part which in turn causes the cranked arm 11 to pivot about its pivot 12 in an anti-clockwise direction, into the position shown in Figure 4. This anti-clockwise pivoting of the cranked arm 11 causes its one limb 10 to uncover the aperture 9 in the base of the accept channel 7 to allow the coin at the downstream end of the accept channel 7 resting against the spring arm 23 to pass through the aperture 9 and into the coin box located beneath the coin runway. The aperture 9 is shown by cross-hatching in Figure 4 to indicate its position more clearly. A photo-emitter and photo-detector pair (not shown) is located beneath the aperture 9 to monitor the movement of the coin through the aperture and into the coin box. Typically, the photoemitter and photodetector pair comprises an infra-red light emitting diode and photodetector. The signal indicating acceptance of a valid coin is taken from this photodetector pair as the coin drops into the coinbox. This overcomes some forms of fraud, such as keeping coins on strings so that they are kept in the acceptance channel 7 even when the aperture 9 is uncovered.

Upon actuation of the cranked arm 11 its other limb 28 bears against the third spring arm 29 and this moves the tab 30 through the hole 31 in the side of the accept channel 7 to engage any subsequent coins that are present in the accept channel 7 or to block the accept channel 7 and so prevent any subsequently accepted coin from passing through the aperture 9 whilst the solenoid 32 is actuated. The solenoid 32 is de-actuated after a

predetermined period of time so that the cranked arm 11 returns to its initial position with its one limb 10 again covering the aperture 9 in the base of the channel 7 and so that the tab 30 moves out through the hole 31 away from the accept channel 7. All the other coins in the accept channel then roll down the accept channel 7 until they are once again stopped by the second spring arm 23. When the accept channel 7 is full of coins before operation of the cranked arm 11 and a further coin is present in the coin validation chamber 1 and has been checked as being acceptable but the pivoted portion 5 of the coin runway is prevented from operating by the electronic control circuit because the accept channel 7 is full, then the control circuitry of the coin validator is arranged so that once a coin has been allowed into the coin box the accept solenoid 13 is enabled to allow the pivoted portion 5 of the coin runway to pivot once again to allow the next coin to pass from the coin validation chamber 1 into the accept channel 7. As soon as the time period for the particular denomination of coin which has been received in the coin box has been used up by the user of the telephone the solenoid 32 is once again actuated to cause the cranked arm 11 to pivot to allow the next coin from the accept channel 7 to enter the coin box, and so on. Naturally, if no more coins are present in the accept channel 7 the telephone call is terminated.

Further photodetector and receiver pairs may be provided at various points along the coin runway, for example at the coin entry to detect the introduction of a coin into the coin validation chamber 1 and to detect a coin leaving the outlet 4. Photoemitter and detector pairs may also be provided along the acceptance channel 7 to check on the number of coins in the acceptance channel 7. Preferably the photodetectors are all pulsed so that the movement or

presence of a coin adjacent a photodetector pair is timed. In this way the time taken for a coin to move from one position to another can also be monitored to make sure that the coins pass along the coin runway. If the monitoring of the photoemitter, photo-detector pairs indicates that the coins are not passing smoothly along the coin runway the pivoted portion 5 of the runway may be pulsed a number of times by alternate actuation of the solenoids 13 and 14. This actuation of the runway tends to shake loose any coins that are lodged in position and provide a warning to the user that the coins are not proceeding smoothly along the coin runway. This may be due to the equipment being tilted and in this case the user is alerted by the rattling of the coin runway to return the equipment to the horizontal position.

At the termination of the telephone call, the user replaces the hand set on the cradle and this exerts a pull on the linkage 27 which is a pull in the direction to the left as shown in Figure 5. This sideways pull by the linkage 27 moves the pivoted portion 5 of the coin runway into its reject position whilst, at the same time, opening the gate at the end of the accept channel 7 formed by the second spring arm 23, this is the position shown in Figure 5. Thus, any coins remaining in the coin validation chamber 1 are discharged through the reject channel 6 to the reject outlet whilst any coin remaining in the accept channel 7 pass down the accept channel 7 and out of the end of the accept channel 7, past the spring arm 23 so that they are also discharged towards the reject outlet. Thus, at the end of the telephone call all coins present from anywhere in the coin runway that have not been used are returned. The cranked arm portion 25 of the spring arm 23 prevents the spring arm 23 from being completely disengaged from the pivoting portion 5 of the coin runway.

C L A I M S

1. A coin accepting device including a coin runway extending from a coin entry to a cash box and to a reject coin outlet, characterised in that the coin runway includes a coin validation chamber (1) in which the coins are received and held in a fixed reference position whilst they are checked for validity, a pivoted portion (5) which is divided into two channels, a reject channel (6) and an accept channel (7), which is biased into a first position in which a part of it blocks an outlet (4) from the coin validation chamber (1) to define the fixed reference position for the coin in the validation chamber (1), which is pivotable into a second position in which the reject channel (6) is aligned with the outlet (4) of the validation chamber (1) to receive rejected coins and channel them towards the reject outlet, and which is pivotable into a third position in which the accept channel (7) is aligned with the outlet (4) of the validation chamber (1) to allow accepted coins to pass into the accept channel (7), the device also including a first gate (9,10) located at the downstream end of the accept channel (7) and operable to allow accepted coins to move towards the coin box, and a second gate (23) at the downstream end of the accept channel (7) operable to allow coins to pass out of the accept channel (7) towards the reject outlet.

2. A coin accepting device according to claim 1, further characterised in that the first position of the pivoted portion (5) of the coin runway into which it is biased is its central position and, in this position, it is a divider (8) between the reject (6) and accept (7) channels which is aligned with the outlet (4) of the

validation chamber (1) to block the outlet (4) of the validation chamber (1).

3. A coin accepting device according to claim 2, further characterised in that the pivoting portion (5) of the coin runway pivots from its first central position in one direction into its second position and in the other direction into its third position.

4. A coin accepting device according to any one of the preceding claims, further characterised in that it also includes means (26,27) to pivot the pivotable portion (5) of the coin runway into its second position in which the reject channel (6) is aligned with the outlet (4) of the validation chamber (1) and simultaneously, open the second gate (23) to channel coins from all parts of the coin runway towards the reject outlet.

5. A coin accepting device according to any one of the preceding claims, further characterised in that it also includes a first coin retainer (21) upstream from the coin validation chamber (1) arranged to detain any coins upstream from the coin validation chamber (1) as the pivoted portion (5) of the coin runway moves into its third position and so allow only the single coin that has just been checked in the validation chamber (1) to pass into the accept channel (7), the first coin retainer (21) moving out of the coin runway upon the pivoted portion (5) of the runway returning to its first position to allow a subsequent coin to enter the validation chamber (1) once the pivoted portion (5) of the coin runway has returned to its first position.

6. A coin accepting device according to claim 5, further characterised in that the first coin retainer is formed by a spring arm (21) attached to the pivoted portion (5) of the coin runway and arranged so that upon pivoting of the runway from its first to its third position the spring arm (21) passes through an aperture (22) in the

side wall of the coin runway upstream from the coin validation chamber (1) to engage a coin located upstream from the coin validation chamber (1), or in the absence of any coin upstream, to block the coin runway upstream from the validation chamber (1) and so prevent any subsequently inserted coin from entering the validation chamber (1) until the pivoted portion (5) of the coin runway has returned to its first position.

7. A coin accepting device according to any one of the preceding claims, further characterised in that the coin accepting device includes a second coin retainer (29,30) associated with the acceptance channel (7) upstream from the first gate (9,10), the second coin retainer (29,30) being operated together with the first gate (9,10) to hold subsequent coins in the acceptance channel (7) whilst the downstream coin passes through the first gate (9,10).

Fig. 1.

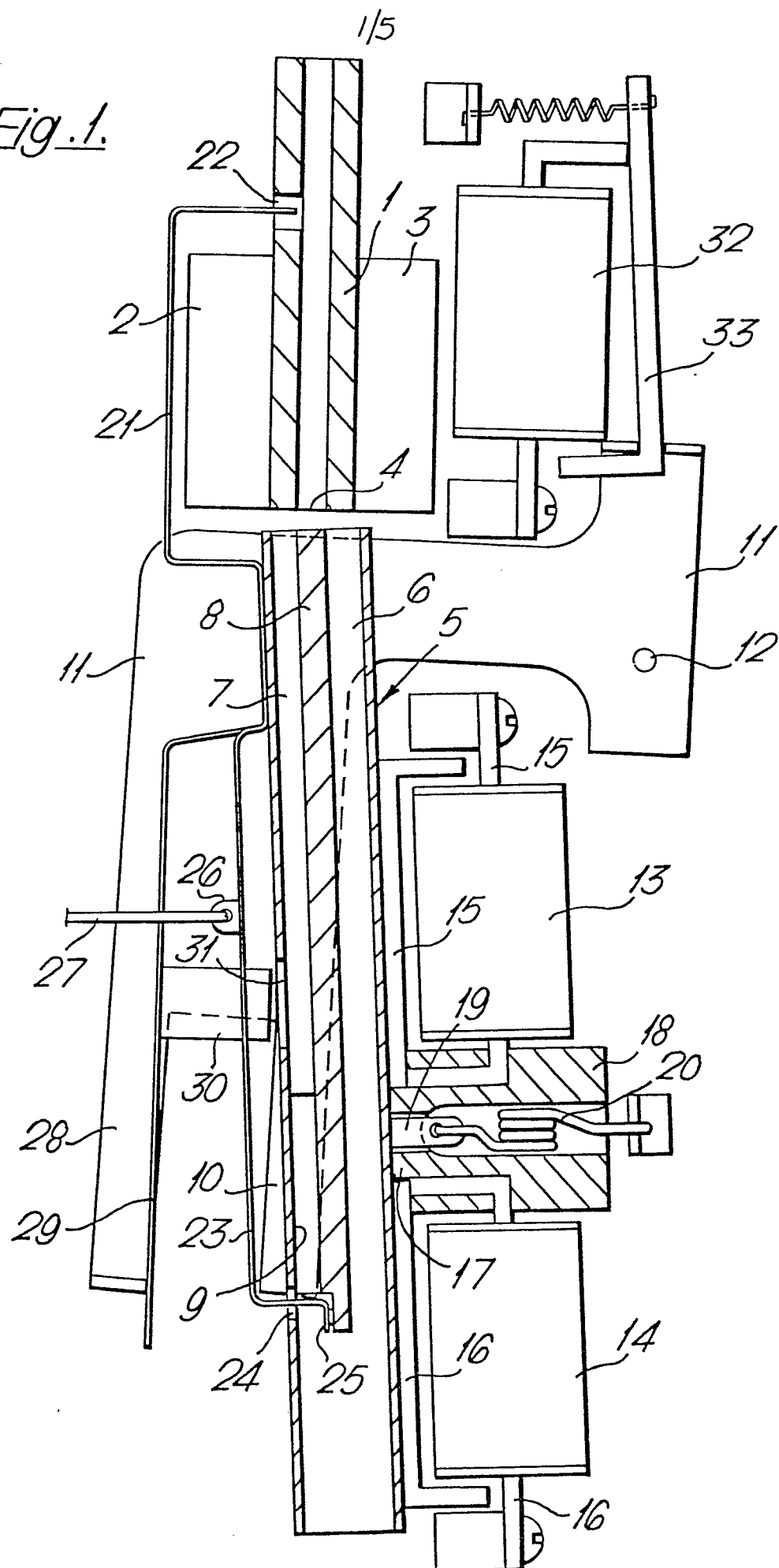


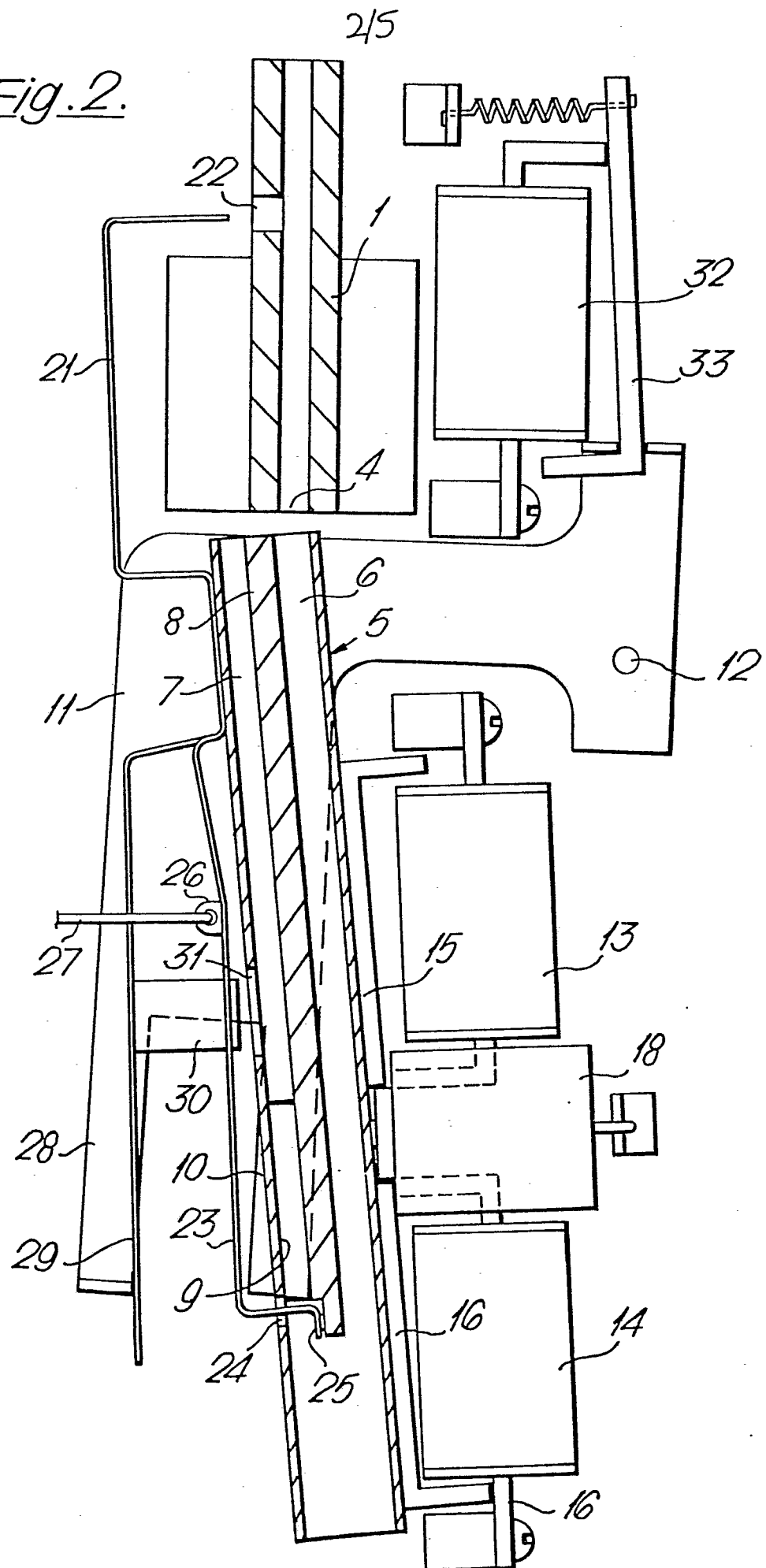
Fig. 2.

Fig. 3.

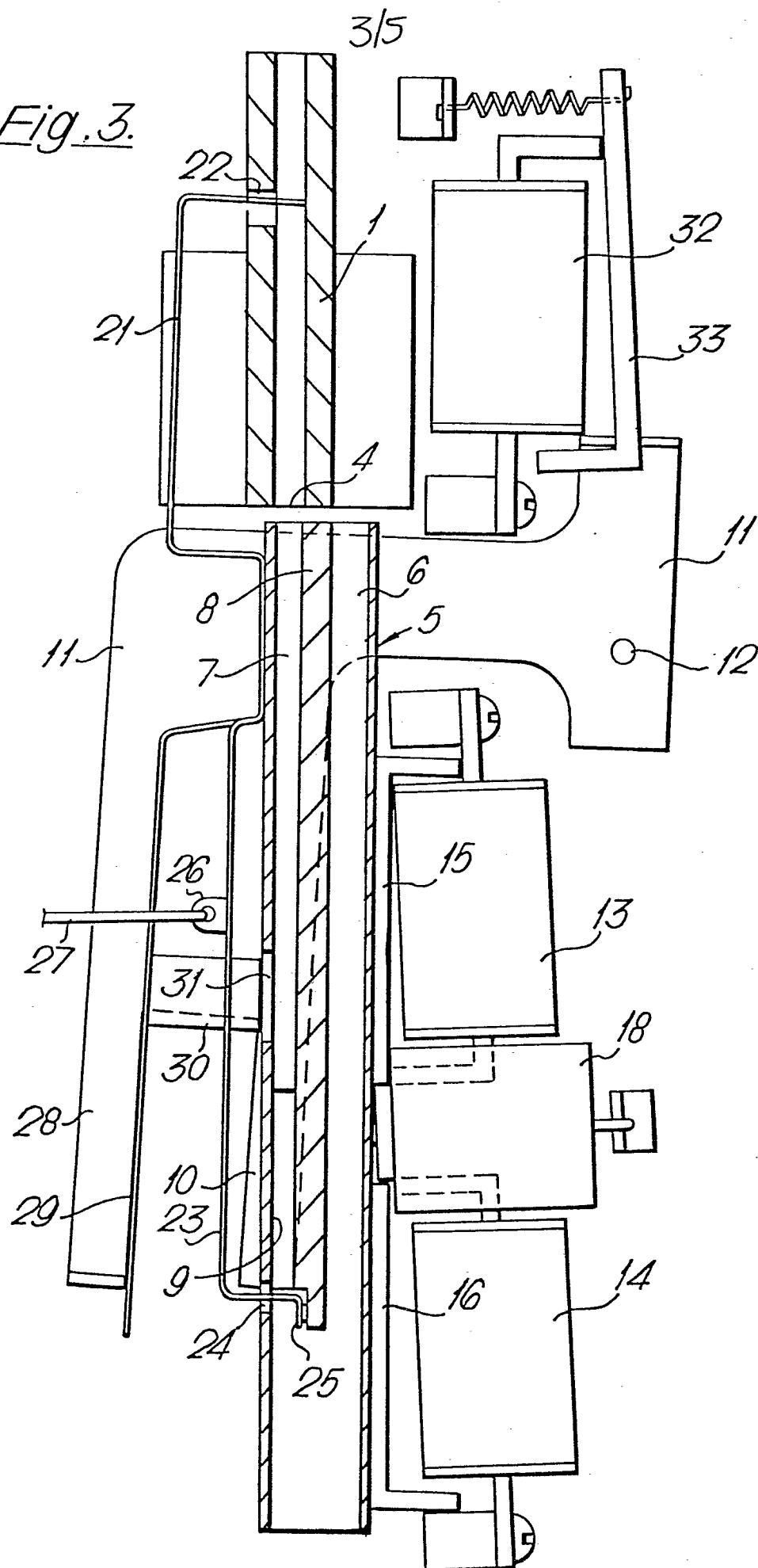


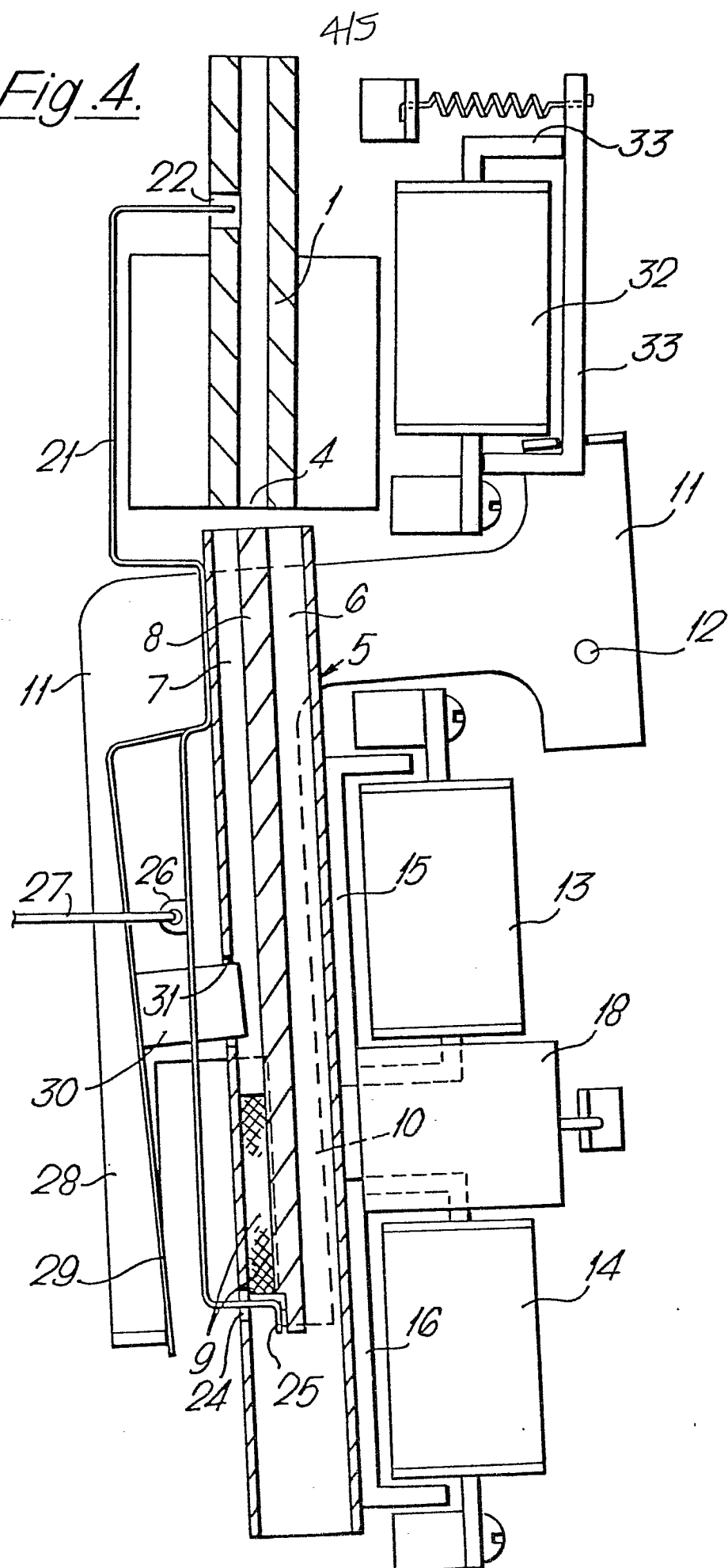
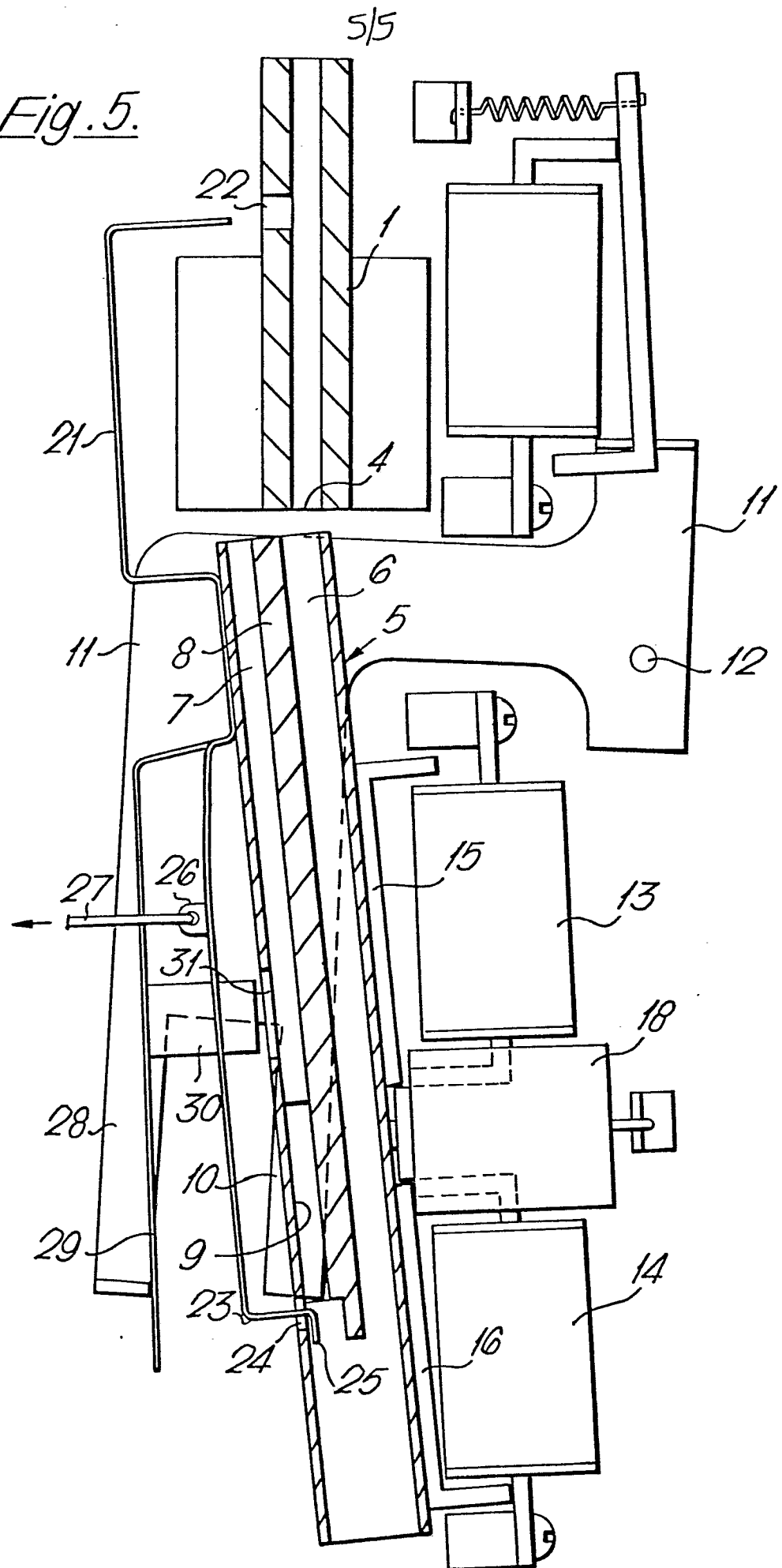

Fig. 4.

Fig. 5.





DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>FR - A - 1 580 430 (ALEXANDROV)</u> * Whole document *	1-5	G 07 F 3/00 1/04 9/04
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	<u>GB - A - 1 415 559 (BARNSTORF)</u> * Page 2, lines 37-57; figure 1 *	1	
	--		
	<u>DE - A - 2 408 395 (BACHFRIEDER)</u> * Page 4, paragraph 2 - page 6, paragraph 1; figures 1-3 *	1-5	
	--		
	<u>US - A - 2 642 974 (OGLE)</u> * Column 5, lines 12-23; figures 1,3 *	1,4	TECHNICAL FIELDS SEARCHED (Int. Cl.) G 07 F 1/00 1/02 1/04 3/00 3/02 3/04 5/00- 5/16 5/20 5/22 G 07 D 3/00 3/14 5/00- 5/10 H 04 M 17/02
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	<u>US - A - 4 105 105 (BRAUM)</u> * Column 6, lines 27-36; figures 1,2 *	1	
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	<u>GB - A - 1 523 208 (AUTELCA)</u> * Page 2, line 90 - page 5, line 83; figures 1-5 *	1,5,7	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
	--		
	<u>GB - A - 417 752 (ELEKTROZEIT)</u> * Page 1, lines 79-100; figures *	1,6	

 The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search	Date of completion of the search	Examiner	
The Hague	13-08-1981	RUDOLPH	