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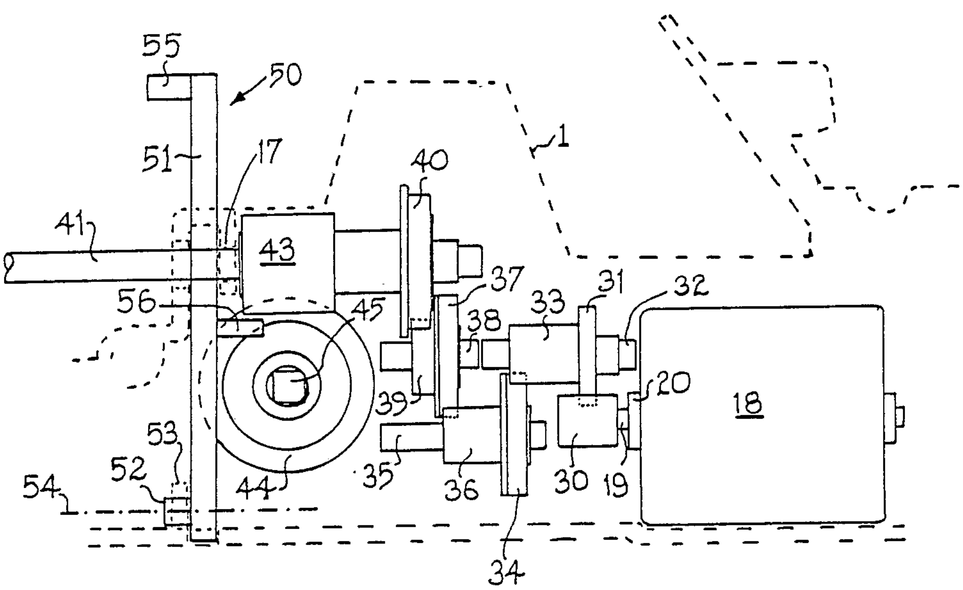

(57) Abstract

A toy or model vehicle, e.g. a tractor, comprises a chassis (1), drive wheel means supported by the chassis (1) and including a drive axle (45) and a first gear means (44), a step-down gear train (30-43) including second gear means (43) and a power take-off shaft (4) extending from the chassis (1) and arranged to be driven by an electric motor (18) via the gear train (30-43). Manually operable clutch means (50) are provided to enable relative movement of the first and second gear means (44 and 43) into or out of meshing engagement to enable or disable the transmission of motive drive to the drive wheel means. The invention also relates to a toy tractor system including a toy tractor having a power take-off shaft and flexible tubing for providing a detachable flexible drive connection between the power take-off shaft and a rotatable shaft or accessory apparatus.

A toy or model vehicle

Technical Field

This invention relates to a toy or model tractor, which is powered from a small electric motor housed in a vehicle body and to a toy tractor system incorporating such a tractor.

Background Art

Manually propelled scale model tractors, typically 1/32 the size of full size commercial tractors, are well known and are generally made from die cast metal components fitted with parts made of plastics material. Other similarly scaled wheeled equipment can be hitched to these known scale model tractors, although such equipment can sometimes only be effectively operated when being towed by the tractor. For example the rotary spreading arms of a scale model rotary manure spreader are typically driven from the ground engaging wheels of the spreader and thus cannot be rotated when the spreader is stationary and not being towed.

An object of the present invention is to provide a toy or scale model tractor with a power take-off shaft driven by an electric motor. With such a power take-off it is possible to drive equipment, typically hitched to the tractor, from the power take-off.

Disclosure of the Invention

According to one aspect of the present invention a toy tractor comprises a chassis, drive wheel means supported by the chassis, an electric motor, a step-down gear train, a power take-off shaft extending from the chassis and arranged to be driven by the motor via the gear train, and clutch means operable selectively to enable or disable the tansmission of motive drive from the motor driven gear train to the drive wheel means.

Conveniently the electric motor is arranged with its drive shaft parallel to the power take-off shaft, drive being transmitted from the motor drive shaft to the power take-off shaft via pinion and spur gears of said gear train whose axes are also parallel to the power take-off shaft.

Suitably the gear tain includes a worm fixed on the power take-off shaft and a worm gear slidably keyed to an axle of said drive wheel means, the clutch means being operable to slide said worm gear along the axle into or out of driving engagement with said worm. Typically the axle has a non-circular, e.g. square, cross-section and the worm gear has an opening of similar non-circular cross-section through which the axle extends so that rotation of the worm gear is transmitted via the axle to drive wheels of the drive wheel means. Conveniently the clutch means comprises a pivoted lever engageable with the worm gear to slide the latter along the axle into or out of engagement with the worm on pivoting the lever about an axis parallel to the power take-off shaft.

Typically the drive wheel means includes ground engaging drive wheels. Alternatively, however, the drive wheel means may comprise a pair of endless ground-engaging tracks driven by drive wheels.

Typically the electric motor is powered from a 1.5 volt battery (e.g. an AA size penlight battery) and has an unloaded rotational speed of 3000-13000, e.g. 8,800 r.p.m.. It will be appreciated that, if an AA size battery is employed, it can, with advantage, be mounted parallel to the power take-off shaft. In this case, the battery, motor, most of the gear wheels of the gear train and the power take-off shaft can be mounted "in-line" with their axes substantially parallel to each other. This enables the various components to be arranged in a relatively slim or thin chassis which is important in the design of small model tractors, typically 1/32 the size of the full size versions.

Conveniently the step-down gear train provides a gear reduction of from 30:1 to 50:1 (typically 40.5:1 between the drive shaft of the electric motor and the power take-off shaft and a gear reduction of from 250:1 to 400:1 (typically 324:1) between the drive shaft of the electric motor and the drive wheel means. Suitably the gear reduction between the motor drive shaft and the power take-off shaft is achieved in a plurality of comparatively small reduction stages via pinion and spur gears. There is a relatively large gear reduction (e.g. 8:1) between the worm and worm gear of the gear train.

An on-off switch may be provided for controlling the energisation of the electric motor.

According to another aspect of the invention a toy tractor system comprises a toy tractor according to said one aspect of the invention, toy equipment, e.g. agricultural apparatus, having a rotatable shaft rotatable to drive operative means of the toy equipment and means providing a flexible drive connection between the power take-off shaft of the tractor and the rotatable shaft of the toy equipment.

Preferably the toy equipment, e.g. agricultural apparatus, is wheeled and has a drive connection between the wheels and the operative means and is provided with clutch means operable to select whether drive for the operative means is via the wheels or the power take-off shaft.

Brief Description of the Drawings

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which

Figure 1 is a partial view of a chassis part of a toy or model tractor according to the invention showing, amongst other things, the disposition of bearings for gears of a gear train,

Figure 1A is a schematic view, on an enlarged scale, of a detail of Figure 1 indicated by the circled part A,

Figure 2 is a schematic view, on an enlarged scale, of a gear train, electric motor, clutch and power take-off shaft mounted on the chassis part shown in Figure 1 but with the gear bearings omitted for clarity,

Figure 3 is a side view of a chassis half of another embodiment of a toy or model tractor according to the invention, the chassis half having a gear train, electric motor, clutch, power take-off shaft and electric switch mounted thereon,

Figure 4 is a view from the rear of part of the electric switch shown in Figure 3,

Figure 5 is a view taken on the line V-V of Figure 4, and

Figures 6-8 are views from above, the rear and the front, respectively, of an actuator of the switch shown in Figures 4 and 5.

Modes for Carrying out the Invention

Toy/model tractors made by Britains Petite Limited are manufactured to a scale of 1:32 of full size and generally include parts of cast metal alloy and moulded plastics. In particular the chassis of such a model tractor typically comprises two longitudinally cast chassis parts or halves which are joined together along a vertical plane to provide a longitudinally extending relatively thin main chassis of the tractor. Figure 1 shows part of such a cast chassis half 1 for a Massey-Ferguson 595 tractor which has been modified to receive parts necessary to provide a powered model tractor. Although the other chassis part is not shown, it will be appreciated that, when assembled together, the two chassis halves define an enclosure or housing for receiving the parts necessary to power the model tractor.

The chassis half 1 includes a plurality of locating and/or retaining projections 2 to 9 and a plurality of bearings 10 to 16. Projections 7 and 8 serve to retain a small d.c. electric motor 18 (see Figure 2) in position in the chassis, the motor being powered from a 1.5v AA penlight battery (not shown), typically having an unloaded rotational speed of 11,700 r.p.m. (maximum efficiency at 8,800 r.p.m.), and including a drive shaft 19 journalled in a bearing 20 which is received in bearing 10 forming part of the chassis half 1. The battery for supplying power to the motor 18 is received between a shaped, metallic negative contact 21 located in the chassis half by the projections 2 to 6 and a metallic positive contact 22 shown in dashed lines. The supply of electric power from the battery to the electric motor 18 is controlled by means of an on/off switch (not shown) having an actuator (not shown) projecting outwardly of the chassis through a hole 23 in the chassis half 1 (and a similar hole in the other chassis half). The switch actuator is arranged to be manually actuable in the assembled model tractor and is slidable in directions perpendicular to the plane of Figure 1 for making or breaking the electric connection between the positive battery terminal and the electric motor via the positive contact 22.

The drive shaft 19 of the motor 18 has a pinion 30 fixed thereon which meshes with a spur gear 31 carried on a shaft 32, opposite end portions of the shaft 32 being journalled in the bearings 11 and 12. A pinion 33 is also mounted on the shaft 32 and meshes with a spur gear 34 carried on a shaft 35 which has opposite end portions journalled in the bearings 13 and 14. The shaft 35 also carries a pinion 36 which meshes with a further spur gear 37 carried on a shaft 38 journalled in bearings 12 and 15. Shaft 38 carries a pinion 39 which meshes with a further spur gear 40. The spur gear 40 is fixed on a shaft which is in the form of a power take-off shaft 41 journalled at one end in the bearing 16 and between its ends in a bearing 17 formed at an edge of the chassis half 1. The end of the power take-off shaft 41 remote from its end which is received in the bearing 16, thus projects through the bearing 17 outwardly and rearwardly of the chassis.

The bearings are substantially similar in form, and Figure 1A shows a side view of one such bearing 16 with the power take-off shaft 41 journalled therein. The open "channel form" of the bearings is closed by rib-like projections formed on the other chassis half (not shown) when the two chassis halves are joined together in a subsequent assembly step. In the assembled condition of the two chassis halves, the rib-like projections formed on the "other" chassis half thus bridge across the channel-like parts of the bearings on the chassis half 1.

A worm 43 is mounted on a portion of the shaft 41 positioned between the bearings 16 and 17 for meshing with a worm gear 44 carried on a wheel axle 45 journalled in holes 46 (only one of which is shown in Figure 1) in the chassis. The worm gear 44 has a square-section central opening through which a similarly shaped portion of the axle 45 extends so that the worm gear is keyed to the axle 45 so as to be slidable axially along the axle 45 into and out of engagement with the worm 43. Since the worm gear slides on a non-circular portion of the axle 45, rotary motion transmitted from the worm 43 to the worm gear 44 is transmitted via the latter to the wheel axle 45.

The axial position of the worm gear 44 on the axle 45 is controlled by means of a manually actuable clutch, generally designated 50. The clutch 50 comprises a pivoted lever 51 having a cylindrical projection 52 at its lower end received in a bearing 53 and defining pivot axis 54 of the lever 51. The upper end of the lever 51 projects upwardly of, and outwardly from, the chassis and is provided with a handle 55. Between the projection 52 and handle 55 are two spaced apart projections 56 (only one of which can be seen in Figure 2) positioned on opposite sides of the worm gear 44. Pivotal actuation of the lever 51 causes one or the other of the two projections 56 to engage and slide the worm gear 44 along the axle 45 into or out of meshing engagement with the worm 43.

The various gear wheels constitute a step-down gear train. By way of example, the pinions 30, 33 and 36 each have 8 teeth, the pinion 39 has 10 teeth, the spur gears 31, 34, 37 and 40 have 18, 24, 24 and 20 teeth, respectively, the worm gear 44 has 16 teeth and the worm 43 has 2 complete turns. With this arrangement a gear reduction between the motor drive shaft 19 and the power take-off shaft 41 of 40½:1 is achieved in a number of comparatively small reduction stages of 2¼:1 between the pinion 30 and spur gear 31, of 3:1 between the pinion 33 and spur gear 34, of 3:1 between the pinion 36 and the spur gear 37 and of 2:1 between the pinion 39 and the spur gear 40. A further gear reduction of 8:1 is provided between the power take-off shaft 41 and the axle 45 resulting in an overall gear reduction between the motor drive shaft 19 and the axle 45 of 324:1. Other gear arrangements are, of course, possible although with the 1.5v d.c. motors commonly commercially available (typically having an unloaded rotational speed of from 3,000 to 13,000 r.p.m.), the overall gear reduction preferably should be in the range of from 250:1 to 400:1 to produce realistic motive speed and the gear reduction between the motor drive shaft 19 and the power take-off shaft preferably should be in the range of from 30:1 to 50:1.

It will be appreciated that the arrangement of the various driving components are generally "in-line" since the motor drive shaft 19, pinions 30, 33, 36 and 39, spur gears 31, 34, 37 and 40, worm 43 and power take-off shaft 41 all have axes parallel to one another and extending lengthwise of the chassis. In addition the elongate AA type battery (not shown) is arranged lengthwise of the chassis. Thus the various driving components can be easily assembled in the chassis halves and can be located in a relatively thin chassis.

In use the motor 18 is operated to drive the power take-off shaft 41. With the motor operating the clutch 50 can be operated to provide or stop transmission of drive to the drive wheels of the tractor. It is thus possible to operate the power take-off shaft, with the tractor moving or stationary, for driving other agricultural models. Thus, for example, a model rotary manure spreader can be modified so that drive to the rotary spreading member can be provided via the drive wheels (as is the case in a known conventional spreader No. 9568 manufactured by Britains Limited) or via the power take-off shaft of the tractor. To this end, the spreader is provided with a clutch device which enables or disables drive from the drive wheels to the rotary spreading member and the shaft of the rotary spreading member is extended outside the spreader so that there is a free end portion of the shaft positioned substantially in line with the power take-off shaft, and spaced a short distance therefrom, when the spreader is hitched to the tractor. A length of flexible tubing, e.g. of plastics or rubber material, acting as a flexible drive connection, is pushed onto confronting end portions of the power take-off shaft 41 and the shaft of the rotary spreading member so that rotation of the power take-off shaft is transmitted to the rotary spreading member. The clutch device may be manually operable but is preferably an automatic type clutch. In this latter case, the drive connection between the rotary spreading member and the drive wheels is conveniently provided by an axle running longitudinally generally in the same direction as the shaft of the rotary spreading member, and drivingly connected to the latter by means of a pair of meshing spur gears, one fixed to the front end of the axle and the other fixed to the projecting front end of the shaft of the rotary spreading member. A further gear wheel is connected to the rear end of the axle and meshes with a further gear wheel which is rotatably mounted on the transversely extending drive wheel axle of the spreader. This rotatably mounted gear wheel forms part of the clutch device which also comprises a clutch member fixed to the drive wheel axle. The clutch member is resiliently urged towards the clutch gear wheel, the two components of the clutch being designed so that rotation of the drive wheel axle in one direction (i.e. on forward movement of the spreader) causes the components to engage with each other so that drive is transmitted to the rotary spreading member but rotation of the drive wheel axle in the opposite direction causes the components to slip so that drive is not transmitted to the rotary spreading member. When the spreader is towed behind the tractor, the drive wheels of the spreader rotate in a forward direction and provide drive via the clutch device to the rotary spreading member which rotates in a first direction. In this mode of operation the flexible tubing should not be connected between the power take-off shaft 41 and the shaft of the rotary spreading member. When the tractor and spreader are stationary, the flexible tubing is connected and drive from the power take-off shaft drives the rotary spreading member in a second direction opposite to the first direction. Drive in this case is not transmitted to the drive wheels of the spreader because of the slip between the two components of the clutch mounted on the drive wheel axle.

Other model agricultural apparatus, e.g. a Vicon Vari-Spreader (Britains Model No. 9341), having movable operating mechanisms can be modified in a similar manner or employed without modification to enable them to be operated from the power take-off shaft. Other toy equipment or implements, although not necessarily agricultural apparatus, such as cement mixers and power saws, could also be adapted to be driven by the power take-off shaft.

In Figure 3 there is shown an alternative form of a chassis half 60 for a model tractor, in particular for a model of a Ford TW35 tractor. Where appropriate the same reference numerals have been used to describe parts which are similar to parts of the chassis half 1 shown in Figures 1 and 2. The chassis half which co-operates with the chassis half 60 to define the chassis is not shown.

Figure 3 shows the full chassis half 60 and it will be appreciated that the layout of the gear train is virtually the same as that for the chassis half 1. The chassis half 1 includes an electric switch, generally designated 61 (also see Figures 4-8), and a battery housing, generally designated 80.

The electric switch 61 comprises a shaped electrically insulating casing part 62 made, for example, of plastics material and which is received in a generally rectangular recess defined by parts, e.g. ribs, of the cooperating chassis halves. As can be seen from Figures 3-5, the casing part 62 comprises a generally rectangular recess 63 for receiving and locating the rectangular section end portion of the motor 18. The casing part 62 also serves to locate the metallic negative contact 21 and the metallic positive contact 23 (only partly shown in Figure 5). The contact 21 has a portion 21a received in a recess 64 in the forwardly directed face of the casing part 62 and a hooked end portion 21b which passes through a slot 65 and lies within a recess 66 in a rearwardly directed face of the casing part 62 to make physical and electrical contact with a terminal (not shown) of the motor 18 when the latter is received in the casing part 62. The contact 23 is also received in the recess but is spaced from the end portion 21b of the contact 21. The contact 23 has a circular hole therein which is aligned with a corresponding hole 67 formed in the casing part 62. A cylindrical bearing for the drive shaft of the motor 18 is received within the hole 67, and also the hole in the contact 23, and thus serves to retain the contact 23 in its correct position. The upper end of the contact 23 is inclined to the rear and includes a projection 68. Between the opposite ends of the contact 23 there is a small projection 71 for making physical and electrical contact with another terminal (not shown) of the motor 18. The switch 61 further comprises a slide actuator 69 (see Figures 6-

8) intended to be slidably mounted in a T-shaped recess 70 of the casing part 62. The actuator 69 has a central portion 72 of T-shaped section intended to be slidably received in the recess 70, arms 73 and 74 extending from opposite ends of the central portion 72 and of semi-circular cross-section and end portions 75 and 76 of circular cross-section. The arms 73 and 74 extend through the circular holes 23 formed in the two chassis halves. A recess 77 is formed in the forwardly facing surface of the central portion 72 and, on sliding the actuator within the recess 70 between limit positions, the projection 68 is either received within the recess 77 at one limit position or is not received within the recess at its opposite limit position. When the projection 68 is received within the recess 77, the contact 23 is positioned out of contact with a position terminal of a battery 79 received in the battery housing 80. When the projection 68 is not received within the recess 77, the contact 23 is urged into a position to contact the positive terminal of the battery 79.

The battery housing 80 is open at the top and extends in the elongate direction of the chassis. Each chassis half has a pair of quarter circular cradles 81 for providing semi-circular cradle supports for the battery.

Industrial Applicability

The toy or model vehicle and toy tractor system find application as toys or models.

CLAIMS

1. A toy or model vehicle, for example a toy tractor, comprising a chassis (1), drive wheel means supported by the chassis (1) and including a drive axle (45) and a first gear means (44), an electric motor (18), a step-down gear train (30-43) including second gear means (43) and a power take-off shaft (4) extending from the chassis (1) and arranged to be driven by the electric motor (18) via the gear train (30-43), characterised in that the toy tractor further comprises clutch means (50) manually operable to relatively move the first and second gear means (44 and 43) into or out of meshing engagement with each other to enable or disable, respectively, the transmission of motive drive from the motor driven gear train (30-43) to the drive wheel means.

2. A vehicle according to claim 1, characterised in that the second gear means comprises a worm (43) fixed on the power take-off shaft (41) and the first gear means comprises a worm gear (44) slidably keyed to said axle (45), the clutch means (50) being operable to slide said worm gear (44) along the axle (45) into or out of driving engagement with said worm.

3. A vehicle according to claim 2, characterised in that the axle (45) has a non-circular, e.g. square, cross-section and the worm gear (44) has an opening of similar non-circular cross-section through which the axle (45) extends so that rotation of the worm gear (44) is transmitted to the axle (45).

4. A vehicle according to claim 2 or 3, characterised in that the clutch means (50) comprises a pivoted lever (51) engageable with the worm gear (44) to slide the latter along the axle (45) into or out of engagement with the worm (43) on pivoting the lever (51) about an axis (54) parallel to the power take-off shaft (41).

5. A vehicle according to any one of the preceding claims, characterised in that the electric motor (18) has a drive shaft (19) parallel to the power take-off shaft (41) and in that the gear train comprises pinion and spur gears having axes parallel to the power take-off shaft (41).

6. A vehicle according to claim 5, characterised in that the chassis (1) includes battery locating means for locating an elongate battery parallel to the power take-off shaft (41).

7. A vehicle according to any one of the preceding claims, characterised in that the chassis (1) comprises two cooperating parts and in that the gear train (30-43) comprises meshing gears each having shafts journalled in spaced apart bearings, each bearing consisting of a recessed member (10-17) formed integrally on one chassis part and having an open recess for receiving a gear axle and closure means on the other chassis part for closing said open recess.

8. A vehicle according to any one of the preceding claims, characterised in that the step-down gear train provides a gear reduction of from 30:1 to 50:1 between a drive shaft of the electric motor and the power take-off shaft (41) and a gear reduction of from 250:1 to 400:1 between the drive shaft of the electric motor and the drive wheel means.

9. A vehicle according to any one of the preceding claims, characterised in that flexible drive means is provided for detachably connecting the power take-off shaft (41) to a rotatable shaft of an accessory to enable the rotatable shaft of the accessory to be driven from the power take-off shaft.

10. A vehicle according to claim 9, characterised in that the flexible drive means is in the form of a flexible tube.

11. A toy tractor system comprising a toy tractor having a power take-off shaft (41) driven from an electric motor (18) and accessory apparatus, e.g. agricultural apparatus, having a rotatable shaft rotatable to drive operative means of the accessory apparatus, characterised in that the toy tractor system further comprises means providing a detachable flexible drive connection between the power take-off shaft of the tractor and the rotatable shaft of the toy equipment.

12. A toy tractor system according to claim 11, characterised in that the accessory apparatus is wheeled and has a drive connection between the wheels and the operative means and is provided with clutch means operable to determine whether drive for the operative means is provided via the wheels of the apparatus or via the power take-off shaft of the tractor and the flexible drive connection.

AMENDED CLAIMS

[received by the International Bureau on 18 November 1987 (18.11.87), original claim 1 amended; remaining claims unchanged (1 page)]

1. A toy or model vehicle, for example a toy tractor, comprising a chassis (1), drive wheel means supported by the chassis (1) and including a drive axle (45) and a first gear means (44), an electric motor (18), a step-down gear train (30-43) including second gear means (43), driven means (4) arranged to be driven by the electric motor (18) via the gear train (30-43) and clutch means (50) manually operable to relatively move the first and second gear means (44 and 43) into or out of meshing engagement with each other to enable or disable, respectively, the transmission of motive drive from the motor driven gear train (30-43) to the drive wheel means, characterised in that the driven means (4) comprises a power take-off shaft (4) extending from the chassis (1) and in that the transmission of drive from the motor driven gear train (30-43) to the power take-off shaft is maintained irrespective of whether the first and second gear means (44 and 43) are in or out of meshing engagement with each other.

2. A vehicle according to claim 1, characterised in that the second gear means comprises a worm (43) fixed on the power take-off shaft (41) and the first gear means comprises a worm gear (44) slidably keyed to said axle (45), the clutch means (50) being operable to slide said worm gear (44) along the axle (45) into or out of driving engagement with said worm (43).

3. A vehicle according to claim 2, characterised in that the axle (45) has a non-circular, e.g. square, cross-section and the worm gear (44) has an opening of similar non-circular cross-section through which the axle (45) extends so that rotation of the worm gear (44) is transmitted to the axle (45).

4. A vehicle according to claim 2 or 3, characterised in that the clutch means (50) comprises a pivoted lever (51) engageable with the worm gear (44) to slide the latter along the axle (45) into or out of engagement with the worm (43) on pivoting the lever (51) about an axis (54) parallel to the power take-off shaft (41).

FIG. 1

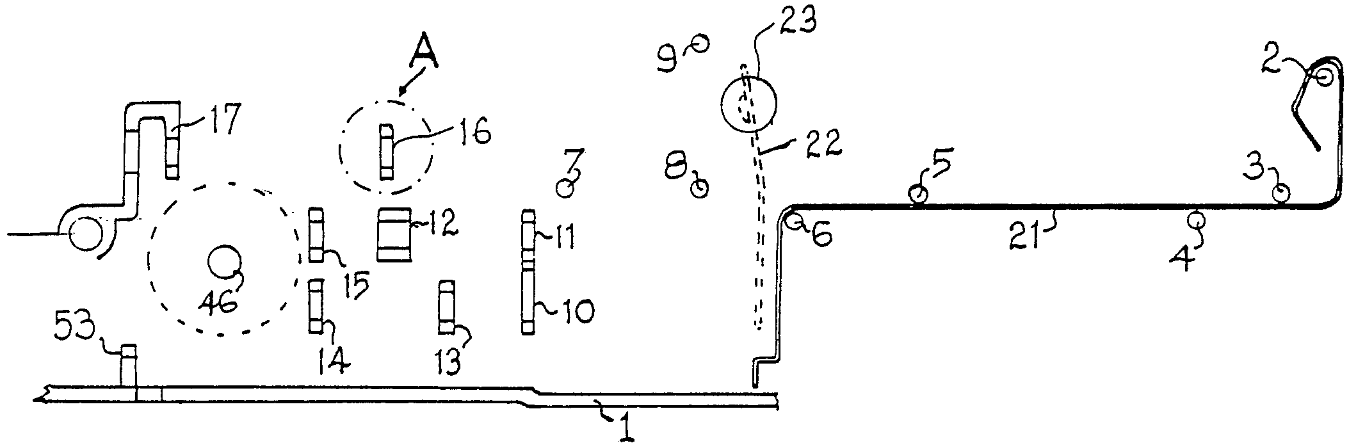

FIG. 1A

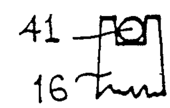

FIG. 2

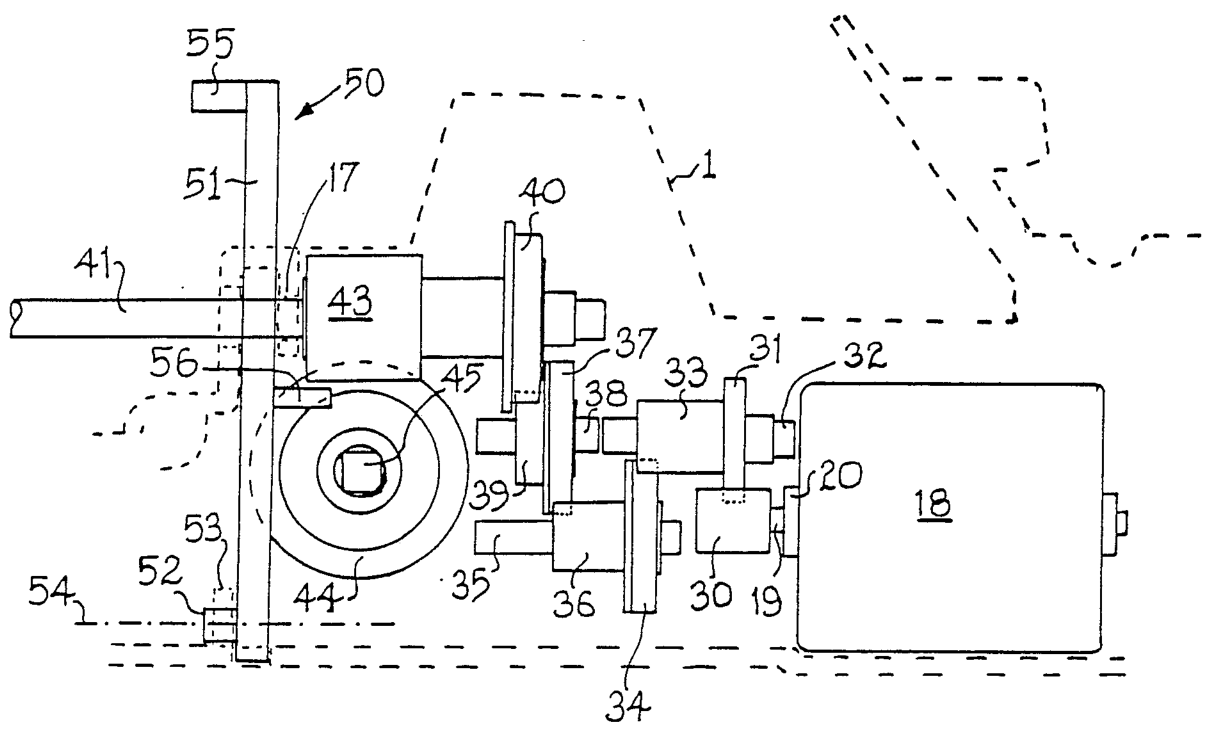

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FIG. 3

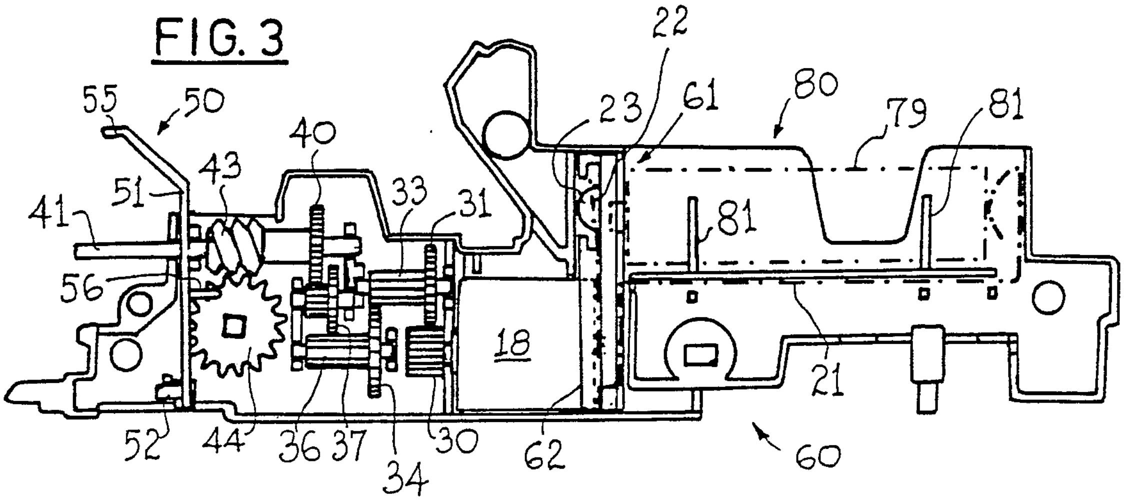


FIG. 5

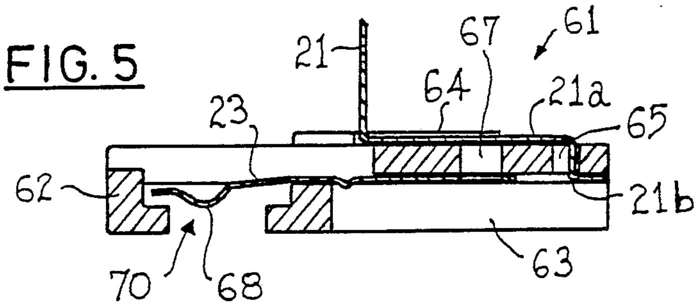


FIG. 4

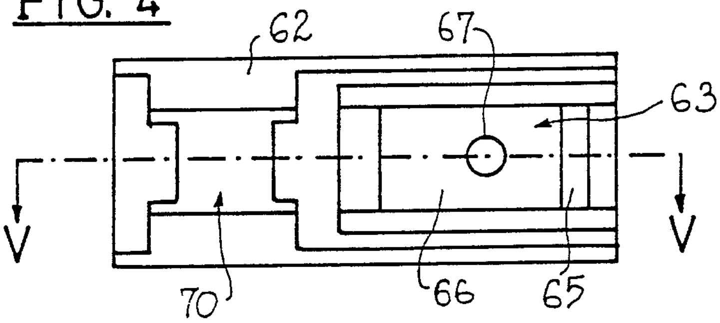


FIG. 6

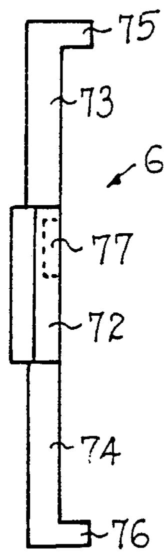


FIG. 7

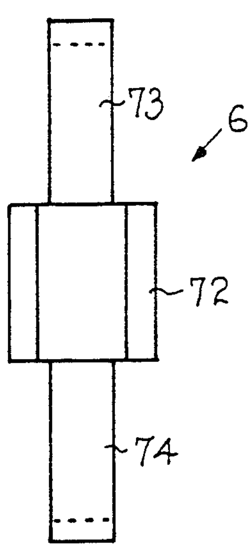
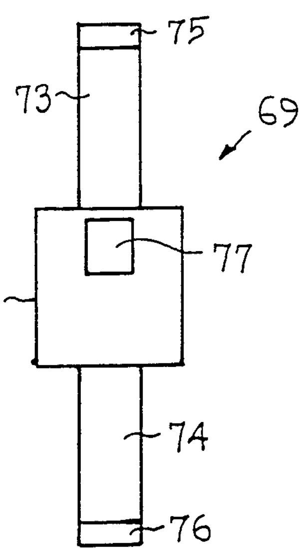


FIG. 8



SUBSTITUTE SHEET

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 87/00482

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC^4: A 63 H 31/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC^4	A 63 H

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No [13]
X	FR, A, 1304969 (GAMA GEORG ADAM MANGOLD) 28 July 1961 see page 1, column 1, line 29 - column 2, line 19; figures 1,2	1
Y		2,4-9
	--	
Y	DE, B, 1197365 (TIPP & CO.) 22 July 1965 see figure 3	2,4-9
	--	
A	DE, A, 2046286 (TOMY KOGYO) 27 May 1971 see figures 3,4	9
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* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
30th September 1987	26 OCT 1987
International Searching Authority	Signature of Authorized Officer
EUROPEAN PATENT OFFICE	M. VAN MOL

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 87/00482 (SA 17800)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 12/10/87

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A- 1304969		None	
DE-B- 1197365		None	
DE-A- 2046286	27/05/71	None	

For more details about this annex :
see Official Journal of the European Patent Office, No. 12/82