

April 12, 1927.

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1,623,995

APPARATUS FOR DRIVING TYPEWRITERS PROVIDED WITH CALCULATING MECHANISM

Filed July 16, 1924

4 Sheets-Sheet 1

Fig. 1.

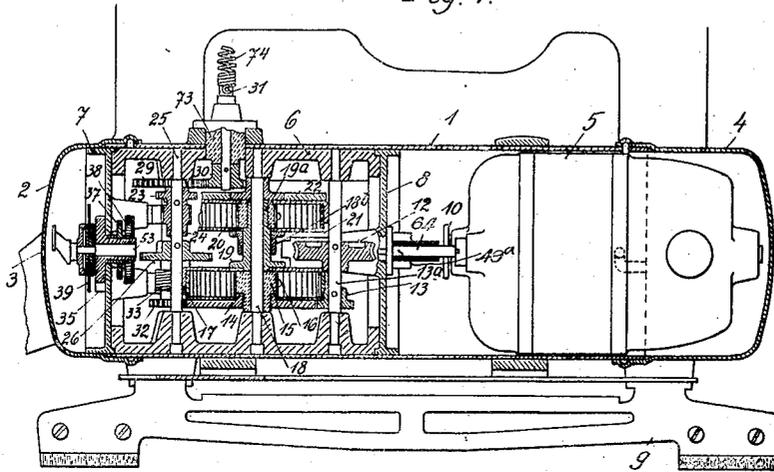


Fig. 1^b

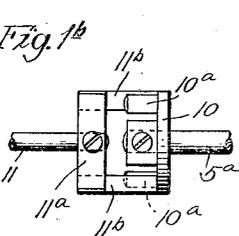


Fig. 1^a

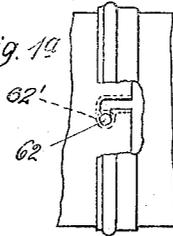


Fig. 1^d

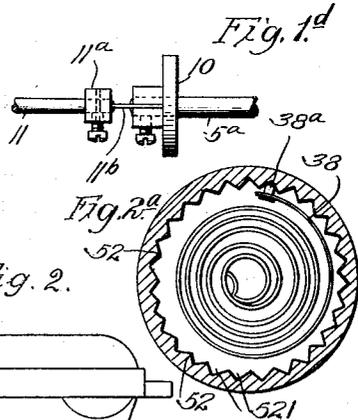


Fig. 2.

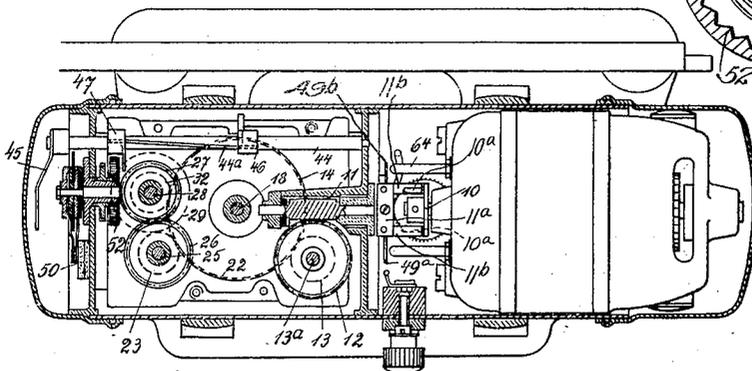
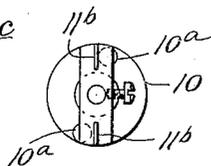


Fig. 1^c



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4 Sheets-Sheet 2

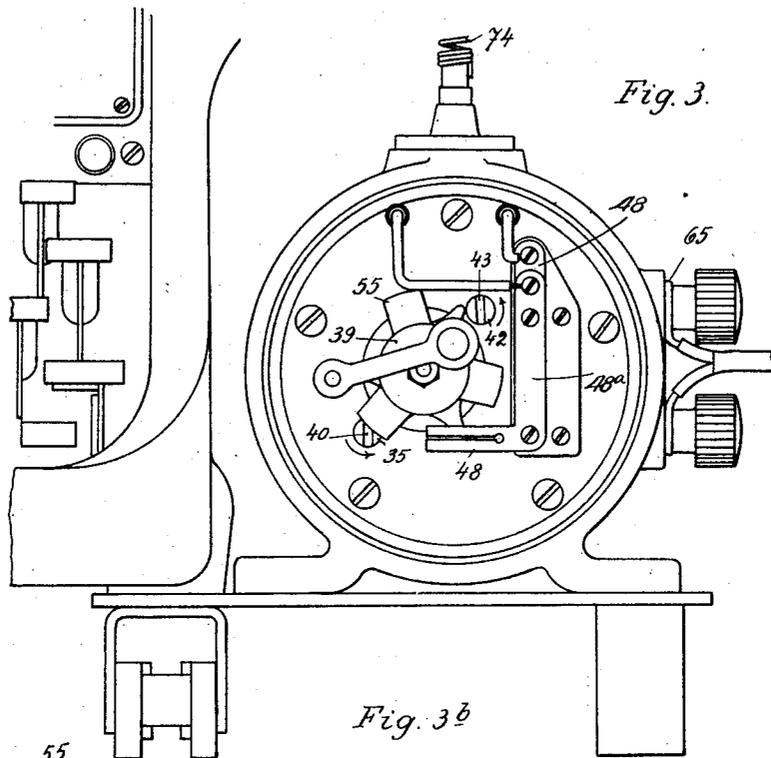


Fig. 3.

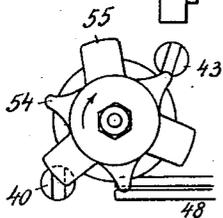


Fig. 3a

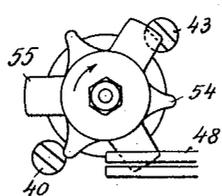


Fig. 3b

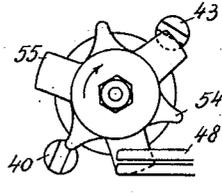


Fig. 3c

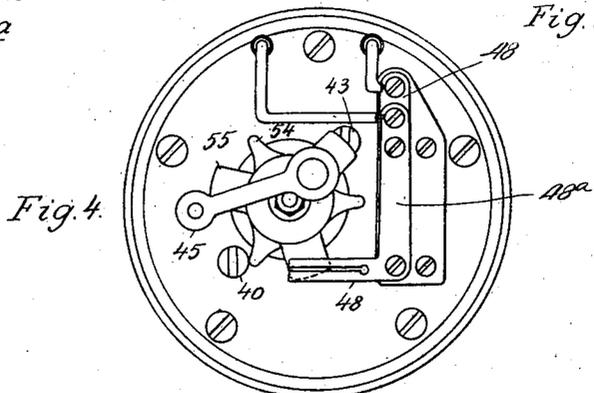


Fig. 4.

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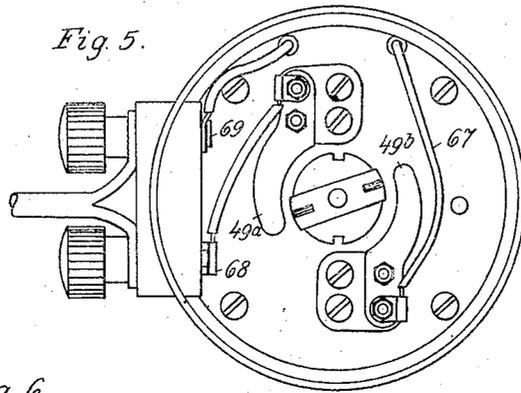


Fig. 6.

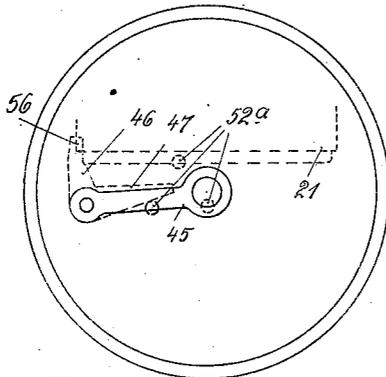


Fig. 7.

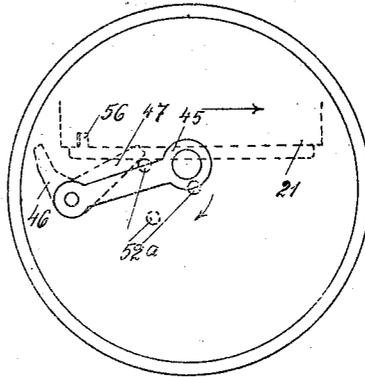


Fig. 8.

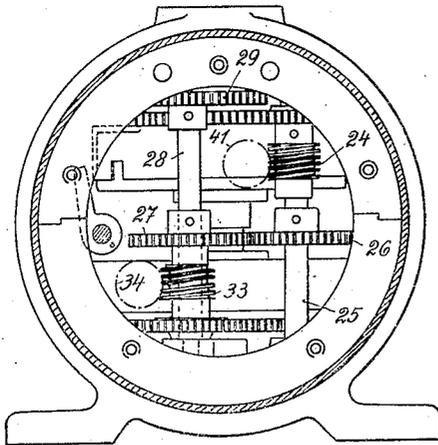
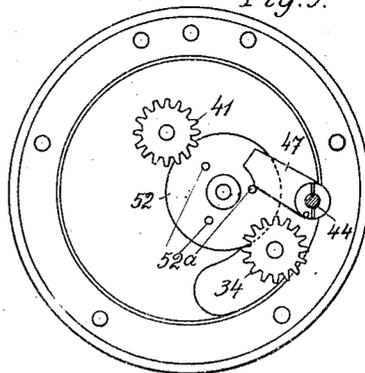


Fig. 9.



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4 Sheets-Sheet 4

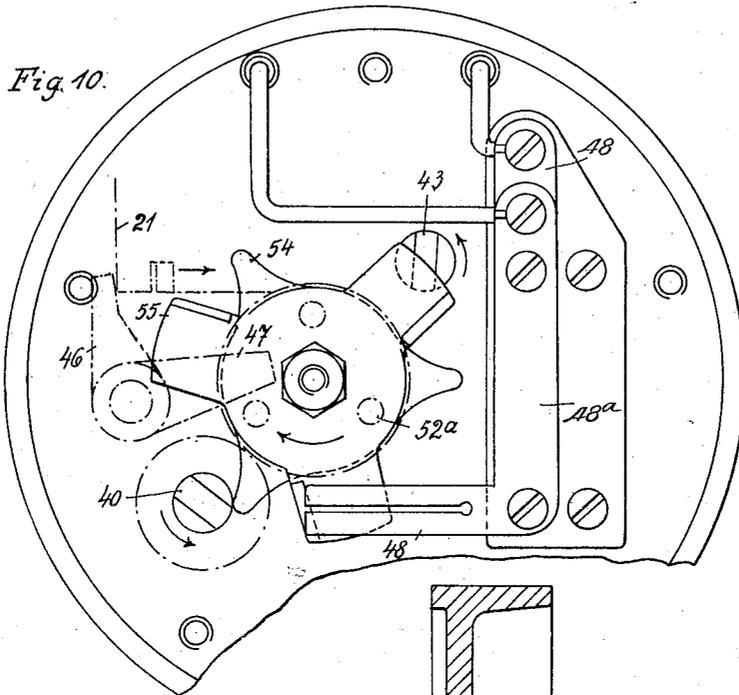
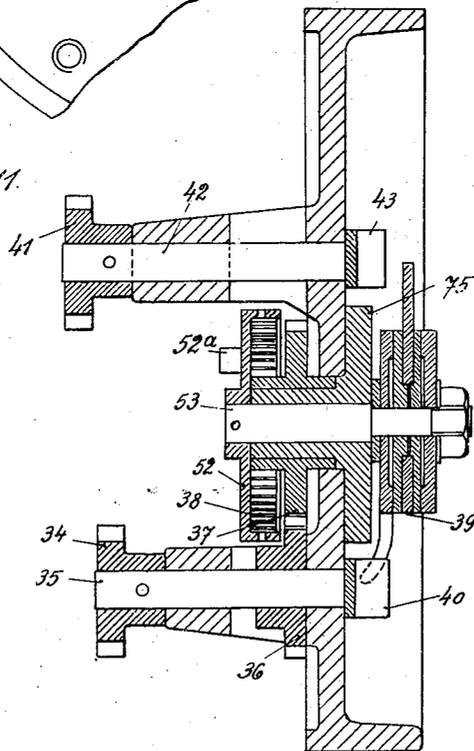


Fig. 11.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR DRIVING TYPEWRITERS PROVIDED WITH CALCULATING MECHANISM.

Application filed July 16, 1924, Serial No. 726,403, and in Germany November 8, 1923.

The subject matter of this invention consists of a mechanical driving apparatus for typewriters provided with calculating mechanism, which is maintained by an external supply of power in constant working readiness for instantly giving power to the calculating mechanism gear.

It has already been proposed, for driving typewriters provided with calculating mechanism, to interpose a power-storing device between the parts to be driven and a driving motor, for instance an electric motor fed from an electric-supply network, a coiled ribbon spring being used for storing and giving up power to the calculating mechanism gear.

In contra-distinction from these known driving apparatuses the invention is designed to solve the problem of so constructing the power-storing device as to enable it to receive and give out the largest possible amount of power, of protecting it and its gear against all external influences and coupling it to the driving motor in a readily disconnectable manner; the throwing of the motor into and out of driving operation being affected automatically by the power-storing device.

In solving this problem a plurality, for instance two, coiled ribbon springs arranged in series with one another, together with the appurtenant gear for supplying and giving out the power, are accommodated in a closed casing in which all the parts can run in oil. This casing, which is preferably of tubular form, is lengthened for the reception of the electric motor which is inserted in the casing and is fastened in place by a bayonet joint and is connected by a simple coupling to the gear of the power-storing device. On the other side there is provided on the outside of the power-storing device gear a rotary switch for the motor. This switch serves to throw the motor into operation in accordance with the power given out by the storing device, and, being influenced by the motor itself, throws the latter out of operation again. In the case of the power supply breaking down the power-storing device is prevented from running down too low by an automatic locking of the power-giving gear, which occurrence is immediately indicated by an alarm.

One constructional example of this invention is illustrated in the drawings in which:

Fig. 1 is a vertical cross section;

Fig. 1^a shows the bayonet joint;

Figs. 1^b, 1^c and 1^d are detail views to a larger scale showing the means for coupling the motor to the power-storing device;

Fig. 2 is a horizontal section of Fig. 1;

Fig. 2^a is a section through a detail;

Fig. 3 shows the switch when the current is interrupted;

Figs. 3^{a-c} show various positions of the switch;

Fig. 4 shows the switch when the circuit is closed;

Fig. 5 shows the circuit-closing terminal with motor contact springs;

Fig. 6 shows the power-spring locked;

Fig. 7 shows the same ready for operation;

Figs. 8 and 9 show the mechanism for actuating the locking shafts;

Fig. 10 is an elevation of the automatic switch;

Fig. 11 is a section thereof.

The apparatus (consisting of the power-storing device with appurtenant gear) for driving the typewriter provided with calculating mechanism is accommodated in a divided casing 6 which is closed by covers 7 and 8 and allows of being charged with lubricant. This casing is furthermore lengthened in tubular form, or it carries a tube 1, with removable covers 2 and 4, which is traversed by the bearing plug 73 whereby the casing and the tube are held together. This tube serves for the reception of the driving motor 5 which is brought into and maintained in its working position by being simply inserted and turned round with the help of a bayonet joint, having studs 62, 62' of different thickness for ensuring correct positioning of the motor. The projecting end of the shaft of the driving motor is provided with a driving disc 10 which transmits the rotary motion to the wormshaft 11 by means of driving pins 10^a which engage projections 11^b provided on a two-armed driver fixed on the shaft 11. When the motor is inserted into the tubular extension of the casing 1 the projections 11^b will lie in the path of the driving pins 10^a, so that when the motor is started up the pins 10^a of the motor will engage the projections 11^b of the

power storing device and thereby couple up the former to the latter. When the motor is withdrawn from the casing, the motor is automatically uncoupled from the power-storing device, the pins 10^a being no longer capable of engaging the projections 11^b. The worm shaft 11 drives the wormwheel 12 which, together with the pinion 13, is fixed on the shaft 13^a. On the shaft 18 are arranged the coiled ribbon springs in the present case two, 16, 20, which serve as power-storing devices and are inter-dependent.

The pinion 13 drives the spurwheel 14 fixed to the sleeve 15 which is loose on the shaft 18 and on which the inner coil of the coiled ribbon spring 16 is mounted. The outer coil is mounted on the spring box 17 by means of a pin or the like. To this box there is also fixed the socket 19 which is likewise loose on the shaft and which is connected by the sleeve 19^a to the inner coil of the spring 20, whilst the outer coil of this spring is mounted on the spring box 21 likewise by means of a pin or the like fastening. The box 21 is mounted on the shaft 18 or socket 19 by means of a socket 18^b and sleeve 19^a, and is fixed to the spurwheel 22. The drive for the calculating mechanism is taken from the spurwheel 22 first through the pinion 23 fixed on the shaft 25. The toothed wheel 26 likewise fixed on the shaft 25 transmits, through the toothed wheel 27, motion to the shaft 28 and from the latter the elastic shaft 31 of the typewriter calculating mechanism is driven through the wheels 29, 30.

By means of the intermediate spring 74 the transmission of the power may be effected even without exact coincidence of the centers of the bearings. Furthermore this spring is intended to prevent overstrain of the driving gear because in such a case the spring 74 will be screwed-up and thus interrupt the transmission.

To the main driving wheel 14 (Fig. 1) there is connected a spurwheel 32 which is mounted loose on the shaft 28 and carries on its extended hub a worm 33. The worm 33 (Fig. 8) meshes with a wormwheel 34 fixed on the locking shaft 35 which terminates outwards in a slotted head 40. On the locking shaft 35 (Fig. 11) there is mounted a pinion 36 meshing with a toothed wheel 37 which is mounted on the bushing 75 for the switch; on its hub is fixed the inner coil of the coiled ribbon spring 38 of the switch. The outer coil is coupled to the switch casing 52 fixed on the switch shaft 53.

When the switch is held fast (Fig. 4), the coiled ribbon spring 38 of the switch is being constantly wound. In order to avoid overstrain, the outer coil of the spring is furnished with a rivet head 38^a (Fig. 2^a), whilst the inner periphery of the switch cas-

ing 52 has corresponding notches 52¹. In the case of overstrain, the outer diameter of the spring is reduced by the winding, so that the rivet head is enabled to jump out of its notch, and, by snapping into one of the next notches, it can effect a diminution of the strain. In this manner the switch-driving spring 38 is always maintained under uniform strain by the drive.

Any suitable external source of current is connected to the network terminals 68 and 69 (Fig. 5). The terminal 68 is connected directly to the one circuit-closing spring 49^a, whereas a lead goes from the terminal 69 to the longer spring 48 of a pair of contact springs 48, 48^a of the rotary switch. The shorter contact spring 48^b (which is insulated from the former) is connected by the lead 67 to the circuit-closing spring 49^b. Current conveying pins 64 located on the driving motor are adapted to come into contact with the contact springs 49^a, 49^b, when the motor is inserted into the casing. A rotary switch whose position is controlled by the driving motor 5, opens and closes the current supply circuit automatically according to requirement. The rotary switch 39 consists here of three switch blades 55 fixed on the switch shaft 53 by means of insulating washers, and of the two contact springs 48 and 48^a. The position of the switch blades 55 is regulated by a locking star-wheel 54 with three locking teeth, which is fixed on the switch shaft 53 and co-operates with the heads of locking shafts projecting from the driving casing. In the present example two such locking shaft heads 40, 43 are provided. The locking shaft head 40 is connected to the winding member of the driving mechanism as already described, and therefore rotates only when the driving motor is in operation. The other locking shaft head 43 is connected to the unwinding member of the driving mechanism of the power-storing device. The shaft 42 of the locking shaft head 43 is rotated by the worm wheel 41 which is fixed on the shaft 22 and is in gear with the wheel 22 by means of the worm 24 and the pinion 23. The shaft 53 of the rotary switch receives as already described through the coiled ribbon spring 38 a rotary stress which is limited by the bearing of the locking teeth 54 against the locking shaft heads. Figures 3-4 show the several limit-positions of the locking star-wheel.

In the position shown in Figure 3, a locking tooth lies against the locking shaft head 42, whilst the switch blades 55 are situated outside the contacts 48. The driving motor is switched off. If the calculating mechanism is used, the mainspring 20, in running down, produces rotation of the locking shaft 42, that is, of its locking shaft head 43, in the direction of the arrow, and the locking

tooth 54 bearing outside against the locking shaft head 43 slips finally into the slot of the locking shaft head 43 and moves together with the shaft, that continues to rotate, into the position shown in Figure 3^a. At this moment the locking shaft end 42 is unable to hold back the locking tooth 54, and, owing to the action of the spring 38, the switch shaft 53, and with it the locking star wheel 54, is rotated until the preceding locking tooth 54 strikes the locking shaft head 40 (Figs. 3^b and 4). At the same time the switch body with one of its blades 55 has closed the circuit between the two contact springs 48 and 48^a, and by switching-in the electric motor effects the winding-up of the main springs 16, 20. The locking shaft 35 is also rotated at the same time as this winding-up is being effected. The locking tooth 54 slips into the slot of the locking head 40, and moves, together with the locking head 40 that continues to rotate, into the position shown in Figure 3^c. The locking tooth 54 cannot now be held any longer by the locking head 40, and by the action of the spring 38 the switch shaft 53, and with it the locking tooth 54, is rotated until the preceding locking tooth 54 strikes the locking shaft head 43. In this movement the switch blade is pulled out from the contact springs and the circuit is broken of the motor 5.

When the motor is stopped the locking shaft 35 remains also at rest, and retains the locking head position shown in Figures 3 and 3^a, whilst the locking shaft 42 rotates in a counter-clockwise direction according to the use of the calculating mechanism. Since the locking shaft 35 rotates very much faster than the locking shaft 42, a certain amount of time will always elapse between the switchings-in of the current. In any case the locking tooth, together with the respective locking head, must execute a small rotation before it can make a further jump forwards.

In order to prevent the driving apparatus from running down completely a locking device for the main spring is provided. This locking device is set in operation by the switch, when, on the occurrence of an interruption of the external current supply, the switch continues to remain in an adjusted position (Fig. 4) whilst the calculating mechanism is being further used. At the same time an alarm indicates the locking of the driving apparatus.

On a shaft 44 (Fig. 2) there is fixed a pawl lever 46 which is adapted to fall into a groove 56 (Figs. 6, 7) of the main-spring box 21 for the purpose of locking the driving apparatus. The locking is determined by pins 52^a which are provided on the switch casing 52 and act upon a pawl 47 which is loose on the shaft 44 and is pressed by a spring 44^a against one of the pins 52^a.

The described apparatus operates as follows:

It is assumed that in the driving apparatus at the commencement of the use of the calculating mechanism the coiled ribbon springs 16, 20, as also the rotary switch spring 38 are stressed, and the rotary switch has the position shown in Figure 3, that is to say, the motor 5 which is connected to any suitable source of current is cut out of circuit. If now power be taken from the spring gear through the shaft 31, the toothed wheels 30, 29, 27, 26, 23 and 22, the worm 24 connected to the toothed wheel 23, will, at the same time drive the wormwheel 41, the locking shaft 42 and the locking shaft head 43. The locking tooth 54 bearing against this head enters, as above stated, gradually into the slot of the locking shaft head 43, and moves with the latter until it is released by the locking shaft head 43. Then the released rotary switch is caused by the action of its spring 38 to rotate until the locking tooth preceding the last mentioned locking tooth strikes the locking shaft head 40, that is to say the position is that shown in Figures 3^b and 4. One of the switch blades 55 has now moved between the switch springs 48 and 48^a, the circuit of the driving motor 5 has thus become closed in the above described manner, and the motor 5 begins to run. The motor drives, through the coupling 10, the worm 11 which meshes with the wormwheel 12, so that through the medium of the spurwheels 13 and 14 the coiled ribbon springs 16 and 20 are stressed. At the same time the spurwheel 14 drives the toothed wheel 32 and the worm 33 connected to it, and the latter, through the wormwheel 34, brings into rotation the locking shaft 35 with the locking head 40. As the locking head 43 did previously, so now the slotted locking head 40 allows finally the contacting locking tooth 54 of the rotary switch to move past, so that the rotary switch is caused by its spring 38 which is wound-up by the toothed wheels 36, 37 by the rotation of the locking shaft 35, to rotate until again the tooth 54 which has preceded the last-mentioned locking tooth strikes the locking head 43. The rotary switch has now again the position shown in Figures 3 and 3^c.

It will thus be seen that one of the two series-connected coiled ribbon springs receives the power that is supplied, whilst the second spring gives out the power, so that thereby the entire gear is considerably simplified and rendered easy to control. Moreover the supply of power is here regulated entirely automatically by the gear of the power-storing device, in such a manner that the running-down part of the gear that is, the part giving out power, interrupts the supply of the power.

If the motor breaks down or does not

receive any current, the spring gear is prevented from running down completely as above stated; this being effected with the aid of the two levers 46, 47 which are mounted on the shaft 44 and are connected together by the spring 44^a. The shaft 44 carries also the alarm disc 45 which by its weight has a constant tendency to rotate the shaft 44, so as to cause the lever 46 to come against the periphery of the spring box 21. The pawl 47 is influenced, as stated, by the pins 52^a on the rotary switch casing 52. The rotary switch has three locking teeth 54 one of which always strikes one of the locking members 40 or 43 after one-sixth part of a revolution of the rotary switch. The rotary switch spring box 52 carries three pins 52^a (Figs. 6, 7 and 9), with the result that at every complete revolution of the rotary switch the pawl 47 has been lifted three times by a pin 52^a, and has assumed in between three times a horizontal position. The pins 52^a are so arranged on their spring box 52 that the pawl 47 is lowered when the motor is placed in circuit (Fig. 10) and is raised when the motor is cut out of circuit (Fig. 7).

In the former case the lever 46 which is connected to the pawl 47 in the hereinabove described manner moves from outside against the spring barrel 21 but the shaft 44 does not rotate sufficiently to allow the alarm flag 45 mounted on it to become visible through the aperture 3. If an interruption should occur in the external source of power when the motor is in circuit, then on power being further taken from the spring gear, the barrel 21 will continue to rotate until its notch 56 coincides with the lever 46, so that the latter snaps-in and stops the spring barrel 21. Then it is impossible to take power further from the spring gear. The additional movement of the lever 46 in snapping into the notch 56 at the same time allows the alarm flag 45 to swing down in front of the aperture 3 and indicate the breakdown. If the interruption in the external supply of power occurs when the motor is out of circuit (Fig. 7), that is to say, when the pawl 47 is raised and the shaft 44 has rotated the lever 46 out of contact with the spring barrel 21, then on power being taken further from the spring gear, the locking shaft head 43 is rotated in the hereinbefore described manner until it allows the locking tooth 54 of the rotary switch which is arrested by it to pass through, so that the rotary switch assumes the position shown in Figure 3^b. The lever 46 thus moves against the spring barrel 21, and if further power be taken, the latter is finally locked in the

manner just described when the notch 56 coincides with the lever 46.

What I claim is:—

1. A mechanical driving apparatus for typewriters provided with calculating mechanism, comprising a driving motor, a power-storing device for operating the calculating mechanism operatively connected with the said driving motor, in combination with a casing for containing and enclosing said power-storing device with its gear and having a tubular extension for housing the driving motor, driving means for coupling the driving motor up to the power-storing device, said means being capable of coming into engagement when the driving motor is inserted into the tubular extension and of moving out of engagement again when the motor is withdrawn from said extension, means for securing the driving motor in its working position inside the tubular extension and means for closing the end of the tubular extension.

2. A mechanical driving apparatus for typewriters provided with calculating mechanism, comprising a driving motor, a power-storing device for operating the calculating mechanism consisting of a plurality of series-connected coiled ribbon springs, said storing device being operatively connected with the said driving motor, a casing for containing and enclosing said power-storing device with its gear and having a tubular extension for housing the driving motor, driving means for coupling the driving motor up to the power-storing device, said means being capable of coming into engagement when the driving motor is inserted into the tubular extension and of moving out of engagement again when the motor is withdrawn from said extension, means for securing the driving motor in its working position inside the tubular extension and means for closing the end of the tubular extension.

3. A mechanical driving apparatus for typewriters provided with calculating mechanism, as set forth in claim 1, having a rotary switch for throwing the driving motor into and out of operation, a spring capable of being wound up by the driving motor for actuating said rotary switch and means controllable by the power-storing device and the motor for retaining the switch alternately in a position for connecting the motor to a source of energy for operating said motor and in a position for disconnecting the motor from said source of energy.

4. A mechanical driving apparatus for typewriters provided with calculating mechanism as set forth in claim 1, having a rotary switch comprising a plurality of switch blades, contact springs intended to

coact with said switch blades for connecting the motor to a source of energy for operating said motor, a spring capable of being wound up, by the driving motor for actuating said rotary switch, means for retaining the switch alternately in a position for connecting the motor to a source of energy for operating said motor and in a position for disconnecting the motor from the said source of energy, said means comprising locking teeth provided on said rotary switch, one locking tooth for each switch blade, a rotatable locking member 40 capable of engaging said locking teeth for arresting the rotary switch with a switch blade in engagement with a contact spring, means for operatively connecting said locking member with the driving motor, including a driving member provided on the power input side of the power-storing device, a rotatable locking member 43 capable of engaging said locking teeth for arresting the rotary switch with the switch blades out of engagement with the contact springs, means including a driving member provided on the power output side of the power storing device for rotating said member, and slots provided in said locking members for allowing the locking teeth to pass through for enabling the rotary switch to move.

5. A mechanical driving apparatus for typewriters provided with calculating mechanism as specified in claim 1, having a bayonet fastening furnished with studs of different thickness for securing said power-storing device in working position in the casing, for the purpose of facilitating the exchange of said power-storing device.

6. A mechanical driving apparatus for typewriters provided with calculating mechanism as specified in claim 1, having current-conveying pins located on the driving motor and circuit-closing springs located on the casing of the power-storing device, said pins being intended to come into contact with said circuit-closing springs when said motor is inserted into said casing.

7. A mechanical driving apparatus for typewriters provided with calculating mechanism as set forth in claim 1, having a rotary switch for throwing the motor into and out of operation, a rotatable spring box provided on the power output side of the power-storing device for transmitting the power to the calculating apparatus, means for locking the power-storing device when the motor breaks down, said means comprising a notch provided in said spring box, a lever capable of engaging in said notch, means for urging said lever into contact with said spring box and means actuatable by the rotary switch for raising said lever from the spring box for preventing said lever from engaging in said notch and an alarm signal connected to said lever for indicating when the power-storing device is locked.

8. A mechanical driving apparatus for typewriters provided with calculating mechanism as set forth in claim 1, having a spring interposed between the power-storing device and the calculating apparatus for transmitting the power from the former to the latter.

In testimony whereof I have signed my name to this specification.

THEODOR EUGEN BUSCHMANN.