A. L. SMITH.

SPRING MOTOR.

APPLICATION FILED APR. 2, 1909.

982,444.

Patented Jan. 24, 1911.

2 SHEETS—SHEET 1.

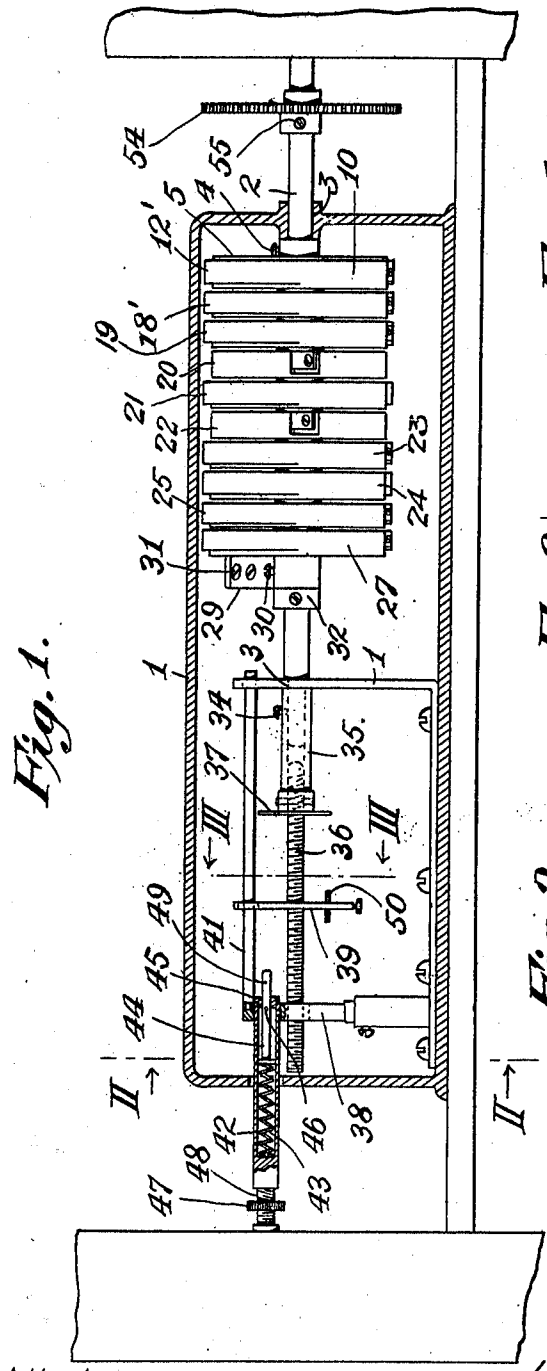

Fig. 1.

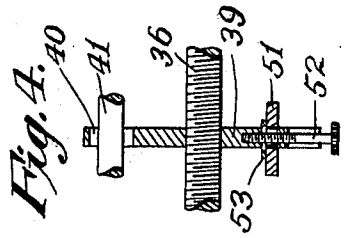

Fig. 4.

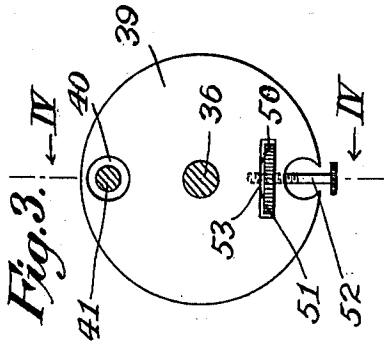

Fig. 3.

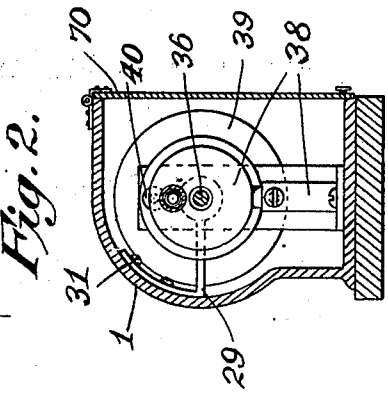

Fig. 2.

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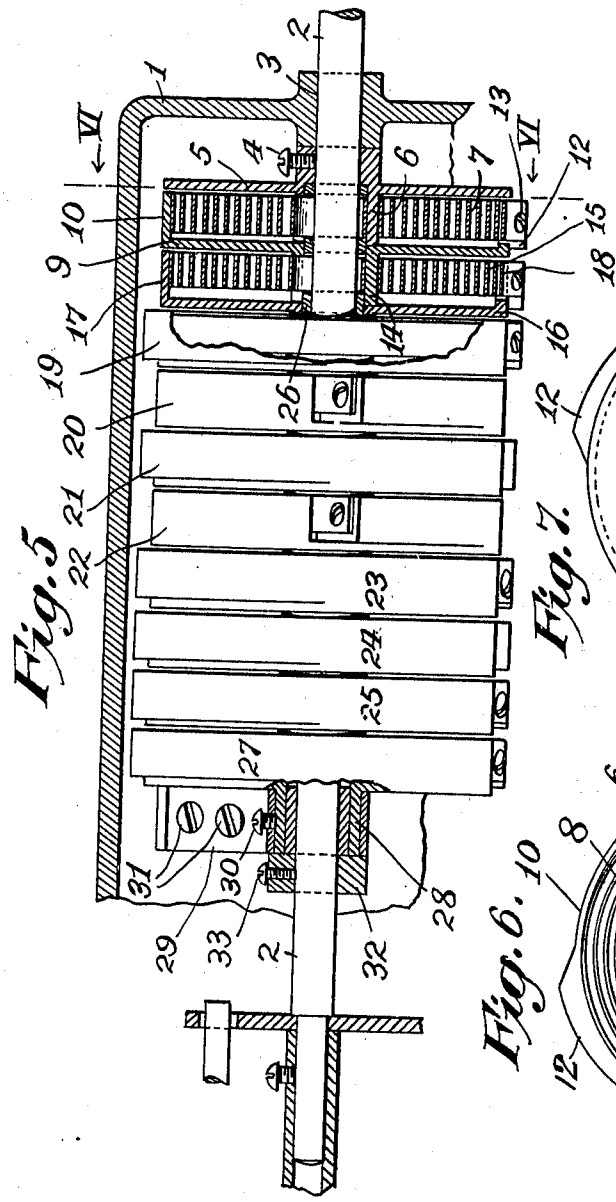

Fig. 5.

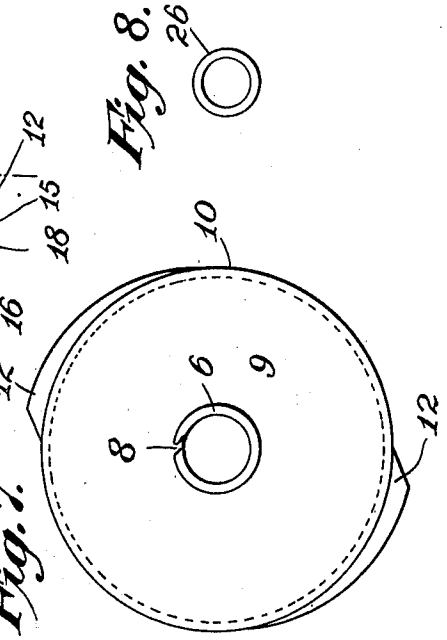

Fig. 7.

Fig. 8.

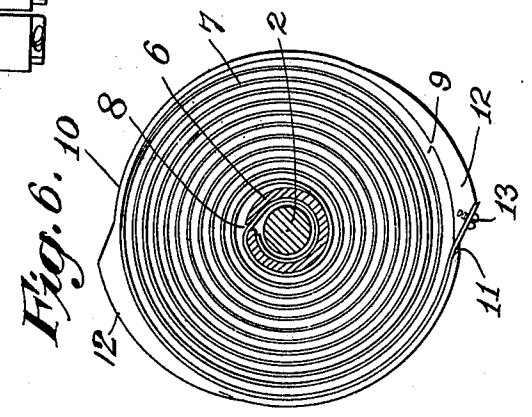

Fig. 6.

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UNITED STATES PATENT OFFICE.

ABRAHAM L. SMITH, OF NEW YORK, N. Y., ASSIGNOR TO MARC A. BLUMENBERG, OF NEW YORK, N. Y.

SPRING-MOTOR.

982,444. Specification of Letters Patent. **Patented Jan. 24, 1911.**

Application filed April 2, 1909. Serial No. 487,431.

To all whom it may concern:

Be it known that I, ABRAHAM L. SMITH, a citizen of the United States, and a resident of the city of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Spring-Motors, of which the following is a specification.

My invention relates to improvements in spring motors and more especially to those having a plurality of springs acting in series.

One object of my invention is to provide a simple and effective spring motor arrangement which will drive for a relatively great length of time and for a relatively great number of revolutions without rewinding the same.

A further object of my invention is to provide an especially efficient means for automatically determining and limiting the number of revolutions which will be given by the motor when it is operating as a driving means.

Further objects, features and advantages will more clearly appear from the detailed description given below taken in connection with the accompanying drawings which form a part of this specification.

In the drawings Figure 1 is a vertical view, mostly in section, showing one form of my improved motor apparatus. Fig. 2 is a section taken on the line II, II of Fig. 1. Fig. 3 is a vertical section of certain parts taken on the line III, III of Fig. 1. Fig. 4 is a vertical section taken on the line IV, IV of Fig. 3. Fig. 5 is a detailed vertical section of certain parts of the motor apparatus shown in Fig. 1. Fig. 6 is a vertical section taken on the line VI, VI of Fig. 5. Fig. 7 is a detailed view of one of the spring containing members shown in Fig. 5. Fig. 8 is a detailed view of a bushing used with the member shown in Fig. 7.

Referring to Fig. 1, 1 represents a support which also serves as a casing for the motor apparatus. Journaled within the support 1 is a shaft 2 having bearings at 3, 3 (see also Fig. 5). Secured to the shaft 2 near the right-hand bearing 3 by means of a screw 4 is a disk 5. Disk 5 is provided on its left-hand side with a hub 6 which is provided with a space between it and the shaft 2. Secured to the hub 6 is a coiled spring 7 which passes through a slot 8 in the hub 6 and extends around the shaft 2. This arrangement forms a convenient arrangement for securing the inner end of the spring 7 to the hub 6, (see also Fig. 6). Loosely mounted upon the shaft 2 adjacent to the coiled spring 7 is a disk 9 having on its periphery a circumferential flange 10. The flange 10 is slotted at 11 and the outer end of the spring 7 is brought through the slot 11 and secured to a projection 12 on the flange 10 by means of a screw 13, as clearly shown in Fig. 6. The disk 9 is provided with a hub 14 similar to the hub 6 on the disk 5. A second coiled spring 15 is arranged about the hub 14 and secured thereto in the same manner as the spring 7 is secured to the hub 6. Adjacent the spring 15 and hub 14 is still another disk or member 16 which has a slot in its circumferential flange 17 similar to that in the flange 10. The outer end of the coil 15 is secured to a similar projection 18 and on the flange 17 in the same manner as above described in connection with the extension 12. The flange 10 is arranged on the opposite side of disk 9 from that of the hub 14. Projections 12′ and 18′ are provided on the opposite sides of disks 9 and 16 respectively in order to balance the turning movement produced by projections 12 and 18 respectively. In a like manner I provide a plurality of members 19, 20, 21, 22, 23, 24, 25, loosely mounted upon the shaft 2. Each of these members is provided with a bushing 26 which fits snugly within its respective hub and forms a bearing for the member upon the shaft 2, (see also Fig. 8). At the end of the series of members is provided a similar member 27 the hub 28 of which is secured to a member 29 by means of a screw 30, the member 29 being secured to the frame-work by means of screws 31 so that the member 27 is rigidly connected with the support or frame-work of the device. An abutting ring 32 is secured to the shaft 2 by means of a screw 33 to hold the various members in their proper positions upon the shaft 2.

The slots 8 and 11 in the hub and flange of the various containing members 9, etc., form a most simple and effective means by which the coiled springs may be secured thereto. The use of rivets or similar awkward arrangements is avoided and the coiled springs may be readily secured in place by slipping the inner end of the spring over the

shaft 2 and into the slot 8. It is then firmly secured and it is only necessary to put the bushing 26 in place to form a bearing for the containing member and prevent the coiled spring from slipping out of the slot 8. The outer end of the coiled spring is readily secured to the flange of the adjacent containing member by slipping the member on the shaft 2 until the outer end of the coil spring slides into the slot 11. This leaves the outer end of the spring on the outside of the flange so that it may be readily secured to the same and prevented from slipping entirely within the containing member, as by the screw 13.

Upon the left-hand end of the shaft 2 is secured by means of a set screw 34 a hollow shafting piece 35 which has secured to it a screw threaded shaft or member 36. At the left-hand end of the member 35 is provided a circular flange 37. The screw threaded shaft 36 has a bearing in an upright or bracket 38 within the frame 1.

Mounted to travel upon the shaft 36 is a nut 39 having an aperture 40 therethrough through which aperture passes a rod 41, which rod is secured to the frame-work thus preventing the nut 39 from revolving but allowing of its travel longitudinally of the screw threaded member 36.

Loosely mounted in bracket 38 is a hollow member 42 having therein a coil spring 43. In front of the spring 43 is a plunger 44 which slides through the end piece 45 of member 42. A pin 46 is arranged to limit the movement of the plunger 44 toward the right. The hollow member 42 may be adjusted horizontally by means of a thumb piece 47 operating a screw 48 which acts to move the member 42 either to the right or left thus adjusting the position of the left-hand end 49 of the plunger 44. The nut 39 is provided with a slot 50 in which is placed a circular member 51 extending some distance from both sides of the nut 39. The circular member 51 is held within the slot 50 by means of a screw 52 so that the nut 51 may be easily rotated or removed. A washer 53 may be placed upon the circular member 51 if desired.

In operation when the coiled springs are taken in their unwound position, the nut 39 is arranged to be hard up against the plunger 44 which acts as a resilient stop. Upon turning a gear 54 which is secured to shaft 2 by means of a screw 55, the coiled springs within the various disk members on the shaft 2 may be gradually wound up in series and the nut 39 will gradually travel toward the right upon the screw threaded member 36. When the device has been sufficiently wound up it may be allowed to unwind and if any suitable mechanism is connected with the gear 54 work may be accomplished thereby. As the motor arrangement unwinds the nut 39 travels back along the screw threaded member 36 but is prevented from rotating because of the rod 41 passing through the aperture 40. As the nut 39 approaches the bracket 38 and contacts with the end 49 of the spring pressed member 44 the nut 39 is gradually brought to rest, thus stopping or limiting the movement of the screw threaded shaft 35, and also of the shaft 2. The nut 39 first engages the end 49 of the resilient stop 44 and then the circular member 51 engages the bracket 38 while the nut is still moving to the left against the action of spring 43. This causes the lower portion of the nut to stop in its movement while the top portion of the same may be carried a slight distance farther to the left, owing to the looseness of the nut upon the screw threads of shaft 36. That is, there is always more or less play of any nut upon a screw shaft due to wear, etc. If the nut 39 were allowed to move right up to the upright 38 and be stopped thereby the nut 39 would bind against the screw threads of the shaft 36 all the way around the shaft and at all points on the left hand surfaces of said threads. If the nut 39 is slightly tilted it will bind at only two points, substantially. But the nut 39 is not even allowed to bind at these two points under the full action of the main springs, since the speed of the nut 39 is gradually diminished by the opposing action of the spring 43. Thus the nut 39 is slightly tilted, so that it is prevented from binding, and so that when it is desired to start the apparatus up again substantially no energy is required to loosen the nut 39 from its position. Furthermore, the hole 40 being considerably larger than the rod 41 a slight rotation of the nut 39 is permitted which aids very materially loosening the same. The action is all the more easily permitted because the member 51 forms a sort of rotatable bearing against the upright 38. That is, the part 51 forms a rotatable bearing member situated on the nut 39 and arranged to engage the frame-work 38 to limit the movement of the nut 39 and practically determine the number of revolutions of the shaft 36. When the shaft 36 is rotated in the opposite direction there is a tendency for the nut 39 to be given a slight rotating movement due to the slight binding of its threads on the shaft 36. This would be prevented however by the friction between the member 51 and frame-work 38 if the member 51 were not made rotatable. Since, however, the member 51 is made rotatable this binding friction is eliminated and the disadvantages usually incurred in prior devices of this kind are not obtained. The circular flange 37 acts as a stop for the nut 39 in the opposite direction. The position of the stop 44 may be adjusted by means of the thumb piece 47 as above described.

A hinged door 70 may be provided for the frame 1 so that the main parts of the motor arrangement may be entirely inclosed, (see Fig. 2).

From the above it will be apparent that I have provided a motor arrangement which is exceptionally efficient and economical in construction and operation and which with the devices connected therewith is automatically operated so that the number of turns which it will give to a rotatable member may be limited to any desired number. I have also provided means whereby the automatic stopping means will not bind or jam so that the motor arrangement may be easily restarted.

Although I have described my improvements in great detail, nevertheless, I do not desire to be limited by such details, but

Having fully and clearly described my invention what I claim as new and desire to secure by Letters Patent is:

1. The combination of a revolving screw-threaded member, a nut arranged to travel on said member when the same revolves, means for preventing the nut from revolving a resilient stop for the nut to limit its travel, and means for slightly tilting said nut as it nears the end of its travel.

2. The combination of a revolving screw-threaded member, a nut arranged to travel on said member when the same revolves, means for preventing the nut from revolving, a stop for the nut to limit its travel, and means for slightly tilting said nut as it nears the end of its travel.

3. The combination of a suitable support, a rotatable shaft mounted thereon, a plurality of members loosely mounted on said shaft, and a plurality of coiled springs each having one end connected to one member and its other end connected to another member to cause said shaft to revolve, said members being in the form of disks each having a circumferential flange at its periphery and a hub adjacent the shaft, said hubs being provided with bushings forming bearings for the members on the shaft.

4. In a spring motor, a rotatable member for carrying a coiled spring, a shaft, a hub secured to said member and loosely mounted on said shaft, said hub being provided with a slot extending through the same and a spring coiled about said hub, and a bushing within said hub forming a bearing therefor on the shaft.

5. In a spring motor, a rotatable member for carrying a coiled spring, a shaft, a hub secured to said member and loosely mounted on said shaft, said hub being provided with a slot extending through the same, a spring coiled about said hub, and a bushing within said hub, said bushing holding the inner end of the spring within the hub.

6. In a spring motor, a plurality of coiled springs connected in series, a shaft arranged to be rotated by said springs, a hub for each spring rotatably mounted on the shaft, said hubs being provided with slots extending through the same and the inner ends of said springs being passed through said slots and extending about said shaft to properly secure the springs, and a bushing within each hub forming a bearing for the same.

7. In a spring motor, a screw-threaded shaft, a spring driving said shaft, a nut traveling on said shaft and means for preventing the nut from material rotation but allowing a slight rotation thereof.

8. In a spring motor, a screw-threaded shaft, a spring driving said shaft, a nut traveling on said shaft as the shaft revolves and a rotatable bearing member arranged to limit the movement of said stop.

9. In a spring motor, suitable framework, a screw-threaded shaft, a spring for driving said shaft, a nut traveling on said shaft as the shaft revolves, means for preventing material rotation of the nut relatively to the shaft, and a rotatable bearing member on the nut arranged to engage part of the framework to limit the movement of the nut and determine the number of revolutions of the shaft.

10. In a spring motor, suitable framework, a screw-threaded shaft, a spring for driving said shaft, a nut traveling on said shaft as the shaft revolves, means for preventing material rotation of the nut relatively to the shaft, a resiliently mounted stop on one side of the shaft for restricting the movement of the nut and a rotatable bearing member on the other side of the shaft for limiting the movement of the nut to determine the number of revolutions of the shaft.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ABRAHAM L. SMITH.

Witnesses:
EDWIN SEGER,
GEO. M. HARRIS.