Jan. 28, 1936. L. E. REID 2,028,845

RELAY MOTOR

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Fig. 1.

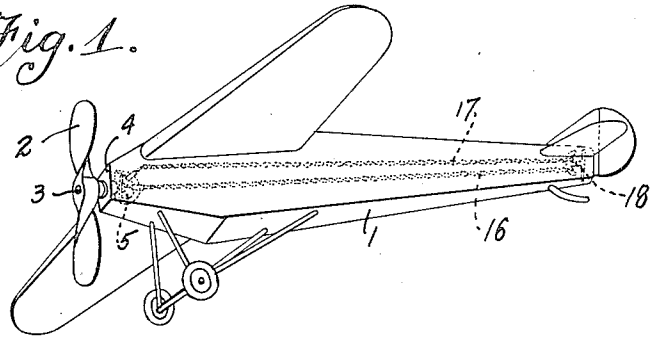


Fig. 2.

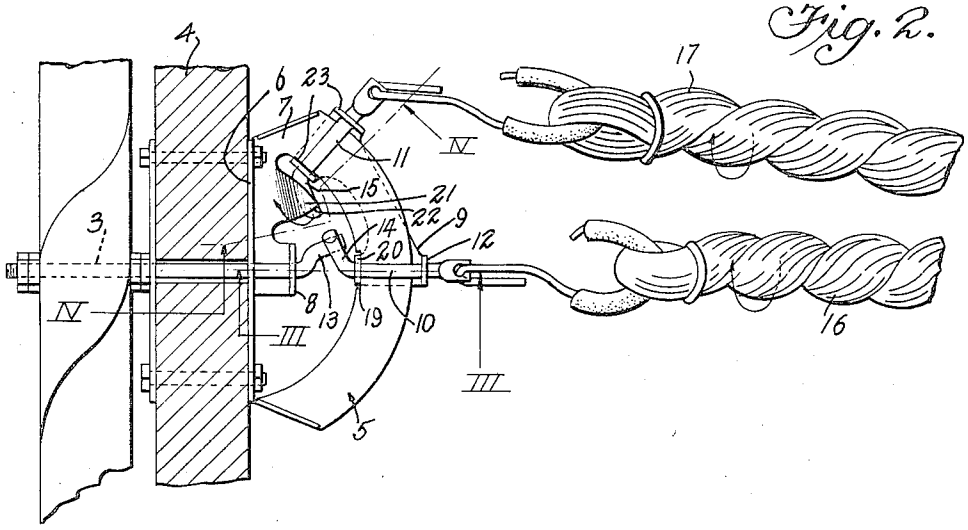


Fig. 3.

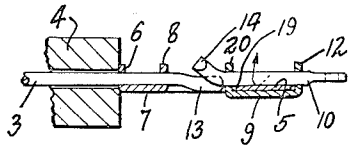
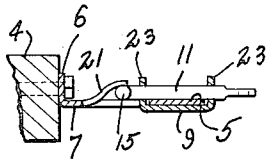


Fig. 4.



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Fig. 5.

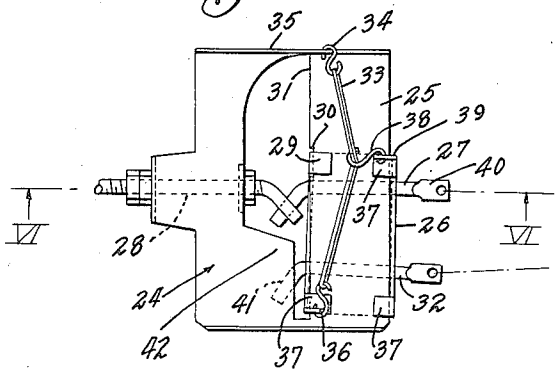
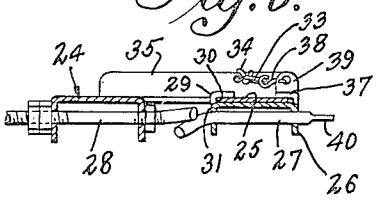


Fig. 6.



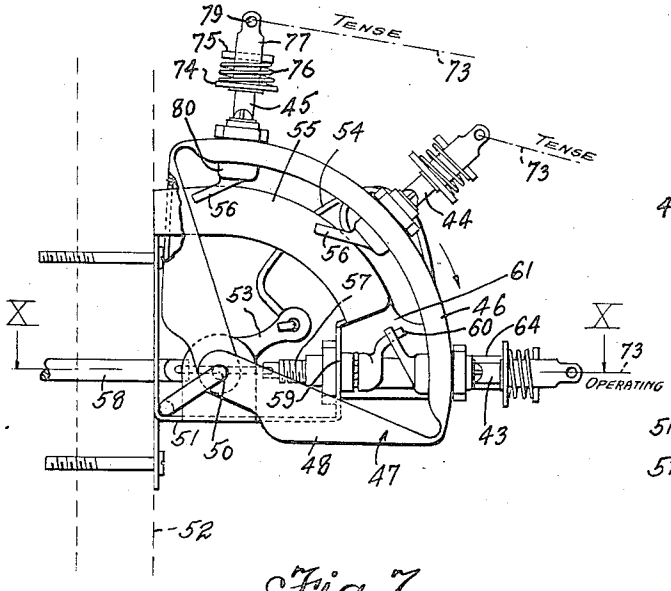


Fig. 7.

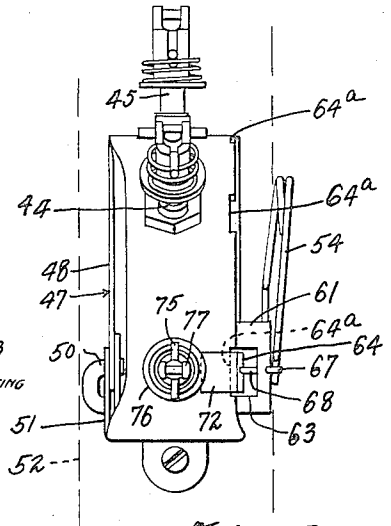


Fig. 8.

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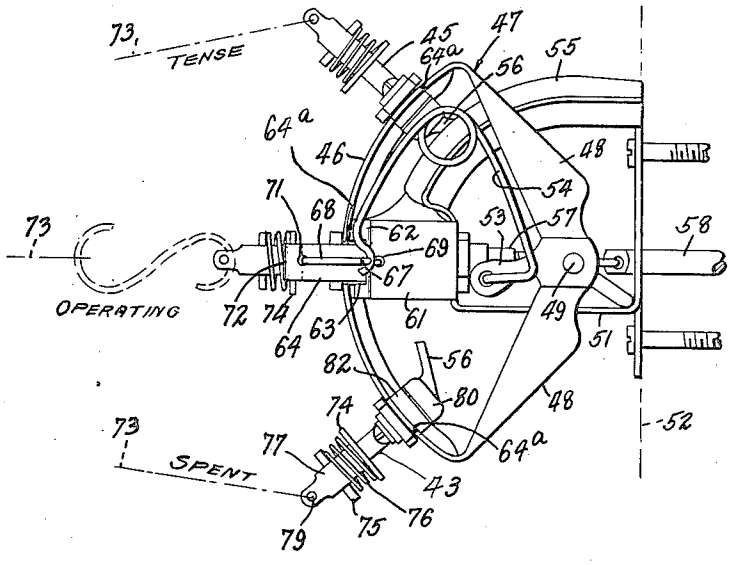


Fig. 9.

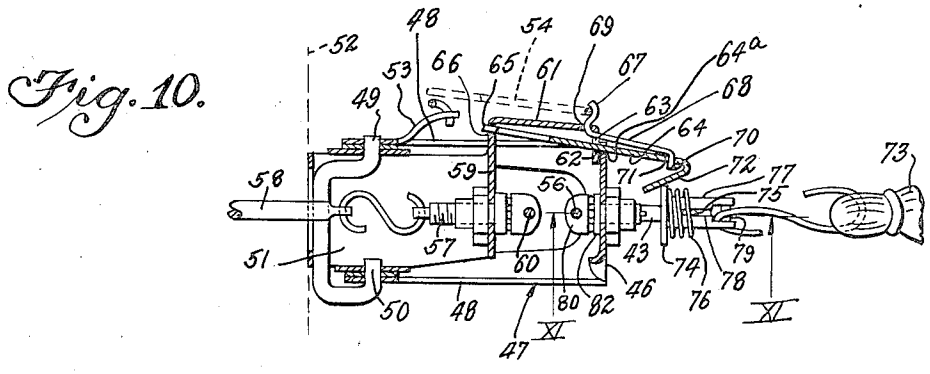


Fig. 10.

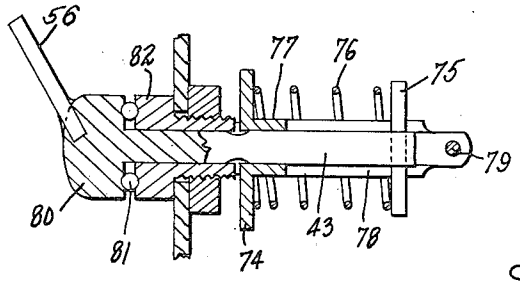


Fig. 11.

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RELAY MOTOR

Leland E. Reid, South Pasadena, Calif.

Application February 5, 1932, Serial No. 591,120

22 Claims. (Cl. 185—37)

This invention relates to a motor, and the object of the invention is to provide a motor of simple construction with means for extending the period during which the motor will drive.

While features of the invention may be applied to motors for any desired purpose, in the present specification the invention is described as applied to a vehicle, for example, a toy aeroplane. Although the invention has been described as applied to a toy aeroplane, the motor could as readily be employed for driving a toy vehicle of any kind, for example, a boat or car.

A common type of motor for driving toy aeroplanes involves the use of a torsion member in the form of a rubber band, or a plurality of rubber bands, which are twisted up so as to store energy in the band. The end of this torsion member is connected with a shaft that drives the propeller of the toy.

One of the objects of this invention is to provide a plurality of driving means for a driven shaft or driven member, together with means whereby when the power of the first or primary driving means is exhausted, a second, or secondary, driving means will be brought into operation; also to provide for a third relay drive when desired.

Further objects of the invention will appear hereinafter.

The invention consists in the novel parts and combination of parts to be described hereinafter, all of which contribute to produce an efficient relay motor.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawings:

Figure 1 is a perspective illustrating a toy aeroplane provided with a relay motor of torsion type embodying my invention.

Figure 2 is a vertical section taken through the forward end of the aeroplane and showing a portion of the propeller broken away. This view illustrates the adjacent ends of the torsion members and illustrates the means for effecting a primary driving with a primary torsion member and a second driving with the secondary torsion member. This view is upon an enlarged scale.

Figure 3 is a vertical section taken about on the line 3—3 of Figure 2 and further illustrating details of the construction.

Figure 4 is a section about on the line 4—4 of Figure 2 and particularly illustrating the means for preventing rotation of the secondary driving shaft while the primary driving shaft is in action.

Figure 5 is a plan illustrating another embodiment of the invention in which special means independent of the torsion members is provided for effecting the shifting from the primary drive to the secondary drive.

Figure 6 is a vertical section taken on the line 6—6 of Figure 5 and further illustrating details of this embodiment of the invention.

Figure 7 is a side elevation illustrating another embodiment of the invention in which the mechanism involves the use of a sector carrying the different driving shafts. This view illustrates the primary driving shaft connected up for actuating the driven shaft, and illustrates the means for preventing premature rotation of the other driving shafts while the drive is taking place through the primary driving shaft.

Figure 8 is a rear elevation of the apparatus illustrated in Figure 7.

Figure 9 is an elevation of the mechanism shown in Figure 7 but viewed from the opposite side and in a reversed position. While Figure 7 shows the mechanism set for effecting drive through the primary shaft, Figure 9 shows the apparatus in a shifted position to effect the drive through a secondary shaft.

Figure 10 is a longitudinal section taken on the line 10—10 of Figure 7 and further illustrating details of the driving connection and particularly illustrating the means for latching the different driving shafts in their driving position.

Figure 11 is a section on the line 11—11 of Figure 10 upon an enlarged scale, and further illustrating details of the construction at one of the driving shafts, particularly the means for cooperating with the latch to release the mechanism to enable an alignment to be effected for the next driving shaft that is to come into action.

Before proceeding to a detailed description of the invention, it should be understood that in accordance with my invention two independent power means, or power devices, are employed, and in the starting position of the motor one of these power means operates to effect the drive. When this power means becomes exhausted, a shift in the mechanism is automatically effected to bring the second power means into action, and so on.

In the simplest embodiments of the invention, I prefer to employ two power members, but the invention readily adapts itself to the use of a greater number of power members which can be

automatically brought in succession into a driving relation with the driven member.

Referring particularly to Figure 1, 1 indicates a toy aeroplane which is provided at its forward end with a propeller 2 which is driven through a driven member or driven shaft 3, said shaft being rotatably mounted in the forward end of the frame 4 of the vehicle or aeroplane.

Attached to the frame 4 I provide a guide 5 which is of arcuate form and which may be formed out of a plate, a portion of the plate being formed with a flange 6 to be attached to the frame 4. The flange is preferably integral with the plate 7 out of which the guide 5 is formed, and this plate may be bent up so as to form a bearing 8 for the driven shaft 3.

On the arcuate guide 5 I provide a shiftable slide 9 which carries a plurality of driving shafts; in the present instance this slide is provided with two shafts, including a primary shaft 10 and a secondary shaft 11. These shafts are substantially alike in construction and each shaft is rotatably mounted in ears 12 struck up from the slide and these ears operate as bearings for the shafts.

The rear end of the driven shaft 3 is formed with a crank 13 preferably disposed in an inclined direction with respect to the axis of the driven shaft, and the shafts 10 and 11 are similarly provided with inclined cranks 14 and 15. While I prefer to employ these inclined cranks for enabling the driving shafts to drive the driven shaft, it should be understood that any known means may be employed for effecting a driving connection between the driving shaft and the driven shaft. The use of inclined cranks is particularly advantageous, however, because they lend themselves readily to the effecting of a driving connection by simply bringing the driving shaft into longitudinal alignment with the driven shaft, and they also facilitate the action of means for preventing rotation of the secondary shaft before it is brought into its driving position.

To the rear end of the primary shaft 10 a primary torsion member 16 is attached, and a similar torsion member 17 is attached to the secondary shaft 11. The rear ends of these torsion members 16 and 17 are anchored in the tail 18 of the aeroplane as indicated by the dotted lines in Figure 1. The torsion members 16 and 17 are preferably formed of rubber bands capable of being twisted up so as to store energy in them.

Figure 2 indicates the mechanism in its primary driving position, and at this time the tension in the primary torsion member 16 holds the slide 9 in a position to maintain the primary driving shaft 10 in alignment with the driven shaft 3.

Means are provided to cooperate with the torsion member 16 so that when its energy is substantially spent, or exhausted, and its tension weakened, the slide 9 will automatically be brought around into a secondary position with the shaft 11 connected up with the driven shaft 3 to drive it.

In the embodiment of the invention illustrated in Figure 2, this is effected through the medium of the relative tension in the torsion members 16 and 17. In order to effect this, the forward edge of the arcuate guide 5 is provided with a notch 19 which is engaged by a dog 20 struck up from the edge of the slide. The shaft 10 is mounted in this dog which operates as the forward bearing for the shaft. The tension or pull exerted on the shaft 10 maintains this end of the slide in a position with the dog 20 in the notch so that the dog operates as a latch holding the slide in this position.

The tension or rear pull in the shaft 10 is imparted to the dog 20 and to the slide by the inclined crank 14.

The plate 7 is provided with means for preventing the shaft 11 from being prematurely rotated by its torsion member 17. For this purpose the plate is provided with a projecting lip 21 which is in the path of the crank 15 and holds it against rotation.

In the operation of this embodiment of the device, as soon as the tension in the torsion member 16 becomes too weak to hold the dog 20 in the notch, the tension in the torsion member 17 will rock the slide 9 in a clockwise direction, as viewed in Figure 2, until the outside ear 12 is stopped by the adjacent edge of the guide 5. This will pull the dog out of the notch and will thereafter pull the slide down into a lower or secondary position in which the shaft 11 will become aligned with the driven shaft 3. It is found in practice that these torsion members will unwind themselves very quickly, and it is necessary to extend the lip 21 as near as possible to the crank 13 of the driven shaft so as to insure that the crank 15 will engage the crank 13 at the instant that it becomes free from the lip. In order to insure such a mode of operation, I prefer to form the end or edge 22 of the lip that is toward the shaft 3 so that the end of the crank 15 projects slightly beyond the lip at this point.

In this way as the crank 15 becomes free from the lip, it gives the edge 22 of the lip a kick, which assists in moving the slide down into its secondary position, and as the crank 15 kicks itself away from the lip, it immediately engages the crank 13 and starts the drive of the driven shaft 3.

In order to facilitate the disengagement of the dog 20 from the notch 19, it is preferable to construct the slide so that it does not fit too tight on the guide; in other words, the ears 23 which form the bearings for the secondary shaft 11 are preferably far enough apart to permit a slight rotation of the slide to free the dog. For the same reason the ears 12 and 20 are also further apart than the width of the guide 5.

In Figure 5 I illustrate another embodiment of the invention in which I do not rely upon the tension in the unused torsion member to shift the slide over into its secondary position. Referring to this figure, I provide a frame plate 24 which corresponds to the plate 7, but this plate is formed with a straight guide 25 for the slide 26.

In the starting position the primary driving shaft 27 is held in alignment with the driven shaft 28 through the agency of a dog 29 on the slide which engages a notch 30 on the forward edge 31 of the guide. Resilient means is provided urging the slide to its secondary position in which the secondary driving shaft 32 would be aligned with the shaft 28. In the present instance this means consists of a resilient member such as a rubber band 33, one end of which is anchored at 34 to a flange 35 on the plate, and the other end of which is attached to an integral ear 36 projecting up from the slide. The slide is provided with tongues 37 that project over the upper side of the guide so as to retain the slide on it. In addition to this, I provide means such as a hook 38 which is attached to an ear 39 projecting up from

the slide so that the resilient means 33 tends to pull the slide laterally, that is to say, in a forward direction. This would disengage the dog 29 from the notch if it were not for the tension in the torsion member which is attached to the rear end 40 of the primary shaft 27. By reason of this tension, however, the shaft 27 is pulled rearwardly, and this pulls the slide rearwardly and holds the dog in the notch.

When the tension in the primary torsion member weakens sufficiently, the resilient member 33 will pull the slide forwardly, or toward the left, as viewed in Figure 5, and this will dislodge the dog 29. As soon as this occurs, the tension in the resilient means 33 will pull the slide upwardly on the guide 25 and bring the shaft 32 into alignment with the shaft 28. When the slide is in the position shown in Figure 5, the crank 41 of the secondary shaft 32 is held against rotation by a projecting wing 42 which forms a part of the plate 24. The resilient means 33 is constructed so that it still has tension in it after the slide has been shifted to its secondary position, and this tension maintains the slide in this position.

In Figures 7 to 11 I illustrate another embodiment of the invention in which I provide three driving shafts. Figure 7 shows the mechanism set for driving through the medium of the primary driving shaft 43. The three driving shafts, 43, 44, and 45 are all mounted for rotation in the arcuate rim 46 of a sector 47; said sector constituting a quadrant and having rigid arms 48 which are pivotally mounted on pintles 49 and 50 which are rigid with the frame plate 51 of the mechanism which is attached to the frame 52 of the vehicle indicated in dotted lines in Figure 7.

The sector or quadrant 47 is also provided with a rigid arm 53 which projects radially from the axis of the pintles 49 and 50 and this arm is engaged by a spring 54 which exerts its force in a direction to swing the quadrant downwardly and in the direction of the arrow indicated in Figure 7. The two reserved shafts 44 and 45 are prevented from rotation when the primary shaft 43 is in action, by means of an arcuate plate 55 that is rigid with the frame plate or bracket 51. In other words, the cranks 56 of the secondary and tertiary shafts lie against this plate 55, and the torsion exerted in the shafts is thereby prevented from rotating these shafts.

Suitable releasing mechanism is provided for releasing the primary shaft 43 and for bringing the secondary shaft 44 into alignment with the driven shaft 57. The preferred mechanism for this purpose is illustrated more clearly in Figure 10. In this view it will be seen that the bracket 51, in line with the propeller shaft 58, is formed into a housing with a web 59 that forms a bearing for the driven shaft 57, the rear end of which is formed with an inclined crank 60 (see Figure 7). The housing also includes a web 61 (see Figure 10), with a downwardly extending flange 62 that has a slot 63 for carrying a latch 64, preferably in the form of a plate, the inner end of which is formed with a pintle 65 that fits into an opening 66 in the web 59.

The slot 63 will permit a lateral movement of the latch sufficient to disengage it from a notch 64a in the edge of the quadrant, (see Figure 8), there being one of these notches 64a to correspond with each driving shaft. The end of the spring 54 already referred to thrusts against a hook 67 which projects upwardly from a short bar 68 that is loosely supported in an opening 69 at the junction of the flange 62 with the web 61. The tip of this bar 68 is formed with a pintle 70 that is received in a hole 71 punched in the latch plate. Beyond this point the latch plate is formed with an inclined tongue 72, the function of which is to cooperate with means on the driving shaft to release the latch 64 when the tension in the torsion member 73 is sufficiently weak. For this purpose I provide a spring-pressed sliding collar 74 which slides on the shaft 43, and similar collars are provided on the other two shafts 44 and 45. The details of this construction are shown clearly in Figure 11.

The shaft 43 is provided at its rear end with a pin 75 against which a coiled spring 76 thrusts, the forward end of the spring exerting thrust against the collar 74. The collar 74 is formed with a sleeve 77 which is formed with a slot 78 that receives the pin 75 and permits the collar to slide freely on the shaft.

This sleeve, through the medium of the slot 78 and the pins 75, transmits the torque from the torsion member 73 to the shaft 43, the torsion member being anchored by means of a hook 79 to the rear end of the sleeve. The forward end of the shaft 43, and the other driving shafts, is provided with a head 80 under which a ball-bearing 81 is provided to reduce the friction of rotation of the shaft in a bearing bushing 82 mounted in the web 59.

In the operation of this mechanism as illustrated in Figures 7 to 11, when the tension in the primary torsion member becomes weak, it will not hold the spring 76 any longer in compression, and this spring will move the collar 74 forwardly on the shaft 43. The contact of the collar with the inclined tongue 72 will push the tongue outwardly from the notch 64a corresponding to the primary torsion member, and the tension of the remaining torsion members will then swing the quadrant or sector 47 on its axis of rotation, thereby bringing the secondary driving shaft 44 into alignment with the driven shaft 57 (see Figure 9). When this secondary shaft arrives in this position, the latch 64 will snap into the notch 64a corresponding to the secondary driving shaft, and hold it in its driving position.

In a similar manner, when the tension in this secondary torsion member becomes sufficiently reduced, the latch 64 will be released in the manner just described, thereby enabling the spring to bring the third shaft around into line so that its corresponding notch 65 will be engaged by the latch 64 to hold the third shaft in line for continuing the drive.

It is understood that the embodiment of the invention described herein is only one of the many embodiments this invention may take, and I do not wish to be limited in the practice of the invention, nor in the claims, to the particular embodiment set forth.

What I claim is:

1. A relay motor having a driven member, a driving member therefor, power means extending from said driving member, a second driving member, power means extending from said second driving member, a transversely movable carriage supporting said driving members, means for guiding said carriage to move in a direction transverse to the direction in which said power means extend, and automatic means for shifting the drive from the first-named driving member to the second named driving member when the power means for the first driving member is exhausted.

2. A relay motor having a driven member, a driving member therefor, torsion means extending from said driving member, a second driving member, torsion means extending from said second driving member, a transversely movable carriage supporting said driving members, means for guiding said carriage to move in a direction transverse to the direction in which said torsion means extend, and automatic means for moving the carriage to shift the drive from the first-named driving member to the second-named driving member when the torsion means for the first driving member is exhausted.

3. In a relay motor, the combination of a frame, a guide attached to the frame, a driven shaft, a slide mounted to shift on the guide, a driving shaft capable of engaging the driven member to drive the same in one position of the slide, a secondary driving shaft carried by the slide, independent power means for rotating said driving shafts, and cooperating so that when the power means corresponding to the first-named driving shaft is exhausted, the slide operates to shift on the said guide and align the second driving shaft with the said driven member to continue the drive with the power means corresponding to the second driving shaft.

4. In a relay motor, the combination of a frame, a guide attached to the frame, a driven shaft, a slide mounted to shift on the guide, a driving shaft capable of engaging the driven member to drive the same in one position of the slide, a secondary driving shaft carried by the slide, independent power means for rotating said driving shafts, and cooperating so that when the power means corresponding to the first-named driving shaft is exhausted, the slide operates to shift on the said guide and align the second driving shaft with the said driven member to continue the drive with the power means corresponding to the second driving shaft, and means for preventing the rotation of the second-named driving shaft until the slide has shifted.

5. In a relay motor, the combination of a frame, a guide attached to the frame, a driven shaft, a slide mounted to shift on the guide, a driving shaft capable of engaging the driven member to drive the same in one position of the slide, a secondary driving shaft carried by the slide, independent power means for rotating said driving shafts, and cooperating so that when the power means corresponding to the first-named driving shaft is exhausted, the slide operates to shift on the said guide and align the second driving shaft with the said driven member to continue the drive with the power means corresponding to the second driving shaft, said power means consisting of torsion members capable of being twisted to store power in the same, said slide and said guide having cooperating means enabling the tension in the torsion member corresponding to the first-named driving shaft to maintain the slide in position for driving through the first-named driving shaft, said parts cooperating so that when the tension in the torsion member corresponding to the first-named driving shaft weakens, the tension in the other torsion member will effect the shifting of the slide and move the second-named driving shaft into alignment with the driven shaft.

6. In a relay motor, the combination of a frame, a guide attached to the frame, a driven shaft, a slide mounted to shift on the guide, a driving shaft capable of engaging the driven member to drive the same in one position of the slide, a secondary driving shaft carried by the slide, independent power means for rotating said driving shafts, said guide and slide having cooperating means for latching the slide to the guide in position for enabling the first-named driving shaft to drive the driven shaft, a torsion member connected with the first-named driving shaft and operating by its own tension to hold the slide latched to the guide, a second torsion member connected with the second-named driving shaft for rotating the same, and means for preventing the second-named driving shaft from rotating while the first-named driving shaft is aligned with the driven shaft, said parts cooperating so that when the tension in the first-named torsion member weakens, the tension in the second-named torsion member will shift the slide to a second position and align its own driving shaft with the driven shaft to continue the driving.

7. A relay motor having a driven shaft, a plurality of driving shafts, said driving shafts having cranks, and said driven shaft having a crank capable of engaging the cranks of the driving shafts respectively for driving the same, torsion members corresponding to the driving shafts and capable of being twisted to store up energy in the same, and means cooperating with said torsion members for enabling one of said driving shafts to drive the driven shaft, and operating to shift another driving shaft into connection with the driven shaft when the energy in the torsion member of the first driving shaft has become exhausted.

8. In a relay motor, the combination of a frame, a guide attached to the frame, a driven shaft, a slide mounted to shift on the guide, a driving shaft capable of engaging the driven member to drive the same in one position of the slide, a secondary driving shaft carried by the slide, independent power means for rotating said driving shafts, said driving shafts each having a crank on its end adjacent the driven shaft for rotating the driven shaft, a torsion member connected with the first-named driving shaft for rotating the same to drive the driven shaft, a second torsion member connected with the secondary driving shaft for rotating the same, fixed means adjacent the second-named driving shaft for preventing its rotation while the first-named driving shaft is driving the driven shaft, and means associated with the guide and the slide for effecting the shifting of the slide when the energy in the first-named torsion member is exhausted to bring the second-named driving shaft into driving connection with the driven shaft.

9. In a relay motor, the combination of a frame, an arcuate guide attached to the frame, a slide mounted to shift on the said guide, a driven shaft rotatably mounted in the frame, a primary driving shaft carried on the slide capable of engaging the driven shaft to drive the same in one position of the slide, a secondary driving shaft carried by the slide, independent power means for rotating said driving shafts, means for preventing rotation of the secondary driving shaft while the primary driving shaft is driving the driven shaft, and means associated with the slide and the guide for automatically shifting the slide when the power means corresponding to the primary driving shaft has become exhausted, and operating to effect a driving connection between the secondary driving shaft and the driven shaft to continue the drive.

10. In a relay motor, the combination of a frame, a guide attached to the frame, a slide mounted to shift on the said guide, a driven shaft rotatably mounted in the frame and having a crank for driving the same, a primary driving shaft carried on the slide and having a crank capable of engaging the crank of the driven shaft to drive the same in one position of the slide, a secondary driving shaft carried by the slide, and having a crank capable of engaging the crank of the driven shaft, independent power means for rotating said driving shafts, said guide having means in the path of rotation of the crank of the secondary driving shaft for preventing rotation of the secondary driving shaft while the primary driving shaft is driving the driven shaft, and means associated with the slide and the guide for automatically shifting the slide when the power means corresponding to the primary driving shaft has become exhausted, and operating to effect a driving connection between the secondary driving shaft and the driven shaft to continue the drive.

11. A relay motor constructed as described in claim 12 in which the guide is provided with a notch and the slide is provided with a projection for engaging the notch to hold the slide in position for maintaining the primary driving shaft in driving connection with the driven shaft, and operating so that when the tension in the primary driving means is weakened, to disengage the slide from the notch and shift the secondary driving shaft into alignment with the driven shaft.

12. In a relay motor, the combination of a frame, a driven shaft mounted for rotation and having a crank for driving the same, a guide mounted on the frame, a slide mounted on the guide for movement transverse to the axis of the driven shaft, a primary driving shaft rotatably mounted on the said slide and having a crank for engaging the crank of the driven shaft, cooperating means on the slide and guide for latching the slide in a primary position with the primary driving shaft in substantial alignment with the driven shaft, means for forcing the slide in a direction to bring the secondary driving shaft into alignment with the driven shaft, and torsion members corresponding to the two driving shafts and capable of being twisted to store up energy in the same, the tension in the primary torsion member operating to maintain the slide in its primary position, and means cooperating with the parts to effect the release of the slide when the tension in the primary torsion member becomes weak, thereby enabling the slide to shift into a second position to continue the drive of the driven shaft by means of the secondary driving shaft.

13. In a relay motor, the combination of a frame, a driven shaft mounted for rotation and having a crank for driving the same, a guide mounted on the frame, a slide mounted on the guide for movement transverse to the axis of the driven shaft, a primary driving shaft rotatably mounted on the said slide and having a crank for engaging the crank of the driven shaft, cooperating means on the slide and guide for latching the slide in a primary position with the primary driving shaft in substantial alignment with the driven shaft, resilient means connecting the guide with the slide for forcing the slide toward a position to bring the secondary driving shaft into alignment with the driven shaft, torsion members corresponding to the two driving shafts supported at one end on the slide and capable of being twisted to store up energy in the same, the tension in the primary torsion member operating to maintain the slide in its primary position while the primary driving shaft is driving the driven shaft, means connecting the said resilient member with the slide for unlatching the slide when the tension in the primary torsion member becomes weak, and cooperating with the resilient means to shift the slide to a second position to align the secondary driving shaft with the driven shaft.

14. In a relay motor, the combination of a frame, a driven shaft mounted for rotation and having a crank for driving the same, a guide mounted on the frame, a slide mounted on the guide for movement transverse to the axis of the driven shaft, a primary driving shaft rotatably mounted on the said slide and having a crank for engaging the crank of the driven shaft, said guide having a notch, and said slide having a dog for engaging the notch for latching the slide in a primary position with the primary driving shaft in substantial alignment with the driven shaft, torsion members corresponding to the two driving shafts and capable of being twisted to store up energy in the same, the tension in the primary torsion member operating to maintain the dog of the slide in said notch, resilient means connecting the slide with the guide for shifting the slide when the dog is disengaged from the notch, and means connecting the resilient means with the slide for disengaging the dog from the notch when the tension in the primary torsion member becomes weak, and cooperating with the resilient means to effect a shifting of the slide to align the secondary driving shaft with the driven shaft.

15. In a relay motor, the combination of a frame, a driven shaft mounted for rotation and having a crank for driving the same, a guide mounted on the frame, a slide mounted on the guide for movement transverse to the axis of the driven shaft, a primary driving shaft rotatably mounted on the said slide and having a crank for engaging the crank of the driven shaft, said guide having a notch, and said slide having a dog for engaging the notch for latching the slide in a primary position with the primary driving shaft in substantial alignment with the driven shaft, torsion members corresponding to the two driving shafts and capable of being twisted to store up energy in the same, the tension in the primary torsion member operating to maintain the dog of the slide in said notch, resilient means connecting the slide with the guide for shifting the slide when the dog is disengaged from the notch, and means connecting the resilient means with the slide for disengaging the dog from the notch when the tension in the primary torsion member becomes weak, and cooperating with the resilient means to effect a shifting of the slide to align the secondary driving shaft with the driven shaft, said guide having an extension engaging the crank of the secondary driving shaft when the primary driving shaft is driving the driven shaft to prevent premature rotation of the secondary driving shaft.

16. In a relay motor, the combination of a frame, a driven shaft rotatably mounted in the frame, a sector pivotally mounted on the said frame on an axis substantially in alignment with the driven shaft, a primary driving shaft mounted on the said sector, a secondary driving shaft rotatably mounted on the sector, said driven shaft having a crank and said driving shafts having

cranks, respectively, capable of engaging the shaft of the driven shaft for rotating the same, torsion members corresponding to the driving shafts capable of being twisted to store up energy in the same, latching mechanism for normally latching the sector in a primary position with the primary driving shaft in alignment with the driven shaft, and automatic means for releasing the latching mechanism and shifting the sector to a secondary position when the energy in the primary torsion member is exhausted, and thereby aligning the secondary driving shaft with the driven shaft to continue driving the same.

17. In a relay motor, the combination of a frame, a driven shaft rotatably mounted in the frame, a sector pivotally mounted on the said frame on an axis substantially in alignment with the driven shaft, a primary driving shaft mounted on the said sector, a secondary driving shaft rotatably mounted on the sector, said driven shaft having a crank and said driving shafts having cranks, respectively, capable of engaging the shaft of the driven shaft for rotating the same, torsion members corresponding to the driving shafts capable of being twisted to store up energy in the same, said sector having an arcuate rim with a notch therein corresponding to the primary driving shaft, a latch supported on the frame for engaging the said notches respectively, and cooperating with the primary notch to hold the primary shaft in cooperative engagement with the driven shaft, automatic means for releasing the said latch when the tension in the primary torsion member becomes weak, and resilient means operating thereafter to rotate the sector on its axis of rotation and bring the secondary notch into alignment with the latch to latch the sector in a second position with the secondary driving shaft in operative engagement with the driven shaft.

18. In a relay motor, the combination of a frame, a driven shaft rotatably mounted in the frame, a sector pivotally mounted on the said frame on an axis substantially in alignment with the driven shaft, a primary driving shaft mounted on the said sector, a secondary driving shaft rotatably mounted on the sector, said driven shaft having a crank and said driving shafts having cranks, respectively, capable of engaging the shaft of the driven shaft for rotating the same, torsion members corresponding to the driving shafts, said sector having an arcuate rim with a notch therein corresponding to the primary driving shaft, a latch supported on the frame for engaging the said notches respectively, automatic means for releasing the said latch when the tension in the primary torsion member becomes weak, resilient means operating thereafter to rotate the sector on its axis of rotation and bring the secondary notch into alignment with the latch, and a connection between said resilient means and the latch for pressing the latch against the edge of the rim.

19. In a relay motor, the combination of a frame, a driven shaft with a crank rotatably mounted in the frame, a sector pivotally mounted on the said frame on an axis substantially in alignment with the driven shaft, a primary driving shaft mounted on the said sector, a secondary driving shaft rotatably mounted on the sector, said driving shafts having cranks, respectively, capable of engaging the crank of the driven shaft for rotating the same, torsion members connected respectively to the driving shafts, said sector having an arcuate rim with a primary notch, and a secondary notch, a latch for cooperating with said notches respectively to hold the sector in a fixed position, a primary torsion member connected with the primary drive shaft, and a secondary torsion member connected with the secondary drive shaft, means on the primary shaft for engaging the latch to release the same when the tension in the primary torsion member becomes weak, and means cooperating with the sector thereafter to rotate the same on its axis and latch the sector in a second position with the secondary driving shaft in alignment for driving the driven shaft.

20. In a relay motor, the combination of a frame, a driven shaft with a crank rotatably mounted in the frame, a sector pivotally mounted on the said frame on an axis aligning with the driven shaft, a primary driving shaft and a secondary driving shaft rotatably mounted on the sector, and having cranks, said sector having an arcuate rim with a primary notch corresponding to the primary shaft, and a secondary notch corresponding to the secondary shaft, a latch for cooperating with said notches respectively, a primary torsion member connected with the primary drive shaft, and a secondary torsion member connented with the secondary drive shaft, a spring pressed collar on the primary shaft, said latch having an inclined tongue in the path of the collar when moved by its spring when the tension in the primary torsion member becomes weak, thereby releasing the sector from the latch, and means cooperating with the sector thereafter to rotate the same on its axis and latch the sector in the second position with the secondary driving shaft in alignment for driving the driven shaft.

21. In a relay motor, the combination of a frame, a driven member mounted for rotation about an axis on the said frame, a pair of torsion power members extending in the same general direction as the said axis of rotation and having their ends remote from the driven member secured to the frame, a carriage associated with the ends of the torsion members adjacent the driven member and mounted for movement transversely to said axis of rotation, means for effecting a driving connection with one of said torsion members, and means for automatically shifting said carriage when the energy of the connected torsion member has become exhausted, for establishing a connection from the other torsion member to the driven member.

22. A relay motor having a driven member, a plurality of torsion members capable of being wound up to store power therein and mounted with their ends adjacent to the driven member, means including a driven member having a driving crank for effecting a driving connection to one of said torsion members to drive the driven member, and means movable longitudinally on the torsion members and controlled by the longitudinal tension exerted in the torsion members for automatically breaking the said driving connection when the energy in the connected torsion member is exhausted, said last-named means operating to establish a connection between said crank and another one of the torsion members, said driven member having an axis of rotation extending in the same general direction as the said torsion members.

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