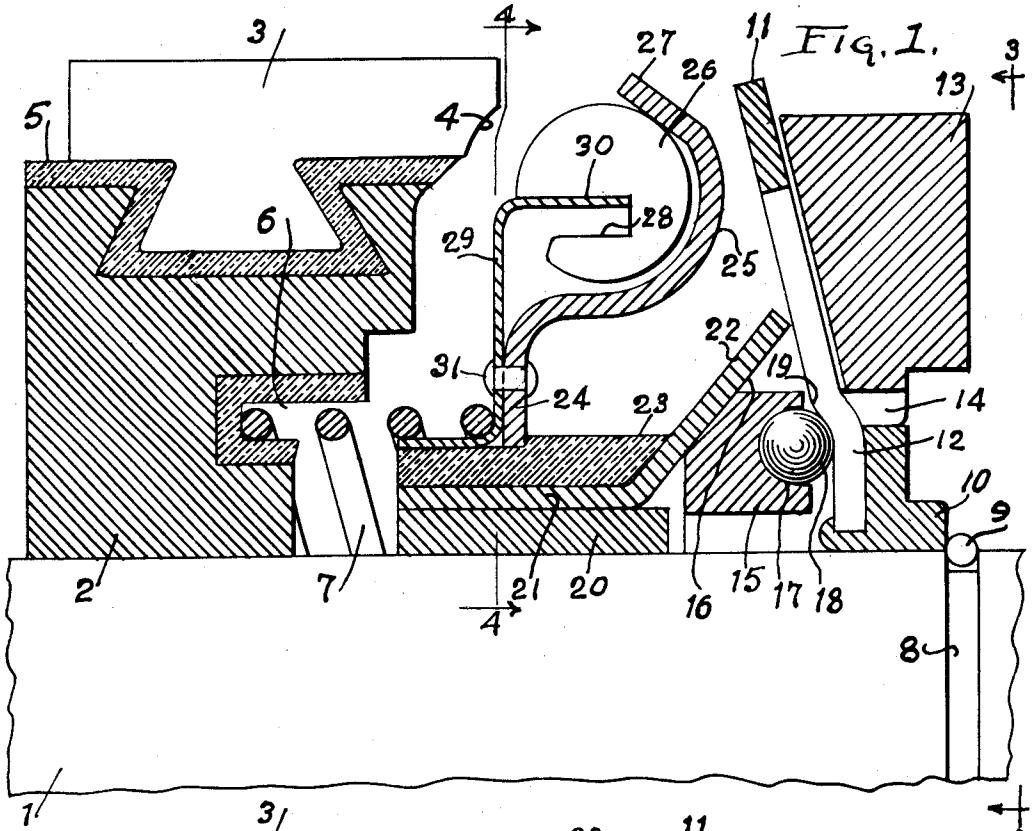
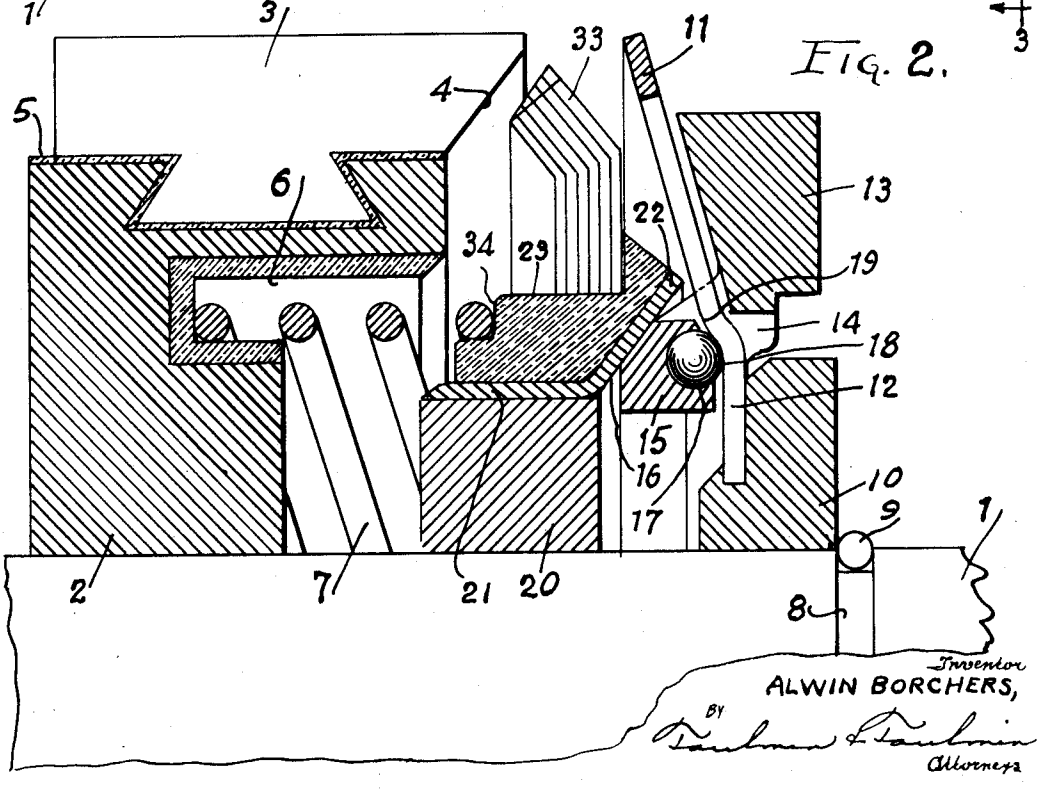
Jan. 9, 1934. A. BORCHERS 1,942,997

SHORT CIRCUITER FOR ELECTRIC MOTORS

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Inventor
ALWIN BORCHERS,
By Dawson & Dawson
Attorneys

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Fig. 3.

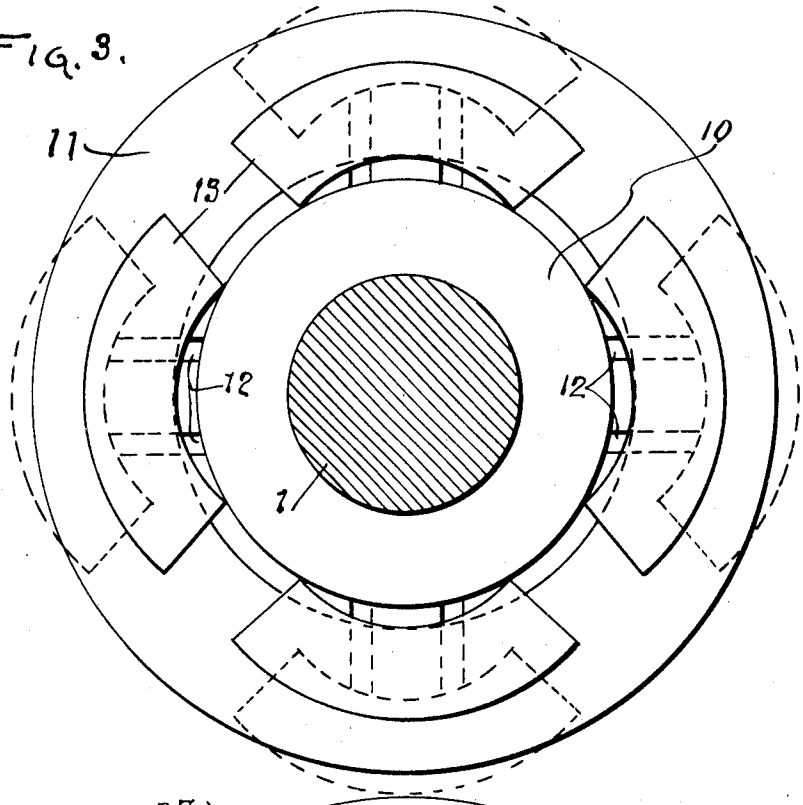
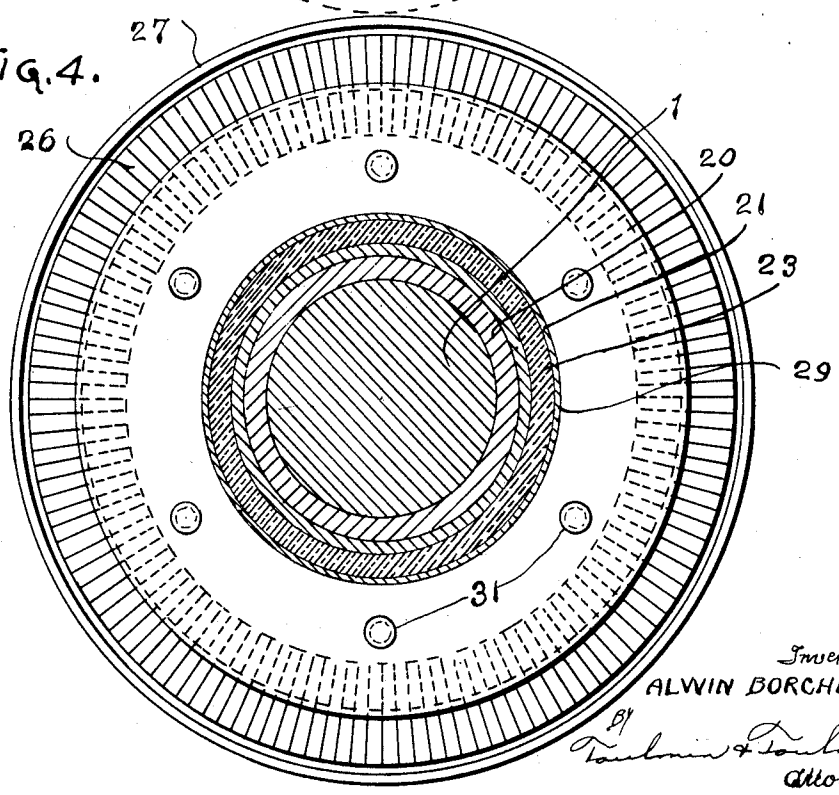


Fig. 4.



Inventor
ALWIN BORCHERS,
By Toulmin & Toulmin
Attorneys

Jan. 9, 1934. A. BORCHERS 1,942,997

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FIG. 5.

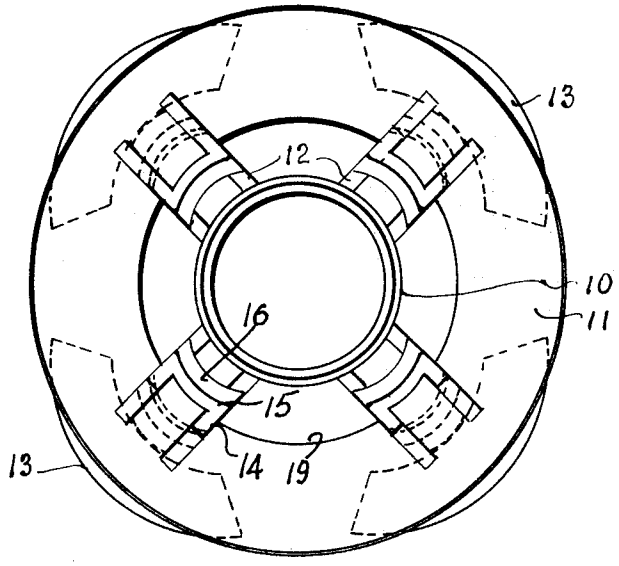


FIG. 6.

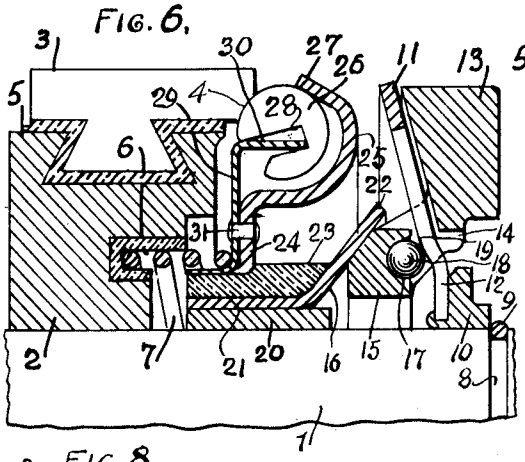


FIG. 7.

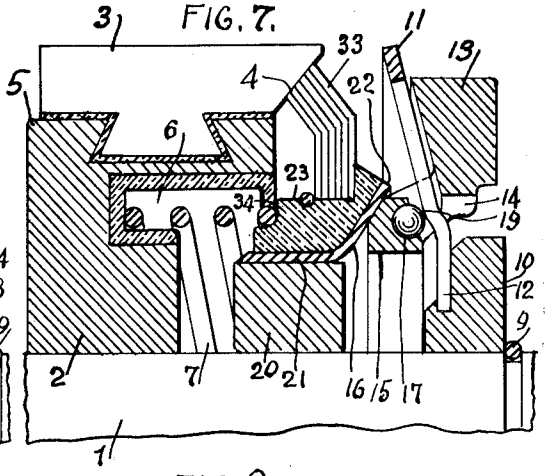


FIG. 8.

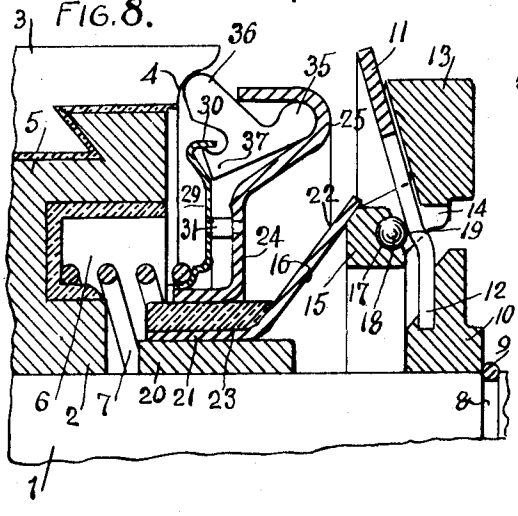
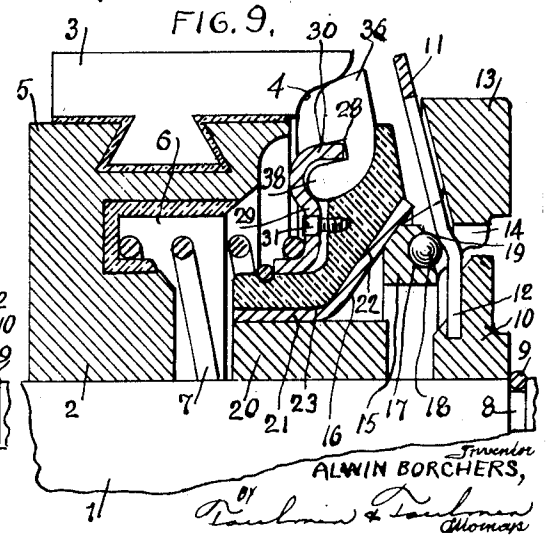


FIG. 9.



Inventor
ALWIN BORCHERS,
By Dawson & Dawson
Attorneys

Jan. 9, 1934. A. BORCHERS 1,942,997

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FIG. 10.

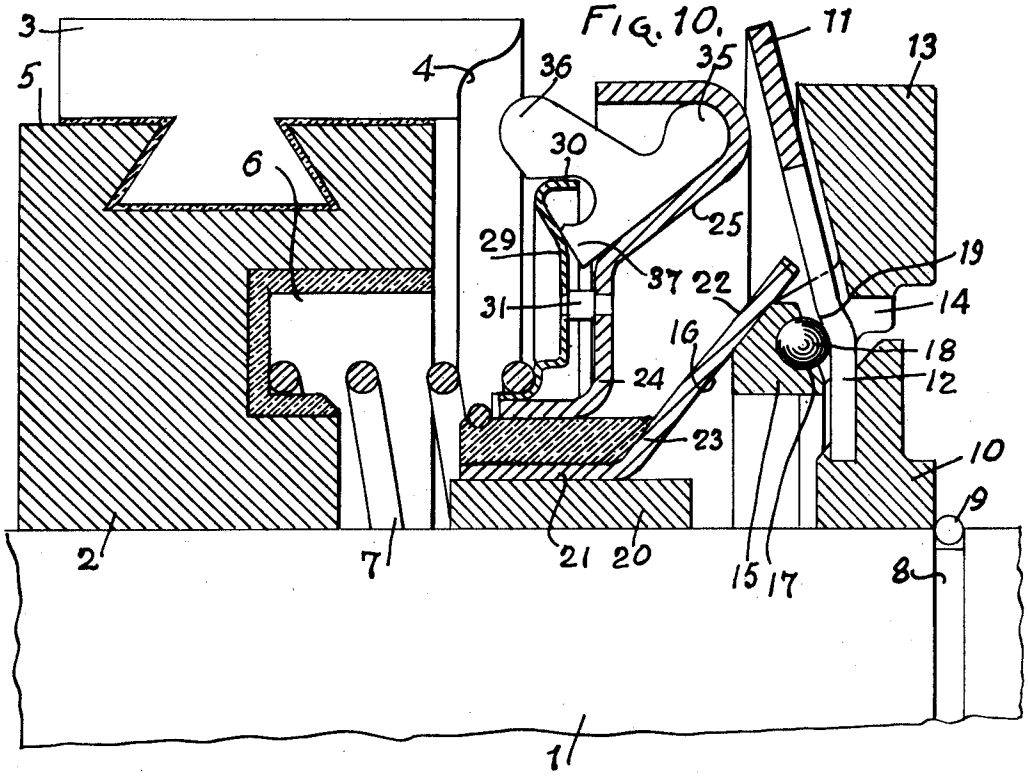
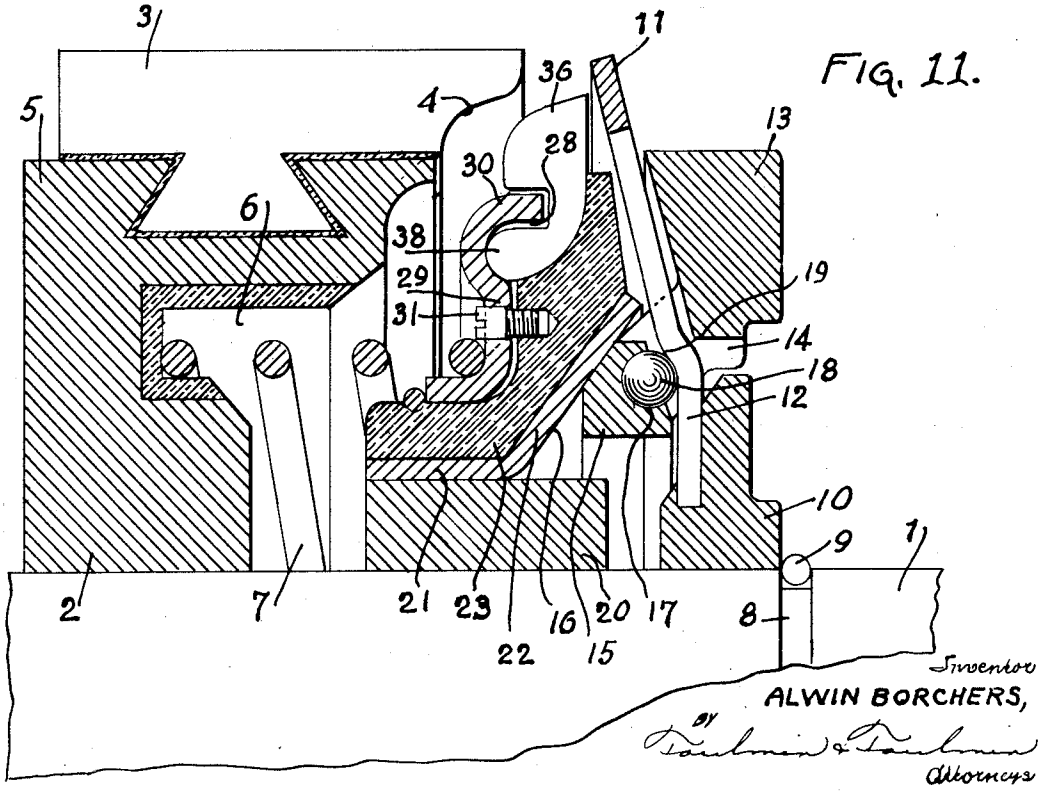


FIG. 11.



Inventor
ALWIN BORCHERS,
BY Taulman & Taulman
Attorneys

Patented Jan. 9, 1934 1,942,997

UNITED STATES PATENT OFFICE

1,942,997

SHORT CIRCUITER FOR ELECTRIC MOTORS

Alwin Borchers, Dayton, Ohio, assignor to The Brown-Brockmeyer Company, Dayton, Ohio, a corporation of Ohio

Application March 19, 1931. Serial No. 523,667

21 Claims. (Cl. 172—279)

My invention relates to repulsion-induction motors, and, in particular, to a short circuiter therefor.

It is the object of my invention to provide a repulsion-induction motor with a short circuiter in which the actuating centrifugal weights are guided in predetermined radial planes in predetermined angular paths in association with means for temporarily resisting their movement so as to give these weights a snap action.

It is my object to provide such an arrangement that is separable from and entirely independent of the remainder of the mechanism for facilitate adjustment and repair and at the same time to provide a contact making and breaking mechanism for the short circuiter which does not itself make contact with the commutator so that its form, size and method of operation may be solely devoted to the actuation of the contact making members. This facilitates both the operation of the apparatus and the design thereof.

It is a further object of my invention to provide a plurality of contact making disks or segments which will have in one or more forms independent relative movement within their supporting cages in order to insure close and accurate engagement with the commutator under the influence of centrifugal action which acts upon them independently of the lateral movement imparted to them by the same centrifugal action working upon the controlling weights.

It is a further object to provide for such segments having a rocking motion to facilitate the engagement therewith with the commutator.

It is an additional object to provide such segments or contact members which are not resisted in any manner in their rocking or centrifugal movement by any spring or other yielding means.

In other words they are perfectly free to move under the influence of the centrifugal force imparted to them according to the armature speed but their movement is not restrained by any spring.

Furthermore, it is an object of my invention to provide a single spring which is acted upon only by the centrifugal weights that have no contact making function with the result that the spring can be made of such size and form that it only performs the single function of resisting the horizontal thrust of the weights in moving the carriage that supports the contact making members laterally on the armature shaft so that the segments can make engagement with the commutator. Here again the principle of my invention is employed of having the weights, the contact making members and the spring each perform a single function and for which function the several parts are so designed that they can operate with the mechanism efficiently, which is not the case where a single part must perform two functions, as in the case where the contact making segments must perform the dual function of making contact and of moving themselves either laterally or radially or both into contact-making position.

I also eliminate the use of a spring for the dual purpose of resisting lateral movement or radial movement and the purpose of aligning the segments where the spring is threaded in or upon the segments. All these disadvantages I eliminate by my arrangement.

Consequently, my invention consists of a series of guided weights moving a carriage horizontally, a spring for resisting this movement, a carriage and a plurality of contact making segments freely mounted upon said carriage in most instances, and adapted to have an independent rocking movement thereon unrestrained and independent of the movements of the other parts; and a commutator with its armature shaft for the usual purposes.

I secure the further object of being able to have two sub-assemblies in manufacturing, to-wit, an assembly of the weights and their disk; and an assembly of the carriage and the freely pivoted contact making segments.

Referring to the drawings:

Figure 1 is a section through one end of the armature showing the armature shaft in full lines and a section through the spring carriage, weights and guiding disk with a contact making segment and the resisting ball of the weights in elevation;

Figure 2 is a similar view showing a plurality of contact making disks mounted on the carriage;

Figure 3 is a section on the line 3—3 of Figure 1 looking in the direction of the arrows showing the "at rest" and "operative" positions of the actuating weights on the disk;

Figure 4 is a section on the line 4—4 of Figure 1 looking in the direction of the arrows showing the arrangement of the contact making slugs mounted in a ring upon the supporting carriage;

Figure 5 is an inside elevation of the weight disk and the weights mounted thereon;

Figure 6 is a view similar to Figure 1 showing the parts in operating, contact making position;

Figure 7 is a view similar to Figure 2 showing the parts in operating, contact making position;

Figure 8 is a similar view showing a modified

form of contact making segment in contact making position;

Figure 9 is a similar view showing another form of segment in contact making position;

Figure 10 is an enlarged view of Figure 8 showing the segments and weights in inoperative position;

Figure 11 is a similar view of the form shown in Figure 9.

Armature construction

Referring to the drawings in detail, 1 is an armature shaft on which is mounted an armature 2 having commutator segments or bars 3 which are provided with arcuate contact making faces 4. These segments are mounted upon the usual insulation 5. The commutator is recessed at 6 to receive one end of the spring 7 to align it, retain it and position it. This spring encircles the armature shaft 1.

Centrifugal weight operating construction

The armature shaft 1 is provided with a groove 8 in which is mounted a split ring 9 that positions against movement to the right hand of the collar 10 supporting a slotted disk 11, which disk is provided with guiding slots 12 of which there are a pair usually arranged at approximately 90 degrees from one another, but the exact number and arrangement of the slots is optional depending upon the size of the motor.

Mounted in each pair of slots is a bifurcated weight consisting of an arcuate exterior weight portion 13, a pair of guiding arms 14 and a transverse arcuate portion 15 interconnecting the inner ends of the arms and adapted to provide a carriage engaging face 16.

In their inoperative positions the weights are adapted to rest upon the collar 10.

Each of these transverse members 15 has an arcuate cut away portion 17 for receiving a ball 18 which rides over a shoulder 19 on the interior of the disk 11 so that the weight is resisted temporarily in its outward movement so that it will move outwardly suddenly to make a quick connection between the contact making segments hereinafter described and the contact making face 4 of the commutator bars 3.

Carriage construction

The member supporting carriage consists of a sleeve 20 slidably mounted upon the armature shaft 1 and carrying a second sleeve 21 with an outwardly flared flange 22 for engaging with the face 16 of the transverse member portions 15 of the weights 13. The flange 22 takes the thrust of the weights 13 with the result that the carriage moves laterally on the armature shaft 1 against the thrust of the spring 7. Mounted upon the sleeve 21 and adapted to retain it upon the sleeve 20 is a thrust sleeve 23 which supports a disk 24 having an arcuate outer flange 25 that acts as a seat for the weights or segments 26. The outer end of this arcuate flange 25 is turned over at 27 to form a retainer for said weights to limit their outward movement.

These weights in Figure 1 are slotted as at 28 so that they may move within the arcuate flange 25 and also move with respect to a retaining disk 29 which has an inwardly turned annular flange 30 extending into the slot 28. This flange 30 is attached by the studs 31 to the disk 24. Thus, a cage is provided for the segments 26 in which they may move a limited degree to facilitate the making of a contact by their rocking movement in order to present the arcuate surface 32 of the contact making segment 26 to engage with the contact making surface 4 of the commutator 3 when the entire carriage and segments are moved laterally to such contact making position under the influence of the weights 13 against the resistance of the spring 7.

In order to get sufficient mass of the contact making members I refer to employ a plurality of cup disks, as shown in Figure 2, of decreasing size and telescopically arranged, designated 33. These disks are mounted upon the sleeve 23 directly which is provided with a shoulder 34 for receiving the spring 7. The sleeve 20 is enlarged as to its vertical diameter as may be necessary to facilitate this design.

In Figures 8 and 10 there is illustrated a right angle segment which has a heel 35 pivoted in the arcuate portion 25 of the disk 24. It is provided with a contact making nose 36 and a shoulder 37 similar to the shoulder 37 on the disk 26 which engages with the horizontal portion 30 of the disk 29 to limit its outward movement.

Another form of segment is illustrated in Figures 9 and 11 consisting of a heel portion 38 and a contact making head 36.

It is also provided with a slot 28 in which is located a horizontal portion 30 of the disk 29.

These several forms illustrate some of the typical means by which my invention may be adapted to varying conditions of uses.

It will be understood that I desire to comprehend within my invention such modifications as may be necessary to adapt it to varying conditions and uses.

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

1. In a short circuiter, a commutator, a plurality of individual contact making segments, said segments being freely movable and unconnected with each other, a carriage therefor, and centrifugally operated weights adapted to move said carriage and segments axially of the shaft and into contact making position, yielding means continually resisting said movements, and means temporarily restraining the movements of the weights.

2. In a short circuiter, a commutator, a plurality of individual contact making segments said segments being freely movable and unconnected with each other, a carriage therefor, centrifugally operated weights adapted to move said carriage and segments axially of the shaft and into contact making position, yielding means for resisting said movement, and means for temporarily restraining the action of said weights whereupon they are suddenly released to perform their function.

3. In a short circuiter, an armature and armature shaft, a commutator, a plurality of individual rocking slotted contact making weights unconnected with each other, a carriage therefor loosely supporting and guiding said contact making segments, and independent weight means engaging with said carriage operated upon by centrifugal force for moving said carriage and contact making segments by centrifugal force into approximate contact making position, yielding means continually resisting the movement of said carriage as actuated by said weights, and means temporarily restraining the movements of the weights.

4. In a short circuiter, an armature and armature shaft, a commutator, a plurality of individual

rocking contact making weights unconnected with each other, a carriage therefor loosely supporting and guiding said contact making segments, and independent weight means engaging with said carriage operated upon by centrifugal force for moving said carriage and contact making segments by centrifugal force into approximate contact making position, yielding means for resisting the movement of said carriage as actuated by said weights, and means for temporarily restraining the movement of said weights whereupon they are suddenly released for operation in moving said carriage.

5. In a short circuiter, an armature and armature shaft, commutator bars, means mounted on said armature shaft for guiding a plurality of weights radially and axially with respect to the shaft, a plurality of said weights, a carriage slidably mounted on said shaft actuated by said weights, a spring resisting the movement of said carriage, and a plurality of individual contact making members, said members being unconnected and freely movable relative to each other, adapted to engage said commutator mounted on said carriage.

6. In a short circuiter, an armature and armature shaft, commutator bars, means mounted on said armature shaft for guiding a plurality of weights radially and axially with respect to the shaft, a plurality of said weights, a carriage slidably mounted on said shaft actuated by said weights, a spring resisting the movement of said carriage, and a plurality of individual independent contact making members adapted to engage said commutator mounted on said carriage, said members being loosely mounted in said carriage and unconnected with each other, and means on said carriage for limiting the movement of said members.

7. In a short circuiter, an armature and armature shaft, commutator bars, means mounted on said armature shaft for guiding a plurality of weights radially and laterally with respect to the shaft, a plurality of said weights, a carriage slidably mounted on said shaft actuated by said weights, a spring resisting the movement of said carriage, and a plurality of individual independent contact making members adapted to engage said commutator mounted on said carriage, said members being loosely mounted in said carriage and unconnected with each other, and means on said carriage for limiting the movement of said weights, said members being adapted to pivot on said carriage.

8. In combination in a short circuiter of an armature having commutator bars, a plurality of centrifugally operated unconnected rocking contact making segments adapted to engage said bars, a plurality of centrifugally operated actuating weights adapted to move said segments into contact making position, yielding means continually resisting the movement of said weights, means temporarily restraining the movements of the weights.

9. In combination in a short circuiter of an armature having commutator bars, a plurality of centrifugally operated unconnected contact making segments adapted to engage said bars, a plurality of centrifugally operated actuating weights adapted to move said segments into contact making position, yielding means for resisting the movement of said weights, and additional means for temporarily impeding the outward movement of said weights and thereupon suddenly releasing them to give a snap movement to said contact making segments into engagement with said commutator.

10. In combination in a short circuiter of an armature having commutator bars, a plurality of centrifugally operated contact making segments adapted to engage said bars, a plurality of centrifugally operated actuating weights adapted to move said segments into contact making position, yielding means for resisting the movement of said weights, and additional means for temporarily impeding the outward movement of said weights and thereupon suddenly releasing them to give a snap movement to said contact making segments into engagement with said commutator, and means to cause and guide a rocking movement of said contact making segments into contact making position as they are bodily moved laterally into contact making position by the action of said weights.

11. In combination in a short circuiter of an armature, an armature shaft and commutator bars, a plurality of radially and laterally movable centrifugally operated weights, means for guiding said weights, a laterally movable carriage actuated thereby, means to yieldingly resist the movement of said carriage, and a plurality of loosely mounted contact making segments on said carriage means mounting said segments whereby said segments may move to and from said commutator bars to rock relative thereto and to move laterally thereof and with respect to said carriage, and means to restrain the movement of said weights and to suddenly release the weights at a predetermined speed of rotation of the armature.

12. In combination in a short circuiter of an armature, an armature shaft and commutator bars, a plurality of radially and laterally movable centrifugally operated weights, means for guiding said weights, a laterally movable carriage actuated thereby, means to yieldingly resist the movement of said carriage, and a plurality of loosely mounted contact making segments on said carriage means mounting said segments whereby said segments may move to and from said commutator bars to rock relative thereto and to move laterally thereof and with respect to said carriage, and means to restrain the movement of said weights and to suddenly release the weights at a predetermined speed of rotation of the armature, said means having a shoulder on said guiding means for the weights and balls carried by said weights engaging with said shoulder.

13. In combination in a short circuiter of an armature, an armature shaft, commutator bars on said shaft, a carriage slidably carried on said shaft, yielding means for resisting the sliding movement thereof towards the armature, a disk having an arcuate supporting and retaining flange around the carriage, a second disk having a segment engaging flange insertible within the arcuate margin of the first mentioned disk, a plurality of loosely mounted rocking segments mounted between said disks having portions projecting therefrom adapted to rock into engaging position with the commutator bars when moved bodily with said disks into contact making position.

14. In combination, an armature having an armature shaft and commutator bars, a plurality of contact making segments each having a slot therein, means to support said segments for relative movement of the segments with re-

spect to the support to cause the segments to rock therein, means on said support engaging in the slots of said segments to align them and guide them in their rocking movement, and independent centrifugally operated weight means adapted to move said support bodily laterally into contact making position for said segments, a dish-shaped disc for supporting and guiding said weights, and yielding means for resisting the movement of said support as actuated by said weights.

15. In a short circuiter, an armature, armature shaft and commutator bars having arcuate cut away faces interiorly thereof, an annular chain of independently loosely mounted contact making segments having aligning slots therein, means to support said segments and cause them to move transversely on said support, means on said support for aligning said segments through their slots, a cam member on said support, a plurality of centrifugally operated weights adapted to engage said cam member for moving said support laterally, and means for guiding said weights radially and diagonally towards said commutator, and yielding means adapted to resist the lateral movement of said support and the radial diagonal movement of said weights.

16. In a short circuiter, an armature, armature shaft and commutator bars having arcuate cut away faces interiorly thereof, an annular chain of independently loosely mounted contact making segments having aligning slots therein, means to support said segments and cause them to move transversely on said support, means on said support for aligning said segments through their slots, a cam member on said support, a plurality of centrifugally operated weights adapted to engage said cam member for moving said support laterally, means for guiding said weights radially and diagonally towards said commutator, yielding means adapted to resist the lateral movement of said support and the radial diagonal movement of said weights, and means to temporarily resist the movement of said weights until a predetermined armature speed is attained whereupon they are suddenly released to move said support.

17. In a short circuiter, an armature shaft, armature and commutator bars, a dished slotted disk having slots arranged in pairs, a plurality of weights mounted thereon having arms projected through said slots with transverse members on the outside and inside of said disk, said inner transverse member of each weight having a cam face, a sliding carriage mounted on said armature shaft having a cam face cooperating with the first-named cam face, contact making segments, means for supporting said segments loosely mounted and aligned on said carriage, yielding means for resisting the movement of said carriage laterally on said shaft.

18. In a short circuiter, an armature shaft, armature and commutator bars, a dished slotted disk having slots arranged in pairs a plurality of weights mounted thereon having arms projected through said slots with transverse members on the outside and inside of said disk, said inner transverse member of each weight having a cam face, a sliding carriage mounted on said armature shaft having a cam face cooperating with the first-named cam face, contact making segments, means for supporting said segments loosely mounted and aligned on said carriage, yielding means for resisting the movement of said carriage laterally on said shaft, and means comprising a ball mounted in each of the inside transverse members of said weights, and a shoulder on said disk for resisting the outward movement of said weights until a predetermined speed is attained by said armature.

19. In a short circuiter, an armature shaft, an armature, and a plurality of commutator bars, a carriage mounted on said armature shaft freely rotatable thereon and slidable laterally thereon, a spring for resisting the lateral movement of the carriage, a plurality of weights adapted to engage the carriage to move it laterally against the spring, means for guiding said weights radially and diagonally with respect to the armature shaft, and a plurality of independent unconnected rocking contact making segments supported and guided on said carriage.

20. In a short circuiter, an armature shaft, an armature, and a plurality of commutator bars, a carriage mounted on said armature shaft freely rotatable thereon and slidable laterally thereon, a spring for resisting the lateral movement of the carriage, a plurality of weights adapted to engage the carriage to move it laterally against the spring, means for guiding said weights radially and diagonally with respect to the armature shaft, and a plurality of independent unconnected rocking contact making segments supported and guided on said carriage, said segments being loosely mounted for transverse movement on the carriage.

21. In a short circuiter, an armature, an armature shaft and commutator bars, a slidable carriage mounted on the armature shaft, yielding means to resist said movement, a plurality of centrifugally operated weights adapted to move said carriage, a slotted dish-shaped disc for supporting said weights, and a plurality of centrifugally operated contact making segments mounted on said carriage, each contact comprising a pivot portion, a commutator engaging portion and a restraining shoulder adjacent the slot on each of said segments.

ALWIN BORCHERS.