J. BIJUR.

DYNAMO ELECTRIC APPARATUS FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED FEB. 10, 1915.

1,331,090.

Patented Feb. 17, 1920.

2 SHEETS—SHEET 1.

FIG. 2

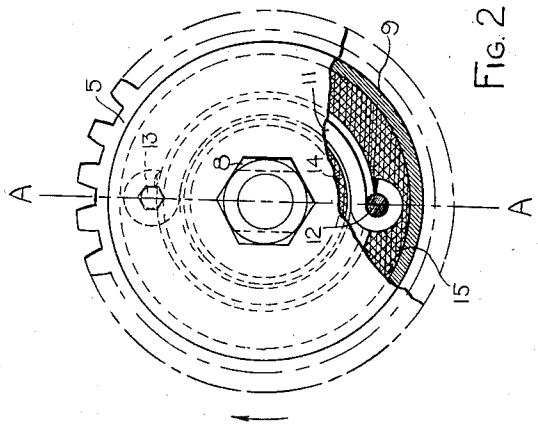
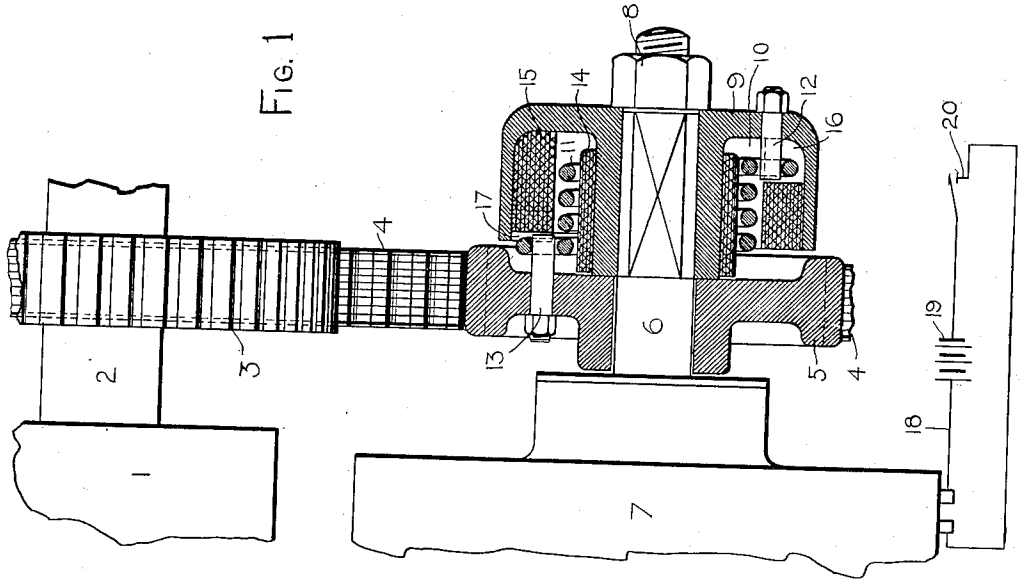


FIG. 1



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2 SHEETS—SHEET 2.

FIG. 4.

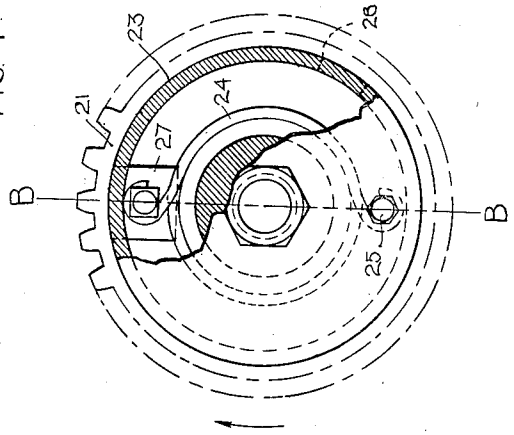
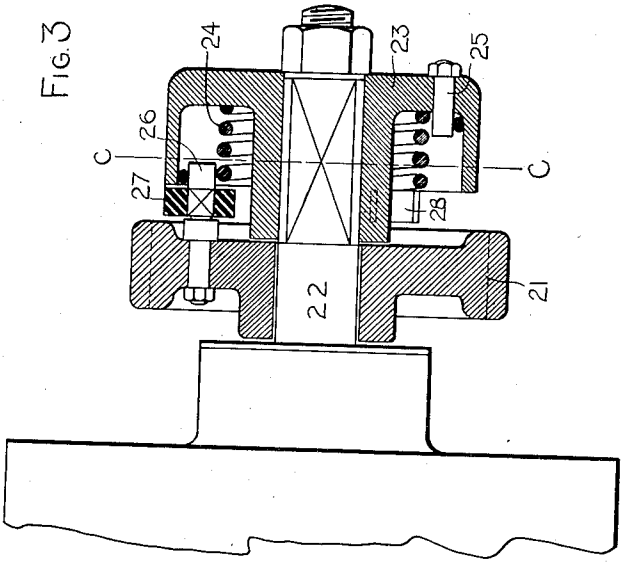


FIG. 3.



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UNITED STATES PATENT OFFICE.

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DYNAMO-ELECTRIC APPARATUS FOR INTERNAL-COMBUSTION ENGINES.

1,331,090. Specification of Letters Patent. Patented Feb. 17, 1920.

Application filed February 10, 1915. Serial No. 7,229.

To all whom it may concern:

Be it known that I, JOSEPH BIJUR, a citizen of the United States, and residing at New York, in the county of New York and State of New York, have invented a new and Improved Dynamo-Electric Apparatus for Internal-Combustion Engines, of which the following specification is a full disclosure.

This invention relates to electrical equipment for internal combustion engines. One of the objects thereof is to provide a dynamo equipment for internal combustion engines of simple construction and efficient action. Other objects are to provide practical means for rendering more efficient and reliable the drive of generators from engines of the above type and the power transmission between engines of this character and motor generators connected therewith.

Other objects will be in part obvious from the annexed drawings and in part indicated in connection therewith by the following analysis of the invention.

This invention accordingly consists in the features of construction, combinations of parts, and in the unique relations of the members and in the relative proportioning and disposition thereof; all as more completely outlined herein.

To enable others skilled in the art so fully to comprehend the underlying features thereof that they may embody the same by the numerous modifications in structure and relation contemplated by this invention, drawings depicting a preferred form have been annexed as a part of this disclosure, and in such drawings, like characters of reference denote corresponding parts throughout all the views of which:—

Figure 1 is a side elevation partially in section along the line A—A of Fig. 2. Fig. 2 is an end view of certain parts shown in Fig. 1, certain portions being broken away in order to show the structure more clearly.

Fig. 3 is a view similar to Fig. 1, the section being taken along the line B—B of Fig. 4, showing a different form of apparatus. Fig. 4 is an end view of certain parts of Fig. 3, broken away in section along the line C—C of Fig. 3.

Referring now to Fig. 1 of the drawings, there is diagrammatically indicated at 1 an internal combustion engine, the crank shaft 2 of which is provided with a sprocket wheel 3. Connected with the sprocket wheel as by the sprocket chain 4 is a sprocket wheel 5 loosely mounted upon the shaft 6 of the motor generator 7. It may here be noted that by the term "motor generator" is meant a dynamo electric device adapted to perform the functions either of a motor or a generator and not a two-part dynamo for transforming an electric current into an electric current having different characteristics.

Rigidly connected to the end of shaft 6 as by the lock nut 8 or other devices, is a collar or cap 9. This cap is provided with an annular recess 10 in which is positioned a spring 11, preferably of the coiled type. One end of spring 11 is rigidly connected with the cap 9 as by means of a pin 12 and the remaining end is similarly secured to the sprocket wheel 5 by means of pin 13.

Spring 11 is normally spaced not only from the hub of the cap 9 but from the outer surface of a sleeve or cushion 14 of fiber or other suitable material fitted upon this hub. Fitted within the outer wall of cap 9 is a sleeve 15 having its inner surface normally spaced from the spring. A suitable recess in sleeve 15 is provided at 16 for the end of spring 11 coiled about the pin 12. In like manner, a recess 17 is provided to permit of the free movement of the pin 13 with the spring-end coiled thereabout. It is to be noted that recess 17 extends a substantial distance about the circumference of the cap 9 in order to permit a free rotary movement between this pin and the cap.

The motor generator 7 is connected as by the conductors 18 with a storage battery 19 and the circuit may be closed by means of any suitable switch 20, it being noted that motor generator 7 is provided with a compound winding.

Assuming now that it be desired to start the engine 1, the switch 20, or other suitable device, is closed to permit a large current to flow through the generator 7. This action immediately turns over the shaft 6, swinging therewith the pin 12 and the end of spring 11 connected thereto. Spring 11 is thus coiled and, without throwing a sudden load upon the motor, rapidly increases the rotary pull upon the pin 13 and places the sprocket chain 4 under constant tension with a corresponding tendency to turn over shaft 2. This force may be sufficient to turn

over the engine shaft, but if not, the spring 11 immediately assumes a position wrapped closely about the cushion 14 and there is thus a substantially rigid connection between shafts 6 and 2. At this point, the full rotary force of the motor, including the momentum of its armature and shaft, are thrown upon the sprocket chain 4 in addition to the spring force already exerted thereon. This immediately causes the rotation of shaft 2 and cranking of the engine. As the engine takes up its cycle of operations it, due to a suitable proportioning of gearing and speeds, tends to drive the motor at a greater rate than its normal free running speed. This action occurs suddenly as the engine starts, and if the dynamo were rigidly connected there would be a sharp whipping of and sudden stress upon the chain 4 due to the abrupt reversal of the direction of its power transmission and the sudden application of the generator 7 as a load. This action, however, causes a reverse movement of the pin 13 with respect to the recess 7 and not only a relief of the distortion of the coiled spring, but a distortion in the opposite direction or tendency to unwind, which is limited by engagement by the spring, of the inner surface of the cushion 15. It may be noted that the parts are so proportioned that the extent of distortion of the spring is greater at the time of cranking the engine than at the time when the engine takes on the dynamo 7 as a load. It will thus be seen that the action of the apparatus at all stages is cushioned, and the parts are not only thus guarded against injury but rendered more effective. Furthermore, at any sudden change of the engine speed, as that due to the throwing out of the clutch of an automobile, there is no corresponding shock brought to bear upon the dynamo from the power transmission. Also, as above noted, whipping of the chain is reduced to a minimum and the entire action is substantially silent. These advantages would be partially realized if the dynamo shaft were connected with the engine shaft by gearing instead of the sprocket chain as shown.

In Fig. 3 of the drawings, is shown generally similar apparatus which is likewise assumed to be continuously connected with the crank shaft of an internal combustion engine. Referring to this figure, the sprocket wheel 21 is loose upon shaft 22, whereas the cap 23 is rigidly secured thereto as by a squared end upon the shaft, or other suitable means. Cap 23 is provided with a coiled spring 24 having its ends respectively connected with pins 25 and 26. Upon the latter pin is a fiber or other cushioning collar 27 which is in the path of a lug 28 formed upon collar 23.

Assuming this form of dynamo to be started to crank the engine, and assuming that this action gives the direction of rotation indicated by the arrow in Fig. 4 of the drawings, the lug 28 travels throughout the major portion of a rotation, storing energy in spring 24 as hereinbefore described, and ultimately striking the collar 27 to form a direct mechanical connection. The engine is thus started, and thereupon, as it tends to drive the dynamo as a generator, there will be a reverse relative movement between sprocket wheel 21 and cap 23, until spring 24 is first released and then distorted in an uncoiling direction, the latter movement being limited by the engagement of collar 27 with the opposite surface of lug 28.

It will be clear that many of the advantages inherent in the first described apparatus are also present in this construction.

As many changes might be made in the above construction, and as many apparently different embodiments might be made of this invention without departing from the scope thereof, it is intended that all features herein described or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having thus revealed this invention, I claim as new and desire to secure the following combinations of elements, or equivalents thereof, by Letters Patent of the United States:—

1. In apparatus of the class described, in combination, an internal combustion engine, a dynamo, a rotary member connected with said engine, a co-axial rotary member connected with said dynamo, resilient means interposed between said members and adapted to permit relative rotary movement in either direction, and means adapted to limit said movement in each direction.

2. In apparatus of the class described, in combination, an internal combustion engine, a dynamo, a rotary member connected with said engine, a co-axial rotary member connected with said dynamo, resilient means interposed between said members and adapted to permit relative rotary movement in either direction, and means adapted to limit said movement in each direction, said limiting means being positioned to permit unequal rotary movements in the two respective directions of rotation.

3. In apparatus of the class described, in combination, an internal combustion engine, a dynamo, a member connected with said engine, a co-axial member connected with said dynamo, a coiled spring, one end of which is secured to said first member and the remaining end of which is secured to said second member, means adapted to limit the coiling and means adapted to limit the uncoiling movement of said spring.

4. In apparatus of the class described, in

combination, an internal combustion engine, a dynamo, a member connected with said engine, a co-axial member connected with said dynamo, a coiled spring, one end of which is secured to said first member and the remaining end of which is secured to said second member, and cushioning means adapted to limit the coiling or uncoiling movement of said spring.

5. In apparatus of the class described, in combination, an internal combustion engine, a dynamo, a member connected with said engine, a co-axial member connected with said dynamo and provided with an annular recess, a coiled spring positioned within said recess and having its ends respectively connected to said members, and cushioning means within said recess limiting the coiling and uncoiling movement of said spring.

6. In apparatus of the class described, in combination, an internal combustion engine, a dynamo, a member connected with said engine, a co-axial member connected with said dynamo and provided with an annular recess, a coiled spring positioned within said recess and having its ends respectively connected to said members, and cushioning means within said recess limiting the coiling and uncoiling movement of said spring, said members being mounted upon the shaft of said dynamo.

In witness whereof, I hereunto subscribe my name, as attested by the two subscribing witnesses.

JOSEPH BIJUR.

Witnesses:
R. S. BLAIR,
H. F. BRNIGES.