A. D. T. LIBBY.

MAGNETIC CLUTCH.

APPLICATION FILED OCT. 26, 1915.

1,283,825.

Patented Nov. 5, 1918.

2 SHEETS—SHEET 1.

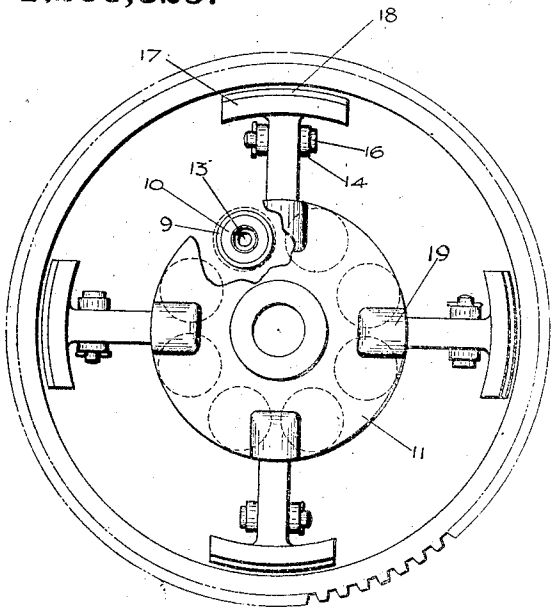


Fig. 1.

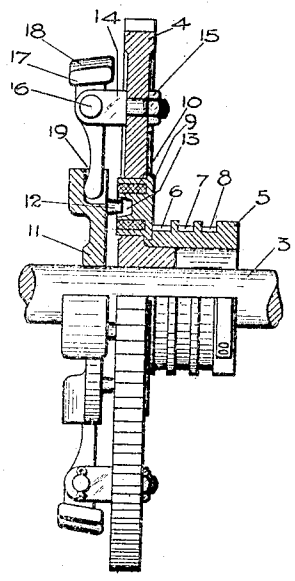


Fig. 2.

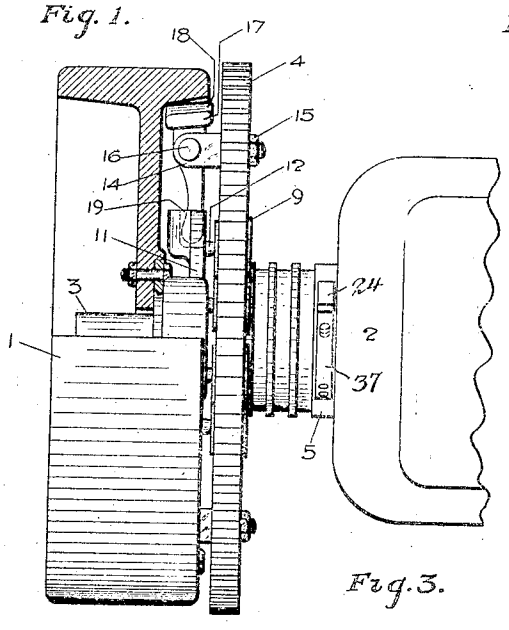


Fig. 3.

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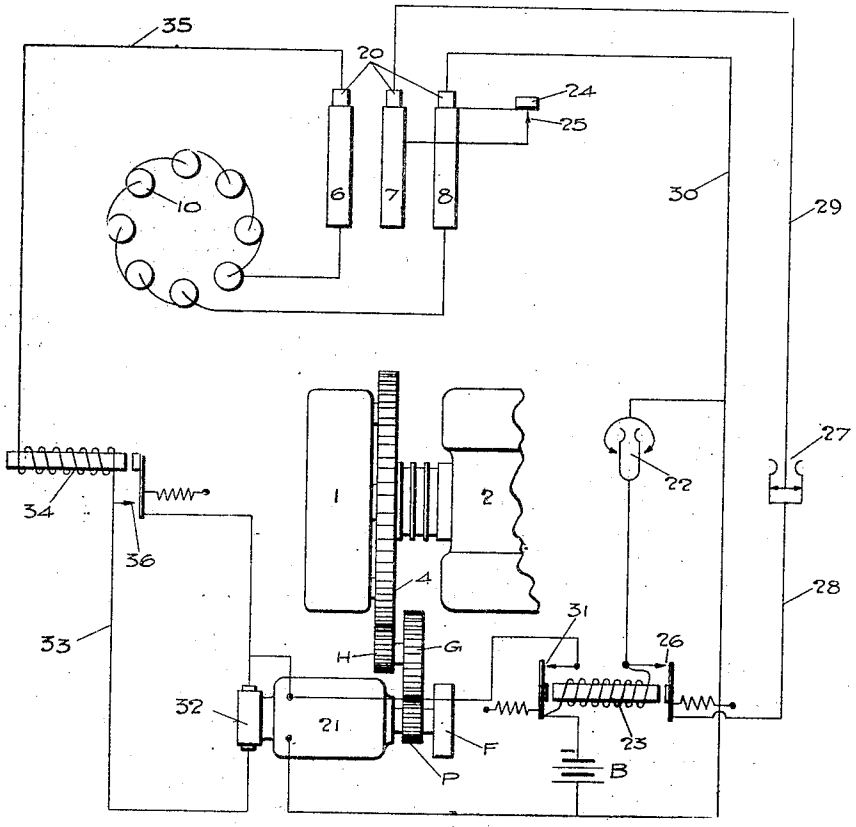
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Fig. 4.



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MAGNETIC CLUTCH.

1,283,825. Specification of Letters Patent. **Patented Nov. 5, 1918.**

Original application filed April 12, 1913, Serial No. 760,842. Divided and this application filed October 26, 1915. Serial No. 57,925.

To all whom it may concern:

Be it known that I, ALBION D. T. LIBBY, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Magnetic Clutches, of which the following is a specification.

My improvement relates to a magnetic clutch particularly adapted for clutching the driving mechanism to the driven mechanism after the driving mechanism has been started and has obtained a certain momentum although it is to be understood that the clutch may be operated and the driving and driven members connected together before the driving member is started.

The subject matter of this application is a division of my co-pending application, Serial No. 760,842, filed April 12, 1913. In Figures 9 and 10 of said application there is shown a clutch adapted to coöperate with the flywheel of an internal combustion engine for the purpose of starting the same from an electric motor to which current is applied in any suitable manner. The flywheel is shown in Fig. 4 of said application and the specification thereof explains the manner of associating the clutch with said flywheel.

My magnetic clutch is of special value in starting internal combustion engines because of the fact that a very small electric motor may be used, current being applied to said motor by a storage battery. In order to start an internal combustion engine which has considerable initial resistance to the starting effort, the small starting motor is connected to a member of the magnetic clutch through suitable gears whereby the leverage of the electrical motor is greatly multiplied and after the motor has obtained a predetermined speed and considerable momentum has accumulated in the moving parts, the clutch is then brought into action and caused to engage with a member of the internal combustion engine and the engine turned without any material increase in the amount of power taken by the starting motor.

One of the objects of my invention is to provide a clutch which can be engaged either automatically or by the will of the operator at a time and in such a manner as to reduce the amount of power, taken by the initial act of starting the driven member, to a minimum. Where the amount of power taken initially is not considered as an objectionable feature then the clutch may be brought into action at the time of starting the driving member.

Other and further objects of my invention will be apparent to anyone skilled in the art by reference to the attached drawings which form a part of this specification in which:

Fig. 1 is a front view of one form of my clutch.

Fig. 2 is a part sectional and side view of Fig. 1.

Fig 3 is a part elevation and part sectional view of the clutch associated with the flywheel of an internal combustion engine; and

Fig. 4 is a diagrammatic view showing the electrical circuits used in connection with the application of the clutch to an internal combustion engine for the purpose of starting the engine automatically.

Referring now particularly to the drawings, 1 is the fly-wheel mounted on the crankshaft 3 of the engine 2. Loosely mounted on the shaft 3 is a gear wheel 4 which carries a collar 5 of insulating material on which are mounted three slip rings 6, 7, and 8. The gear wheel 4 also carries a plurality of coil holders 9 that have annular spaces for coils 10. Loosely mounted on the shaft 3 is a plate 11, having core bosses 12, of magnetic material, which are adapted to coöperate with recesses 13, within the coil holders 9. Toward the outer periphery of gear wheel 4 is mounted a plurality of supports 14, four being shown in Fig. 1, but any number of these supports may be used for the purpose which will be hereinafter described. The supports 14 have reduced ends which pass through the gear wheel and are held thereto by nuts 15. Attached to the supports 14 by pivot pins 16 are clutch arms 17 which are faced by suitable friction wearing elements 18. The lower end of the clutch arms 17 are adapted to enter recesses 19 within the plate 11. There are as many recesses 19 as there are clutch arms 17. The above described manner of associating the arms 17 with plate 11,

which is loosely mounted on shaft 3, serves to keep said plate in proper angular alinement with the coils 10 so that the core bosses 12 are always in proper working relation with their respective recesses 13. The coils 10 may be connected in any suitable manner but by way of illustration are shown in Fig. 4 connected in series. One end of the series connection is carried to the slip ring 6 and the other end to the slip ring 8. Electric current is carried to the slip rings 6, 7 and 8 by means of brushes 20, which for the sake of clearness, are not shown in Figs. 2 and 3. When the electric current passes through the coils 10, the coil holders 9 become magnetically excited and attract the core bosses 12 that are attached to the slidable plate 11. The plate 11 is drawn in toward the gear wheel 4 and it will be seen that this action rotates the clutch arms 17 about the pivots 16 to cause the friction surfaces 18 to engage with the member that is to be driven, which in the case illustrated, is a flywheel. The parts are so made and adjusted that the core bosses 12 never can go into the coil holders far enough to seat until the friction surfaces 18 are worn out. When the friction surfaces 18 engage the member to be driven, then this member is carried along with the gear wheel 4 and will be carried along until the circuit through the holding coils 10 is opened.

In Fig. 4 I have shown a diagrammatic arrangement of circuits used with the clutch for starting an internal combustion engine, where the action is automatic. This arrangement will now be briefly described. 21 is an electric motor having a driving pinion P, that is in permanent engagement with gear wheel G, which in turn carries with it a gear H, that is permanently in mesh with the gear wheel 4. F illustrates a small flywheel used on the electric motor for the purpose of absorbing the shock of engagement when the electric current passes through the coils 10 and the magnetic clutch is brought into action.

In order to start the engine 2, the switch 22 is operated which causes current to flow from battery B through the relay 23. Upon closure of contact 26 it will be seen that the relay is locked in its operated position by the current passing through contact 26, wire 28, switch 27, which is normally closed, wire 29, brush 20, ring 7, through the closed contact made by the governor members 24 and 25, slip ring 8, and back to the other side of battery over wire 30. Current also flows through the contact 31 of the relay 23 to the electric motor 21. The motor immediately starts under no load and at a certain predetermined speed, a contact is closed by the governor 32. This device is fully described in my co-pending application hereinbefore referred to and need not be further described herein. When, however, the circuit is closed through the governor 32, current flows by wire 33, through relay 34, wire 35, to the slip ring 6 through the coils 10 of the magnetic clutch, slip ring 8 back to battery by wire 30. The passage of current through the above circuit operates the relay 34 and closes the contact 36 and the relay 34 is then locked in its operated position, regardless of the position of the members of governor 32. On engagement of the magnetic clutch with the flywheel 1, the engine is turned. When the engine picks up under its own power and a certain predetermined speed is reached, the governor member 24, which is carried by a resilient member 37, breaks contact with the stationary member 25 and the circuit through the magnetic clutch coils, as well as through the relays 34 and 23, is broken and the current is cut off from the starting motor. Should for any reason the engine not start the switch 27 can be operated which breaks the circuit through the clutch coils and the parts are restored to normal position, as just described.

While I have shown one form of my clutch as applied to an internal combustion engine, it will be understood that I do not wish to be limited to this particular application as the principles involved apply to various devices, even though the details be greatly modified without departing from the spirit of the invention or the scope of the appended claims:

Having thus described my invention, what I claim is:—

1. In a device of the character described, the combination of a driving member and a driven member, a plurality of coils arranged about said driving member, said coils having recessed cores, a movable plate adjacent said driving member having a plurality of projections adapted to enter said recessed cores, and clutch arms coöperating between said plate and driving member so that when said coils are energized the movable plate is attracted thereby and said clutch arms are caused to engage said driven member.

2. In a device of the character described, the combination of a driving member and a driven member, electromagnetic coils carried by said driving member, a movable plate adjacent to said driving member having recesses about the periphery thereof, and adapted to be attracted toward said member when said coils are energized, supporting members attached to said driving member, clutch arms pivotally mounted on said supports, one end of said clutch arms entering said recesses and adapted to be acted on by said plate whereby the opposite end of said clutch arms is caused to engage with said driven member when said plate is acted on by said coils.

3. In a device of the character described,

the combination of a driving member and a driven member, electromagnetic coils carried by said driving member, a flat annular plate adjacent to said driving member adapted to be drawn toward the driving member and said coils when they are energized, supports mounted on said driving member near its periphery, clutch arms pivotally mounted in said supports, one end of said clutch arms adapted to be operated on by said plate to cause said arms to rotate on their pivot, the other end of said clutch arms carrying friction wearing material for the purpose of engaging said driven member when said clutch arms are operated.

4. In a device of the character described, the combination of a driven member and a shaft connected thereto, a driving member loosely mounted on said shaft, electromagnetic coils carried by said driving member, a clutch plate adjacent to said driving member loosely mounted on said shaft and adapted to move longitudinally thereon, clutch arms pivotally supported on said driving member, said clutch arms adapted to be engaged by said clutch plate when said plate is acted on by said electromagnetic coils, whereby said arms engage said driven member, the clutch arms also serving to maintain said plate in proper angular relation with said coils.

5. In a device of the character described, the combination of a driving member and a driven member, coil frames carried by said driven member, said coil frames having annular recesses for coil windings and a central recess, a clutch plate adjacent to said driving member, said plate having bosses adapted to enter said central recesses, whereby said clutch plate is drawn toward said driving member when said coil windings are energized and means carried by said driving member and operated by said clutch plate for engaging said driven member for the purpose described.

6. In a device of the character described, the combination of a driven member and a shaft fastened thereto, a driving member loosely carried on said shaft adjacent to said driven member, a plurality of electromagnetic coils carried by the body portion of said driving member and arranged in a circular manner about the axis of rotation of said member, an annular clutch plate carried on said shaft intermediate the driving and driven member and adapted to be attracted longitudinally of said shaft toward the driving member by said electromagnetic coils when energized, means carried by said driving member and adapted to be brought into engagement with said driven member when said plate is attracted by said coils, said means coacting with said driving member and clutch plate to maintain the latter in proper angular relation with said coils, means conveying current to said coils and means carried by said driving member for breaking the electrical circuit through said coils when said driving member has reached a predetermined speed.

7. In a device of the character described, the combination of a driving member having a series of holes concentrically arranged about its axis, coil holders disposed in said holes each having an annular recess and also a central recess, coils in the annular recess of said coil holders, a driven member, a movable plate between the driving and driven members having a series of projections adapted to enter said central recesses, and pivotal clutch levers located on said driving member and adapted to engage the driven member when said coils are energized to attract said movable plate.

In witness whereof I affix my signature.

ALBION D. T. LIBBY.