July 25, 1939. E. T. HARMON ET AL 2,167,276

POWER TRANSMISSION APPARATUS

Filed Aug. 12, 1938

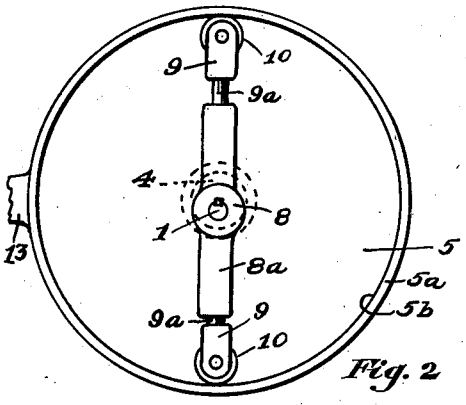



Fig. 2

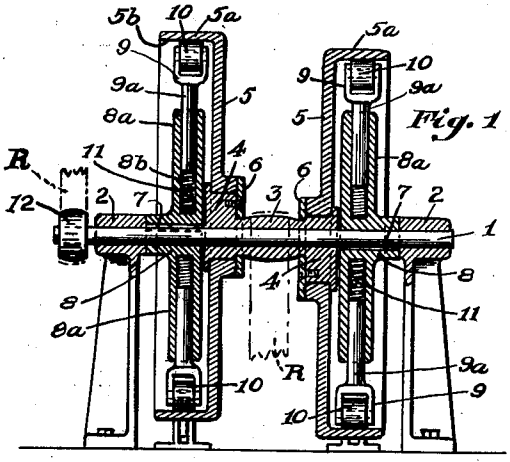



Fig. 1

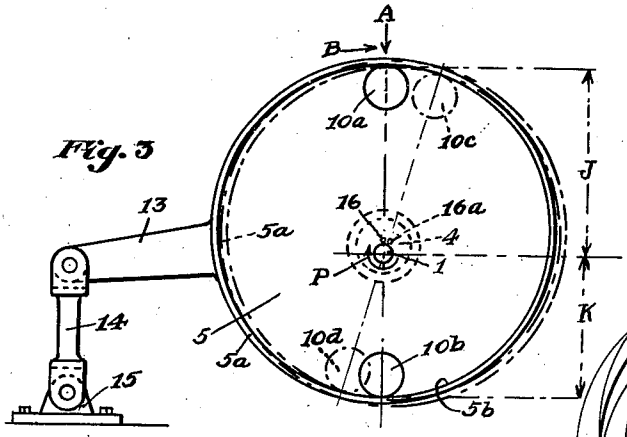



Fig. 3

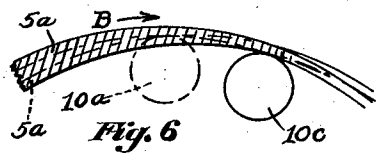



Fig. 6

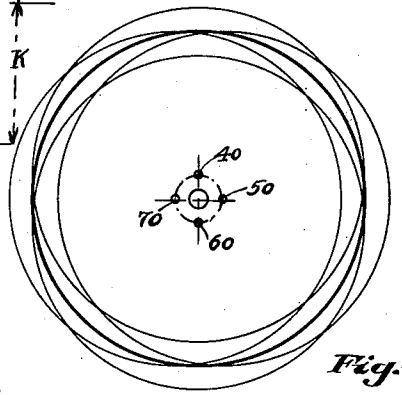



Fig. 5

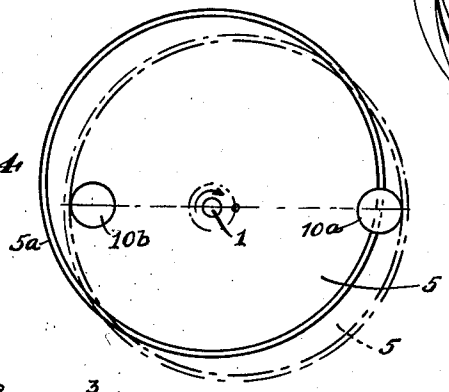



Fig. 4

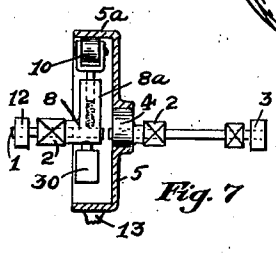



Fig. 7


Inventors,
Ernest T. Harmon.
and
Philip W. Doherty.
BY Henry L. Chenery.
Atty

Patented July 25, 1939 2,167,276

# UNITED STATES PATENT OFFICE

2,167,276

## POWER TRANSMISSION APPARATUS

Ernest T. Harmon, Lewiston, and Philip W. Doherty, Portland, Maine

Application August 12, 1938, Serial No. 224,594

7 Claims. (Cl. 74—64)

The invention hereinafter to be described relates, in general terms, to transmission apparatus, dealing more particularly with a novel yieldable clutch mechanism, through the agency of which the power from any prime mover may be transmitted to the point of delivery of the power.

The mechanism embodies a cylindrical impeller element mounted on an eccentric and deriving eccentrical movements therefrom. Within the impeller cylinder is disposed a turnstile element having roll-equipped arms which contact the inner peripheral face of the impeller cylinder. The turnstile member is fixed on a rotatable shaft which is not directly connected to the prime mover.

As in the case with any body mounted on an eccentric, such for instance as the structure employed to operate an engine valve, this impeller element does not revolve on its own axis, but its axis or axial point describes a circle around the axis of the eccentric shaft.

When rotating, the eccentric causes the impeller cylinder to move into an infinite number of different positions around the axis of the eccentric shaft, the impeller cylinder, representing a circle moving eccentrically, continuously and obliquely cutting a circle drawn concentric with the eccentric shaft.

There is therefore developed a condition which might perhaps best be described as a crescent-shape wedge which throughout the entire cycle of movement of the impeller acts on the turnstile roll to push it ahead.

To provide against slippage caused by overloads on the power delivery line, the rolls are given more or less in and out movement in their supporting structure, the reason for this being more fully set forth as the description proceeds.

The turnstile element may be constructed with one arm and roll, but we prefer two, placing them diametrically opposite. Furthermore, to obtain better balance of the parts when rotating at high speeds we propose to mount two or more sets of these roll-equipped arms, arranging them circumferentially at regular spaced intervals.

An object of our present invention is to supply an intermediary, yieldable mechanism between the source of power—the prime mover, and the point at which the power is delivered for use. It is, primarily, an apparatus to overcome the possibility of injury to the prime mover, say an electric motor, by burning out the fields or armature by overloading. If overworked for but a very short period of time this difficulty can occur when the motor has direct and unyielding connection with the main line from which power is taken.

In some instances a clutch is interposed, but the same result obtains with this type of connection. But with our present invention no harm can result in placing an overload on the delivery line, as in case the motor is unable to drive the turnstile, the shanks of the roll-carrying yokes will alternately recede and extend in and out of their housings while the impeller will continue to go through its movements.

We may elect to install a governor on our apparatus to regulate the eccentricity of the eccentric, to make it of either greater or less throw. It is desirable to have maximum throw of the eccentric in starting the apparatus and on very slow speeds, but when once under way and approaching full or maximum speed, less throw of the eccentric suffices to keep the turnstile operating.

For a clearer understanding of the import of our invention reference should be had to the description found in the following specification when taken in connection with the accompanying drawing in which like reference characters are employed to identify like parts in all the different views thereof, and in which—

Fig. 1 is a sectional elevation of our apparatus;

Fig. 2 is an end view thereof;

Figs. 3, 4, 5 and 6 are diagrammatical views showing various actions taking place while the impeller is engaging the turnstile rolls, and

Fig. 7 represents the apparatus in its simplest form.

Referring to the drawing, particularly to Fig. 1 in which we show a duplex arrangement of our impellers and turnstiles, each being similar to the other except as will hereinafter be pointed out.

A shaft 1 is journalled in bearings, 2, 2. Loosely mounted on the shaft 1 is a pulley 3 on each side of which and integral therewith is an eccentric 4. It will be observed that the large "throw" of the eccentric is diametrically opposite in the two eccentrics, the left hand one being up and the right hand being down, as shown. This position will, of course be changed upon movement of the pulley 3 in either direction.

Mounted on each eccentric 4 is what we term an impeller, 5, having a cylindrical portion 5a. A thrust plate 6 holds the hub portion of the impeller from lateral displacement off the eccentric 4.

Fixed on the shaft 1, by a key 7, is a turnstile element 8 having, preferably, two spokes 8a ex-

tending radially from the hub portion of the turnstile, and having in each a bore 8b.

Operating in the bore 8b is the shank 9a of the roll-carrying yoke member 9 in which is pivotally mounted the roll 10. In the bottom of each bore 8b, and thrusting on the end of the shank 9a, is a spring 11 which normally functions to maintain continuous contact of the roll with the inner face 5b of the impeller.

Power to drive the apparatus may be delivered through any approved means, as for instance by chain drive, gearing or by belt, R, as shown, operating over the pulley 3. Power taken from the apparatus is also shown by belt operating over pulley 12.

To prevent the impeller revolving on its own axis we provide an outstanding arm 13 projecting from the periphery of the cylindrical portion 5a of the impeller, pivotally connecting the arm with a link 14 the lower end of which has connection with the floor stand 15.

Fig. 3 is a diagrammatical view showing the result of a small eccentrical movement of the impeller on the roll, which latter for position-indicating purposes will in this instance be designated as 10a for the upper and 10b for the lower roll.

Starting with the impeller cylinder and the two oppositely disposed rolls drawn in full lines, and assume that a rotary movement of the eccentric is given the eccentric in the direction of arrow. This will bring the central or axial point of the impeller from point 16 to point 16a, the cylinder itself from the full to the dot and dash line delineation, and the rolls 10a and 10b to positions indicated as at 10c and 10d, respectively.

In this movement of the impeller two forces are acting on the roll 10a, one downwardly as indicated by arrow A, and the other more or less horizontally but in any event obliquely, as indicated by the arrow B. Now provided the spring 11, acting together with the force acquired by centrifugal action when the apparatus is rotating at considerable speed is sufficient to keep the roll in its maximum position,—that is, in its extreme outward position, then the force A is more than counter-balanced by the force B which latter would act to drive or push the roll ahead. The extreme or maximum outward distance of the roll from the axis of the eccentric is represented by the letter J, and the shortest distance by letter K, Fig. 3.

To present the matter somewhat more understandingly reference to Fig. 6 is invited. In this view the outside position of a fragmentary portion of the impeller cylinder corresponds to the full line position shown in Fig. 3, and the superimposed outline of the same, in its advanced position cross-hatched to show more clearly the arcuate-wedge-shape effect of the presentment of the impeller surface to the roll.

It is not contended that the roll 10a will always and without exception be maintained in its extreme outward position. It will depend largely on the load the apparatus is "lugging", so to speak, but under calculated conditions, and barring occasional extreme overloads, the roll will require but a comparatively small portion of the wedge capacity for keeping the roll advancing. Should the unexpected happen, however, there would be no harm done, as even though the turnstile should stop, the impeller is capable of continuing its eccentrical movements; and when the overload is released the impeller will pick up the roll which is disposed at or near the larger radius of the eccentric movement.

It might easily be possible to operate our apparatus using but one set of the parts shown in Fig. 1, although the matter of counter-weighting the parts to procure proper balance is somewhat more of a problem than would at first appear, due to the fact that the spokes in which operate the rolls 10a and 10b (as designated in Fig. 3) may alternately be positioned at the long and short radial positions. For this reason we prefer to construct the device with two, or more, sets of the parts, as shown in Fig. 1, arranging them side by side.

It is obvious that the roll 10a (Fig. 3) carries the load, as this one is in advance of the wedge effect, whereas the roll 10b is in arrear of this action. However, the roll 10b is essential, not alone for assisting in balancing the spoked structure, but in case of overload placed on the shaft 1 it may occupy the position originally occupied by roll 10a, because when extreme overloads are placed on the apparatus there develops a slipping of the carrying roll on the surface of the cylinder, and the two rolls under these conditions may become reversed in position.

Fig. 4 illustrates, diagrammatically, the positions of the rolls and the impeller cylinder when the eccentric has made a quarter turn, and Fig. 5 shows how the impeller cylinder circle cuts or intersects a circle of the same diameter but concentric with the axis of the shaft 1. While this cutting action is continuous, or in other words an infinite number of intersections of the circles are made in one turning cycle of the eccentric, four only are shown in the drawing, the concentric circle being shown in heavy and the eccentric cirles in light lines, the diametrically central points of the four positions of the eccentric being shown at 40, 50, 60 and 70, respectively.

The fundamental principle upon which our invention is based would be carried out in the main if construction shown in Fig. 7 was employed.

This disclosure contemplates but one roll 10, but to procure proper balance a counter-weight 30 is placed opposite this roll. In this design, in case of overload, the cylindrical member or impeller would require to make one complete cycle of movements before the wedge effect would come into play in its action to force the roll ahead.

What we claim is:

1. Apparatus of the class described comprising a rotatable shaft, a roll-equipped body secured on said shaft, an eccentric mounted to rotate independently of, but on an axis coincident with the axis of, said shaft, a cylindrical member, having a head with a bored hub portion, operably mounted on said eccentric, the cylinder portion of said cylindrical member adapted to engage said roll-equipped body, and in its eccentrical movements force said roll-equipped body to revolve around said shaft, means to prevent said cylindrical member revolving on its own diametrically central point, and means to rotate said eccentric.

2. Apparatus of the class described comprising an eccentric, a cylindrical member having a head in which is a bore within which operates said eccentric, means to hold said cylindrical member against revolving on its own central point, a revoluble shaft, a two-spoke member fixed on said shaft and adapted, normally, to revolve concentrically with the axis of said shaft, the outer ends of said two-spoke member being in continuous contact with the inner peripheral face of said cylindrical member, and means to rotate said eccentric.

3. Apparatus of the class described comprising a rotatable shaft, a hub fixedly secured to said shaft, a spoke extending radially from said hub, a roll pivotally mounted on the end of said spoke, an eccentric, means to rotate said eccentric independently of said shaft, a cylindrical member mounted on, and acquiring eccentrical movements from, said eccentric, the inner peripheral face of said cylindrical member being in continuous contact with said roll, causing, when said eccentric is revolving, an infinite number of obliquely-presented impacts to be made on said roll calculated to rotate said spoke hub and said shaft, and means to prevent said cylindrical member revolving on its diametrically central point.

4. Apparatus of the class described comprising a rotatable eccentric, a cylindrical member mounted on said eccentric, a shaft, a hub secured on said shaft, a spoke element extending radially from said hub, a roll yieldingly mounted on said spoke element and having continuous contact with said cylindrical member, holding means to prevent rotation of said cylindrical member on its diametrically central point, and means to rotate said eccentric to the end that the face of said cylindrical member may be constantly and obliquely presented to said roll, to force it ahead, throughout its entire cycle of eccentrical movements, except when resistance to this forward movement overcomes the power of frictional engagement of the roll with the face of the cylinder through the force of the yielding means and the power of centrifugal action tending to hold them together, in which instance said roll will yield and slip on the face of said cylinder until the resistance to rotation of the roll-equipped member is sufficiently released to permit the parts to function as before.

5. Apparatus of the class described comprising in combination with a prime mover, an eccentric adapted to be driven by said prime mover, a cylindrical member mounted on and acquiring eccentrical movement from said eccentric, a shaft, an impelled, rotatable member fixed on said shaft and deriving its power of rotation from continuously and obliquely presented thrusts of the inner peripheral face of said cylindrical member thereon, as said cylindrical member moves in its eccentrical orbit, means to prevent rotation of said cylindrical member on its diametrical center, and means associated with said impelled member which permits it to radially yield and slip in its contact with said cylindrical member when extreme resistance to the rotation of the impelled member occurs.

6. Apparatus of the class described comprising a rotatable shaft, bearings in which said shaft is journalled, a pulley mounted on but unsecured to said shaft, an eccentric disposed on one end of said pulley, an impeller cylinder having a head bored for mounting on said eccentric, an arm extending from said impeller cylinder, a link one end of which swings from a fixed point and having pivotal connection with said arm to hold said impeller cylinder against rotating on its own diametrically central point, a turnstile member disposed within said impeller cylinder, embodying a hub portion fixedly secured on and to said shaft, and a plurality of spokes, each having a longitudinal bore therein, extending radially from said hub portion, a roll-carrying member for each of said spokes, a shank on said roll-carrying member operable in said bore, a roll pivotally mounted in each of said roll-carrying members, a spring in each of said bores adapted to thrust on the end of the shank therein and causing continuous and yieldable contact of said roll with the inner peripheral face of said impeller cylinder, a duplicate set of the foregoing elements disposed on the opposite end of said pulley, the eccentric in the last named set being advanced one hundred and eighty degrees from the first named eccentric, and means to rotate said pulley to the end that said impellers in their eccentrical movements may impinge on said rolls and cause said turnstiles to be rotated.

7. In apparatus of the class described the combination with an eccentric and a member operatively mounted thereon, of a cylindrical portion on, and extending laterally from, said member, a rotatable shaft, a body mounted on and secured to said shaft, its outer end portion having continuous and radially yieldable engagement with said cylinder, and means to rotate said eccentric.

ERNEST T. HARMON.
PHILIP W. DOHERTY.