C. A. SAWTELLE.

FLUID CLUTCH.

APPLICATION FILED JULY 20, 1911.

1,035,478.

Patented Aug. 13, 1912.

2 SHEETS—SHEET 1.

Fig. 2.

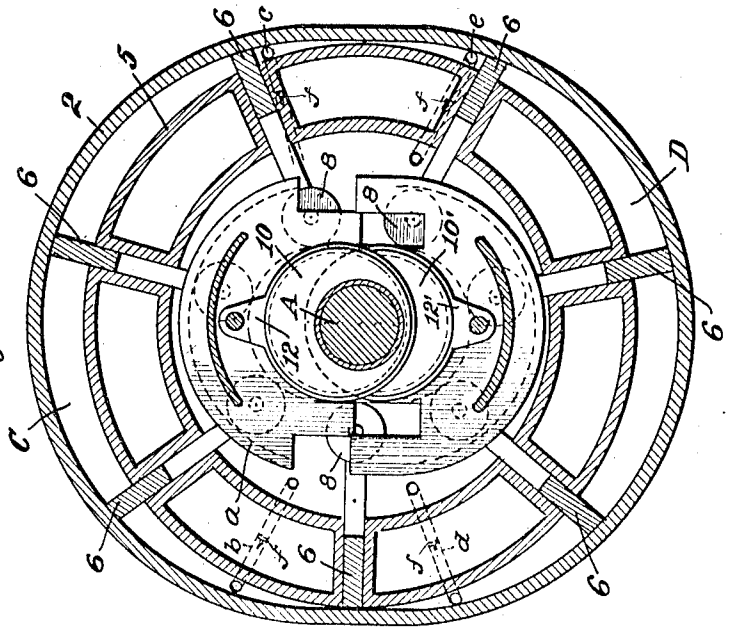
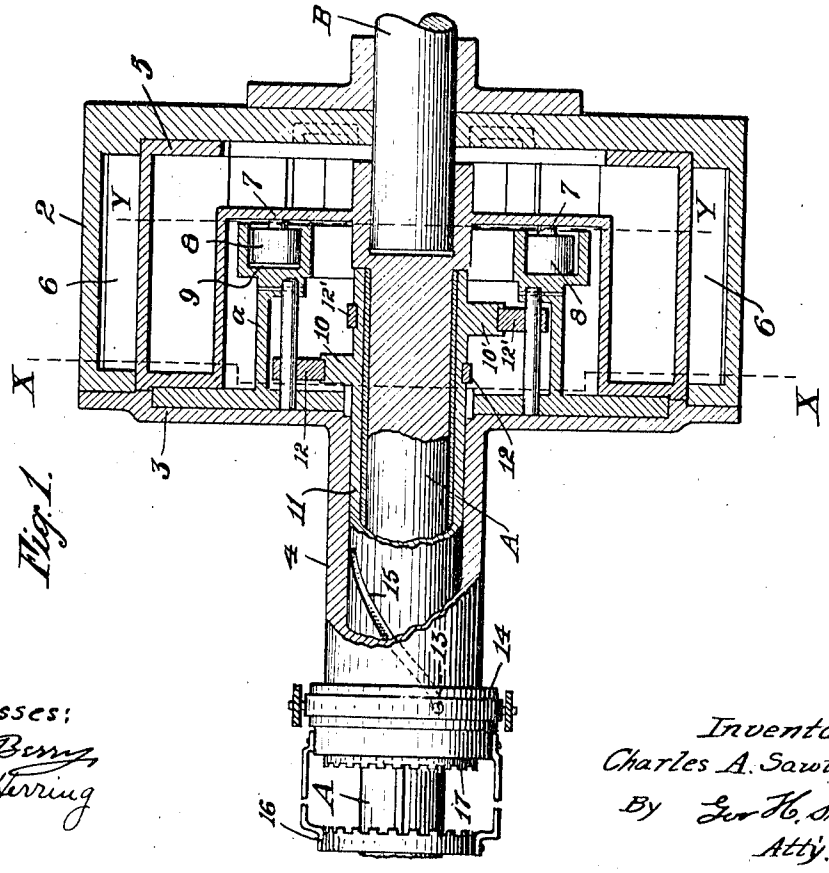


Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 3.

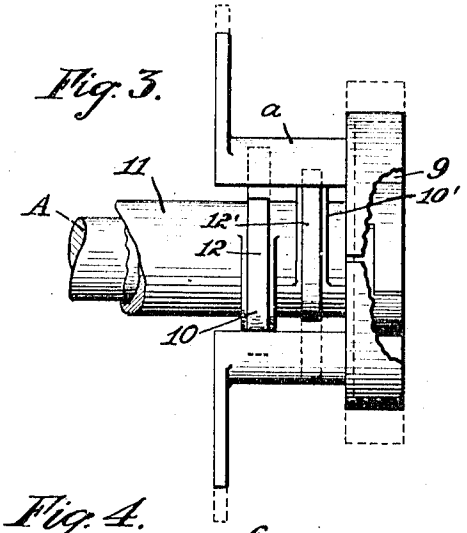
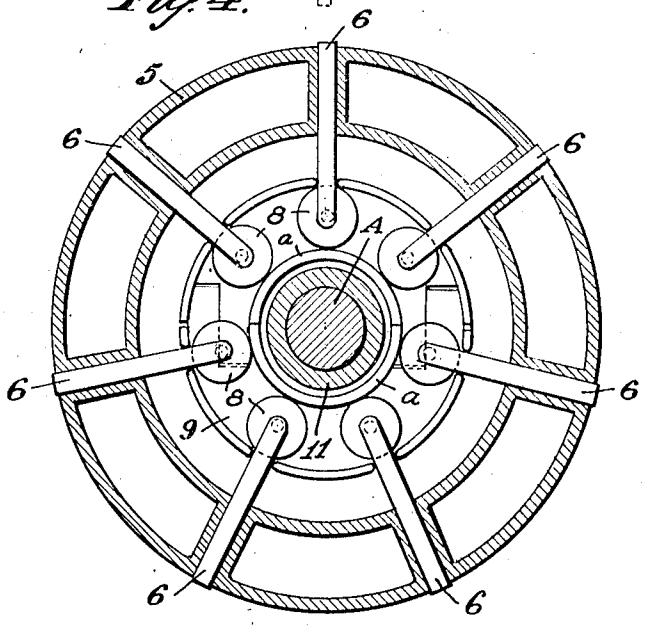


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES A. SAWTELLE, OF SACRAMENTO, CALIFORNIA.

FLUID-CLUTCH.

1,035,478. Specification of Letters Patent. Patented Aug. 13, 1912.

Application filed July 20, 1911. Serial No. 639,526.

To all whom it may concern:

Be it known that I, CHARLES A. SAWTELLE, a citizen of the United States, residing at Sacramento, in the county of Sacramento and State of California, have invented new and useful Improvements in Fluid-Clutches, of which the following is a specification.

This invention relates to a variable speed clutch, and particularly pertains to a clutch of the hydraulic type.

It is the object of this invention to provide a clutch of the hydraulic type in which the use of gear teeth and valves is dispensed with and by which a driven shaft may be rotated at various speeds from a uniformly driven drive shaft, and which obviates the use of pulleys, gears and other transmission devices commonly employed for this purpose.

Another object is to provide a clutch of the above character, which is simple in construction, efficient in operation and not liable to get out of order, and by means of which the drive shaft and the driven shaft may be readily connected and disconnected, as desired.

Other objects will become apparent in the following description.

The invention consists of the parts and the combination and construction of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a vertical section of the invention. Fig. 2 is a section on the line X X, Fig. 1. Fig. 3 is a detail and side elevation of the groove and cam and the mechanism for operating same. Fig. 4 is a section on the line Y Y, Fig. 1, showing the vanes in elevation.

In the drawings A represents a drive shaft and B is a shaft to be driven. Rigidly mounted on the shaft B is an elliptical casing or housing 2, which may be of any suitable construction, and is closed at both ends; one being closed by means of a removable plate 3 on which an outwardly extending hub 4 surrounding the shaft A is formed. The shaft A extends through the hub 4 into the interior of the casing 2 and has a cylinder 5 mounted on its inner end which cylinder 5 is adapted to be rotated within the casing 2 with its periphery contacting the inner surface of the elliptical casing 2 at diametrically opposed points on the minor diameter of the latter, as shown in Fig. 2. The casing 2 being elliptical and the cylinder 5 circular, crescent shaped chambers C and D are formed between the casing 2 and cylinder 5 on diametrically opposite sides of the latter, which spaces are filled with any suitable fluid or semi-liquid.

Slidably mounted and guided in the cylinder 5 are a series of blades or vanes 6, in this case seven in number; which vanes are designed to be advanced outwardly beyond or retracted within the periphery of the cylinder 5, through the guide slots in the cylinder, and are so designed as to extend the full width of the inner circumferential wall of the casing 2 in the chambers C—D.

Mounted on the inner end of each vane 6 is a pin 7 which extends through a slot formed in the cylinder 5 and has a roller 8 revolubly mounted thereon. The rollers 8 are designed to travel in a cam groove 9 which is formed on a divided sleeve *a* and which groove is adapted to be elongated and contracted by spreading the divided sleeve *a* or drawing it together, as will presently be described so as to cause the vanes 6 to move back or forth in the cylinder 5.

The operation of extending or contracting the cam groove 9 by separating the divided sleeve *a* or drawing it together, is accomplished by means of oppositely disposed eccentrics 10 and 10′ formed on a sleeve 11 mounted on the shaft A. Straps 12 and 12′ pass around the eccentrics 10 and 10′ respectively, and are pivotally connected at diametrically opposed points to the two halves of the divided sleeve *a* as shown in Figs. 1 and 2.

In the operation of the invention, the sleeve 11 is rotated by means of a pin 13 which is mounted on a collar 14 slidable longitudinally on the hub 4; the pin 13 extending through a slot in the hub 4 and projecting into an angularly disposed groove 15 formed on the sleeve 11. The sleeve 11, when rotated by the pin 13, causes the eccentrics 10 and 10′ to advance or retract the halves of the divided sleeves *a*—*a* through the eccentric straps 12 and 12′ which elongates the cam groove 9 in such manner that the vanes 6 will be caused to project into the chambers C and D between the cylinder 5 and casing 2 when the cylinder 5 is rotated with the drive shaft A.

It will be observed that when the cylinder 5 is rotated with the divided sleeve *a* in its innermost position, the vanes 6 will not extend into the chambers C and D, so that the cylinder will travel freely within the casing 2 and there will be no movement of the latter; but when the tips of the vanes 6 are caused to project into the chambers C and D and contact the inner circumferential wall of the casing 2 as before described, the liquid in these spaces acts to block the rotary movement of vanes 6 and cylinder 5 with the effect of causing the casing 2 and shaft B to travel in unison with the cylinder 5 and shaft A. By varying the extent of the projection of the vanes 6 into the chambers C—D the speed of rotation of the casing 2 and shaft B in relation to the speed of the cylinder 5 and shaft A will be varied, for the reason that the liquid in the chambers C—D will only partially retard the movement of the vanes 6 in relation to the casing 2; the vanes 6 then traveling through the liquid at a speed proportional to the amount of blade area extending therein. By this arrangement, any desired speed may be given the shaft B from the shaft A from an extremely low speed to a high speed equaling that of the shaft A, or the drive shaft A may be rotated independent of the driven shaft B.

Means are provided for preventing slippage when the shaft B is to be rotated at high speed; which slippage would be occasioned by leakage of the liquids in the chambers C—D around the ends and edges of the vanes 6. This means is here shown as consisting of a toothed clutch-member 16 slidable on the shaft A and which is connected to the sleeve 14 on the hub 4 in such manner as to be reciprocated in unison therewith; the clutch member 16 engaging teeth 17 on the outer end of the hub 4, when the sleeve 14 has been moved to its innermost position on the hub 4 and in which position the pin 13 will have caused the sleeve 11 to turn one-half of a revolution to throw the divided sleeve *a* into its outermost position; the end portion of the diagonal slot 15 extending parallel with the axis of the sleeve 11 to admit the sleeve 14 being moved a short distance without operating the sleeve 11 and which movement is sufficient to throw the clutch member 16 into engagement with the hub 4.

The clutch member 16 is keyed on the shaft A so that when it is engaged with the hub 4, the latter will be caused to rotate in unison with the shaft A. By this arrangement the shaft B may be driven direct from the shaft A on the high speed.

If desired, the whole interior of the casing 2 may be filled with the liquid before mentioned, so as to obviate any difficulty arising from leakage of the liquid through the guide slots in the cylinder 5, and means are provided for insuring the chambers C—D being maintained in a completely filled condition.

This means is here shown as consisting of a series of passages, indicated at *b—c—d* and *e*, which are formed in the casing 2 and lead from the outer ends of the crescent shaped chambers C and D to a suitable point communicating with the space inclosed by the cylinder 5. The passages *b—c—d* and *e* are each provided with a check valve, indicated at *f*, which valve is designed to open toward the chambers C and D.

From the foregoing it will be seen that when the cylinder 5 and vanes 6 are rotated in either direction any liquid that may leak from the chambers C and D will be replaced through the passages *b—e* or *c—d* according to the direction of rotation; the vanes 6 creating a suction as they pass over the outer openings of the passages, so as to draw or pump what liquid is necessary to completely fill the chambers C and D between the vanes 6. By this arrangement the chambers C and D may be maintained in a filled condition.

The operation of the invention is as follows: When it is desired that no motion be given the shaft B from the shaft A, the vanes 6 are caused to retain their innermost position in the cylinder 5 which allows the latter to revolve freely within the casing 2 when the shaft A is rotated; the casing 2 remaining stationary. When it is desired to rotate the shaft B in unison with the shaft A, the vanes 6 are caused to extend to the inner periphery of the casing 2, as before described, which action locks the cylinder 5 on the shaft A and casing 2 on the shaft B together.

The shaft B may be rotated at various speeds in relation to the shaft A by varying the extent of the projection of the vanes 6 beyond the outer periphery of the cylinder 5, as before described.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. A variable speed clutch comprising an elliptical housing, a cylinder revoluble therein and disposed centrally thereof with its outer periphery contacting the inner circumferential wall of the housing at diametrically opposed points, a series of vanes slidably mounted in said cylinder, and means for positively advancing and retracting said vanes, said means including a divided expansible member, the parts of which are connected to the inner ends of the vanes.

2. A variable speed clutch comprising an elliptical housing, a cylinder revoluble therein and disposed centrally thereof with its outer periphery contacting the inner circumferential wall of the housing at dia-

metrically opposed points, a series of vanes slidably mounted in said cylinder, means for advancing and retracting said vanes, said means consisting of a cam groove, rollers on said vanes adapted to travel in said groove, and means whereby said groove may be expanded and contracted.

3. A variable speed clutch comprising an elliptical housing, a cylinder revoluble therein and disposed centrally thereof with its outer periphery contacting the inner circumferential wall of the housing at diametrically opposed points, a series of vanes slidably mounted in said cylinder, means for advancing and retracting said vanes, said means consisting of a cam groove, means whereby said groove may be expanded and contracted, said means including a divided sleeve on which the cam groove is formed, and a mechanism for reciprocating the halves of the divided sleeve in opposite directions.

4. A variable speed clutch comprising an elliptical housing, a cylinder revoluble therein and disposed centrally thereof with its outer periphery contacting the inner circumferential wall of the housing at diametrically opposed points, a series of vanes slidably mounted in said cylinder, means for advancing and retracting said vanes, said means consisting of a cam groove, means whereby said groove may be expanded and contracted, said means including a divided sleeve on which the cam groove is formed, a mechanism for reciprocating the halves of the divided sleeve in opposite directions, said mechanism embodying a pair of eccentrics, a sleeve on which said eccentrics are mounted, straps on said eccentrics connected to the divided sleeve, and means for rotating said eccentric carrying-sleeve exterior of the casing.

5. In a variable speed clutch, an elliptical casing, a cylinder therein, the outer diameter of said cylinder corresponding to the minor diameter of the interior of said casing, the cylinder being positioned centrally of the casing to form a pair of oppositely disposed crescent shaped chambers between the cylinder and casing, a series of vanes in said cylinder adapted to be extended into and withdrawn from the chambers, and a divided expansible sleeve the parts of which are connected to the vanes for positively moving the latter in and out of the chambers.

6. In a clutch, the combination with a drive shaft and a driven shaft, of an elliptical casing mounted on the driven shaft, a cylinder mounted on the drive shaft and disposed within said elliptical casing and dividing the interior of the casing into two compartments, a series of vanes mounted in said cylinder, and means including a divided expansible member having a cam groove for reciprocating said vanes to project them successively into the compartments and to withdraw them therefrom.

7. In a clutch, the combination with a drive shaft and a driven shaft, of an elliptical casing mounted on the driven shaft, a cylinder mounted on the drive shaft and disposed within said elliptical casing and dividing the interior of the casing into two compartments, a series of vanes mounted in said cylinder, means for reciprocating said vanes to project them successively into the compartments and to withdraw them therefrom, said means including a roller on each of said vanes, a cam groove in which said rollers are adapted to travel, and means for expanding and contracting said cam groove.

8. In a clutch, the combination with a drive shaft and a driven shaft, of an elliptical casing mounted on the driven shaft, a cylinder mounted on the drive shaft and disposed within said elliptical casing and dividing the interior of the casing into two compartments, a series of vanes mounted in said cylinder, means for reciprocating said vanes to project them successively into the compartments and to withdraw them therefrom, said means including a roller on each of said vanes, a cam groove in which said rollers are adapted to travel, means for expanding and contracting said cam groove, said means including a divided sleeve on which said cam groove is formed, and eccentrics for reciprocating the parts of the sleeve in opposite directions.

9. In a clutch, the combination with a drive shaft and a driven shaft, of an elliptical casing mounted on the driven shaft, a cylinder mounted on the drive shaft and disposed within said elliptical casing and dividing the interior of the casing into two compartments, a series of vanes mounted in said cylinder, means for reciprocating said vanes to project them successively into th compartments and to withdraw them therefrom, said means including a roller on each of said vanes, a cam groove in which said rollers are adapted to travel, means for expanding and contracting said cam groove, said means consisting of a divided sleeve on which said cam groove is formed, eccentrics for reciprocating the parts of the sleeve in opposite directions, a sleeve on which said eccentrics are mounted, and means for rotating said sleeve exterior of the casing independent of the drive shaft.

10. In a clutch, the combination with a drive shaft and a driven shaft, of an elliptical casing mounted on the driven shaft, a cylinder mounted on the drive shaft and disposed within said elliptical casing and dividing the interior of the casing into two compartments, a series of vanes mounted in said cylinder, means for reciprocating said vanes to project them successively into

the compartments and to withdraw them therefrom, said means including a roller on each of said vanes, a cam groove in which said rollers are adapted to travel, means for expanding and contracting said cam groove, said means consisting of a divided sleeve on which said cam groove is formed, eccentrics for reciprocating the parts of the sleeve in opposite directions, a sleeve on which said eccentrics are mounted, means for rotating said sleeve exterior of the casing independent of the drive shaft, and valved passages leading from the ends of said crescent shaped chambers from a point near the inner periphery of the casing to a point near the center of the casing.

11. In a clutch, the combination with a drive shaft and a driven shaft, of an elliptical casing mounted on the driven shaft, a cylinder mounted on the drive shaft and disposed within said elliptical casing and dividing the interior of the casing into two compartments, a series of vanes mounted in said cylinder, means for reciprocating said vanes to project them successively into the compartments and to withdraw them therefrom, said means including a roller on each of said vanes, a cam groove in which said rollers are adapted to travel, means for expanding and contracting said cam groove, said means consisting of a divided sleeve on which said cam groove is formed, eccentrics for reciprocating the parts of the sleeve in opposite directions, a sleeve on which said eccentrics are mounted, means for rotating said sleeve exterior of the casing independent of the drive shaft, valved passages leading from the ends of said crescent shaped chambers from a point near the inner periphery of the casing to a point near the center of the casing, and a clutch member on the drive shaft for engaging said casing on the driven shaft.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES A. SAWTELLE.

Witnesses:
CHARLES EDELMAN,
ZETA HASTINGS.