Oct. 3, 1950

E. P. LALONDE

2,524,389

HYDRAULIC CLUTCH

Filed Jan. 21, 1946

2 Sheets-Sheet 1

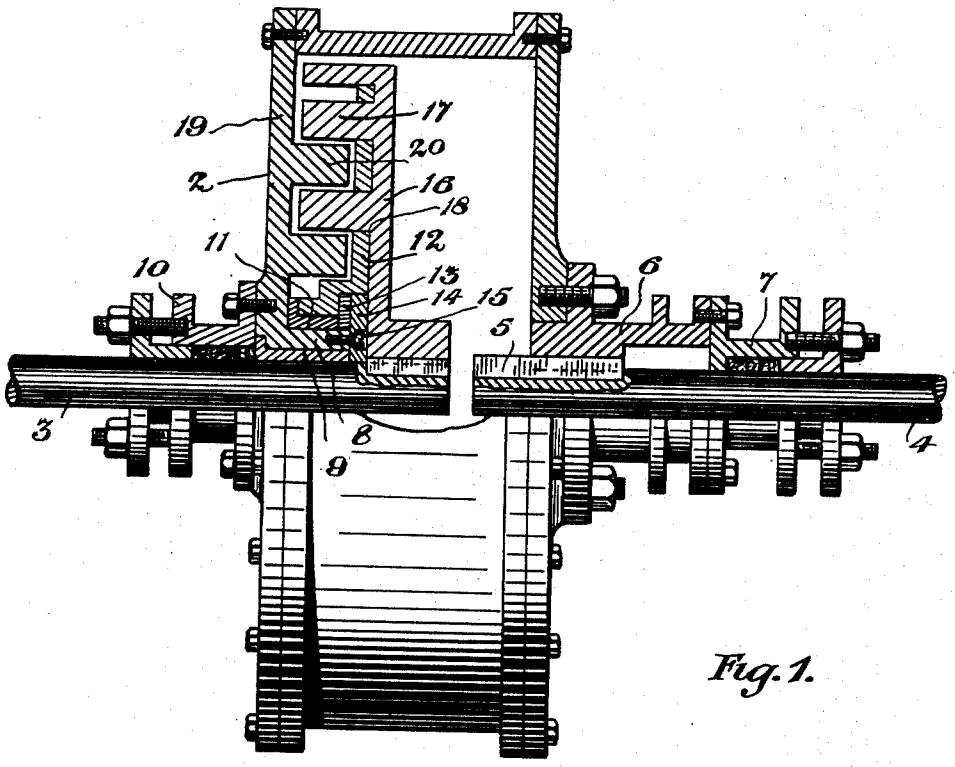


Fig. 1.

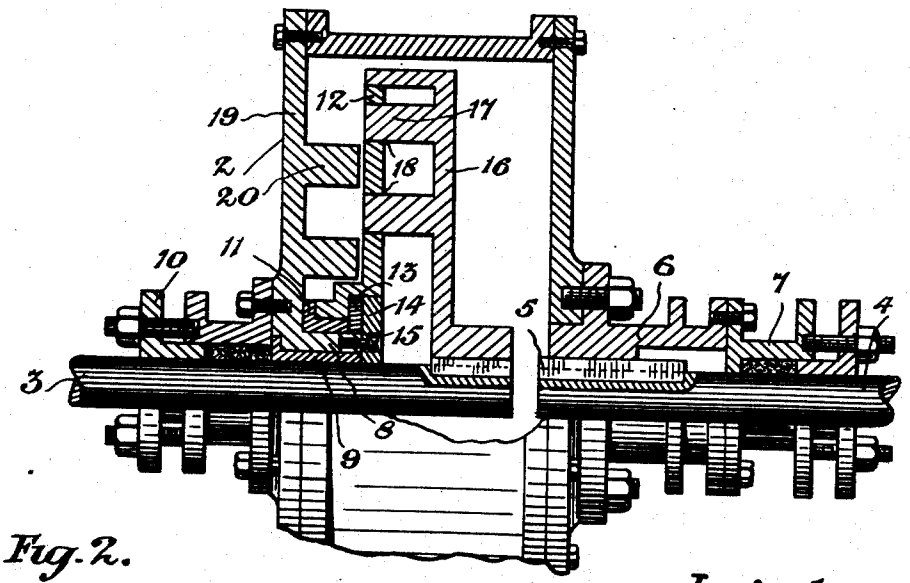


Fig. 2.

Inventor.
E. P. Lalonde
By Egerton R. Case
Atty.

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2 Sheets-Sheet 2

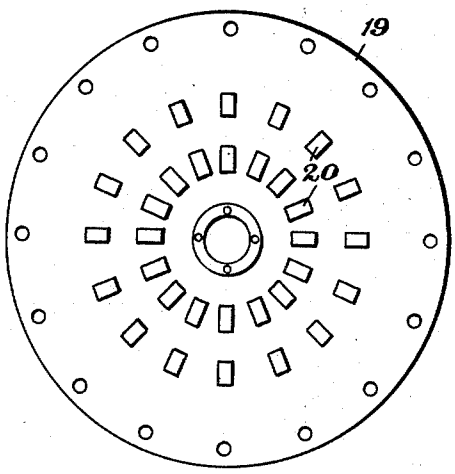


Fig. 3.

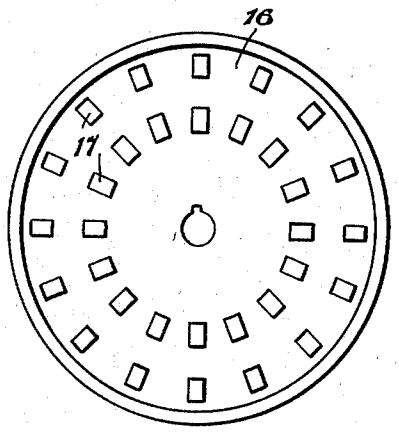


Fig. 4.

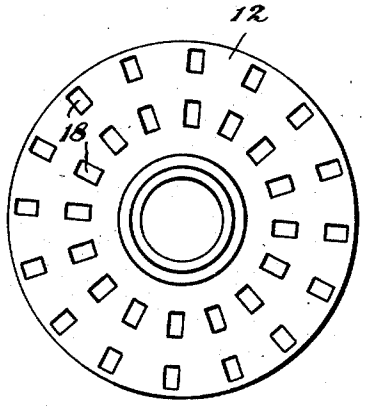


Fig. 5.

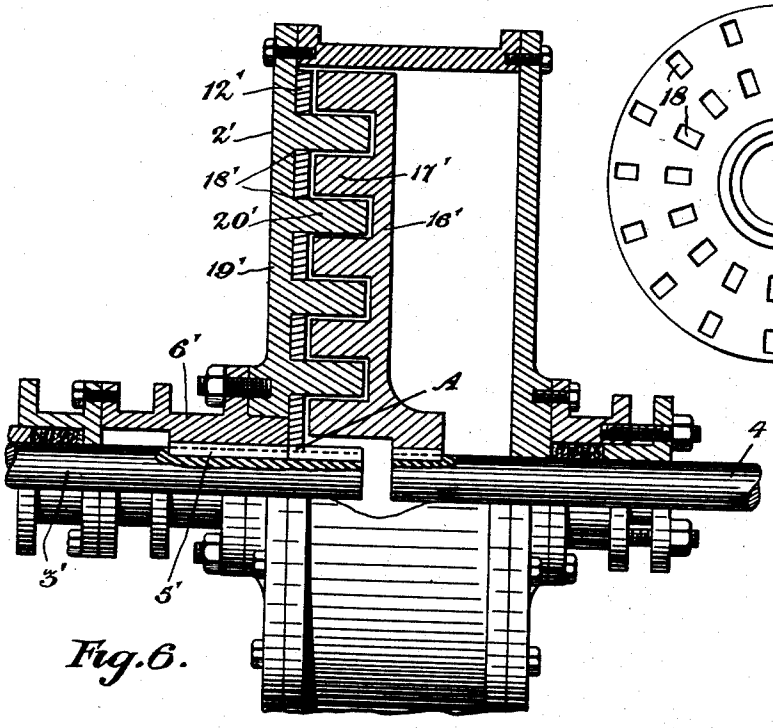


Fig. 6.

Inventor.
E. P. Lalonde
By Egerton N. Case
Atty.

Patented Oct. 3, 1950

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HYDRAULIC CLUTCH

Eugene P. Lalonde, Val d'Or, Quebec, Canada

Application January 21, 1946, Serial No. 642,547

10 Claims. (Cl. 192—58)

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This invention relates to an improved hydraulic clutch, and one object of the invention is to produce a clutch of simple design and very sturdy construction to work full of the liquid used thereby avoiding any pauses or delays in action which occur in some types in this art which operate by varying the amount of liquid flowing through them which results in the emulsification thereof, thus making this hydraulic clutch very desirable as a speed, load, pressure or volume regulator.

Another object is to produce an apparatus of this class which avoids all shock or jar because of the principle of operation thereof flowing from its novel association of elements which give it much flexibility.

Another object is to store energy in the casing and the contained liquid by the prime mover as thereby less inertia is to be overcome when the rotor is put to work.

Fig. 1 is a half longitudinal section through one form of the clutch, and a half side elevation, showing the clutch operative to transmit its maximum capacity.

Fig. 2 is a view largely similar to Fig. 1, showing the clutch in non-operative position.

Fig. 3 is an elevation of the inner side of the rotor.

Fig. 4 is an elevation of the inner side of the impeller.

Fig. 5 is an elevation of the side of the clutch-plate, and

Fig. 6 is a view similar to Fig. 1, showing a modified form of construction.

In the drawings like characters of reference refer to the same parts.

The invention comprises novel combinations of elements some of which may be used to perform the opposite function in one complete apparatus to that performed in another complete apparatus but which elements essentially co-operate with an element located therebetween by the same mode of operation and for the same purpose in both groupings.

In one grouping the apparatus comprises a casing filled with a liquid, functioning as a rotor, freely journalled on a drive shaft and splined on a driven shaft; an impeller within said casing keyed to said drive shaft, and an apertured clutch-plate between said rotor and impeller mounted to rotate around said drive shaft with said impeller and to be moved longitudinally on said shaft independently of said impeller and with which the fins of said impeller are constantly in engagement.

In another grouping the casing is splined on the drive shaft and the fins thereof are constantly in engagement with the clutch-plate which is keyed directly to said shaft; thus the casing now functions as the impeller and the impeller in the other grouping is now the rotor and is keyed on the driven shaft.

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The casing 2, containing the liquid, preferably oil, may be of any suitable construction. In the form shown in Figs. 1 and 2, this casing is loosely journalled on the drive shaft 3, so that it may be, at times, at rest. This casing may also be moved longitudinally on said shaft. The driven shaft 4, is aligned with the drive shaft 3, and splined on this shaft is one side of the casing 2, as shown at 5, through the medium of the shifting collar 6, suitably secured to said casing. Attached to said collar is a stuffing-box 7, through which said driven shaft passes.

Any suitable construction may be employed to mount the casing 2, on the shaft 3. As shown, a collar 8, is bushed by the sleeve 9. A stuffing-box 10, is attached to said casing and through which passes the shaft 3. Journalled on the collar 8, through the medium of the bushing 11, is the clutch-plate 12. A bushing-ring 13, is located around the collar 8, and against the clutch-plate. This bushing 13, and the bushing 11, are retained in place by the abutting-ring 14, secured by screws 15, to the collar 8.

Keyed to the inner end of the shaft 3, to, at times, closely contact the clutch-plate 12, is the impeller 16. This impeller is provided with a plurality of spaced fins 17, of any suitable shape, and positioned at any suitable angle, which project beyond the inner side thereof through correspondingly-shaped openings 18, formed in the clutch-plate 12, thus indirectly keying this plate to the drive shaft 3. These fins are shown as arranged in spaced concentric rows (Fig. 4) and may be of any suitable number. Carried by the inner side wall 19, of the casing, are fins 20, of any suitable shape, thus making this casing bi-functional in that it functions as a rotor, too. These fins are shown as also arranged in spaced concentric rows (Fig. 3), and may be also of any suitable number. In co-operative relationship the fins 17, and 20, interfit or have a telescopic action, so to speak, as shown in Fig. 1 and are moved axially relative to each other upon sliding the casing to vary the degree of overlap or coacting interfitting areas of the opposed fins, due to the relative movements between the impeller and the clutch plate and the extent of projection of the impeller fins therefrom while

the fins of the rotor remain in fixed relation to the clutch plate.

To put the clutch into action the shifting collar 6, is moved to the right (Fig. 2), thus moving the clutch-plate 12, and casing 2, in that direction also, and as this movement continues the fins 17, increasingly project beyond the outer side of the clutch-plate 12, through the openings or apertures 18, and the fins 20, are progressively moved into telescopic relationship with the fins 17, until this operation is completed, as shown in Fig. 1. During these movements the shaft 3, is being rotated and of course rotates the impeller 16.

By varying the amount of engagement between the fins 17, and 20, various speeds may be obtained.

In Fig. 6, is shown a modified form of the clutch. In this form the rotor of Fig. 1, becomes the impeller 2', and the impeller in Fig. 1, becomes the rotor 16'. Here the clutch-plate 12', is directly keyed or fixed, as at A, to the drive shaft 3'. By means of the collar 6', the impeller 2', is splined on the drive shaft, as shown at 5' to shift or slide axially relative thereto. Through the shifting-collar 6', the impeller 2', is moved longitudinally on the shaft 3', thus causing the fins 17', and 20', to be brought into the desired relationship.

In this modified form of apparatus the casing 2', and the liquid therein function as a fly-wheel and therefore there is much less inertia to overcome in this modified form when putting the rotor into action.

This hydraulic clutch may be used with synchronous motors to allow pull in, or to maintain constant pressures on pumps or fans, as will be understood by one skilled in the art.

The basic principle of this invention may be embodied in other forms of construction without departing from the spirit of the invention and the scope of the following claims.

The clutch-plate, of whatever construction, functions to normally close the areas between the fins of the impeller at the free ends of said fins to render the same ineffective to transmit power and depending upon the degree of projection of the fins of the impeller relative to the clutch plate when the casing or impeller is shifted relative to the clutch plate to vary the overlapped or telescoped areas of the fins and, in effect, measure out the area of the impeller fins that are effective to develop motion in the liquid to be transferred to the fins of the rotor. Hence this clutch-plate need not be apertured, in the broadest conception of the invention.

Another important function of this clutch-plate is to completely house or partition off the impeller or any part thereof, from any efficient action when it is desired to keep the clutch inactive.

The term "overlapped" as used in the specification and claims, is meant to define the position of the fins of the impeller relative to the fins of the rotor, and with respect to the clutch plate. In all forms of the invention and as illustrated in the drawings, these fins extend beyond or through the clutch plate to overlap the same, and in Figure 1, the topmost fin of the impeller 16 extends across or overlaps the perimeter of the clutch plate 12.

I claim:

1. In an hydraulic clutch, in combination, aligned drive and driven shafts, an enclosing casing having bearings rotatable and slidable on the driven shaft, and splined and slidable on the drive shaft, a disc-like finless clutch-plate mounted on the drive shaft to rotate therewith, one side plate of the casing being provided with fins projecting inwardly, a plate extending radially within the casing and provided with fins opposing the fins of the casing and adapted to interfittingly overlap the same at varying degrees, one set of fins constantly overlapping said clutch-plate and being movable axially with respect to each other to regulate the distance the said fins project beyond said clutch-plate and in one position at the ends of said fins to close off the areas between said fins to render the same inactive to transmit power, said clutch-plate remaining in fixed relation adjacent to the ends of the other fins, and means to move said clutch-plate and plate having its fins overlapping the clutch-plate with respect to each other to vary the overlapping relation of the latter fins and the clutch-plate and the amount of power transmitted by the clutch.

2. An hydraulic clutch comprising a casing adapted to enclose a fluid, a drive shaft and a driven shaft extending axially of the casing in alignment independently of each other, one shaft being splined to the casing to rotate therewith and the other having the casing journaled thereon, at least one side wall of the casing being provided with spaced circular rows of spaced fins projecting inwardly, a radial wall fixed on one shaft within the casing, said wall having spaced rows of fins opposing the fins of the casing wall and extending therebetween, one of said walls forming a rotor and the other an impeller, a clutch-plate on one shaft having spaced rows of spaced seats adapted to mate with the rows of spaced fins of the impeller in telescoping relation thereto and project therefrom, said clutch-plate being disposed radially between one of said walls and the ends of the other fins and mounted on one shaft, and means to shift the casing on the shafts to move one of said walls axially relative to the other wall and the clutch-plate to vary the projection of the fins of the latter wall relative to the clutch-plate and regulate the amount of power to be transmitted by the clutch.

3. An hydraulic clutch comprising a cylindrical casing adapted to enclose a fluid, a drive shaft and a driven shaft extending axially of the casing in alignment and spaced at their inner ends within the casing, one shaft being slidably fixed to the casing to rotate therewith and the other having the casing journaled thereon for sliding movement and rotation, one side wall of the casing being provided with spaced concentric series of spaced fins projecting inwardly, a radial plate fixed on one shaft within the casing and extending substantially throughout its radial area, said plate having a similar series of fins opposing the fins of the casing wall and adapted to interfit therewith, a clutch plate having a plurality of rows of spaced openings adapted to receive the rows of spaced fins of one series in axially sliding relation thereto, said clutch plate being disposed radially between said wall and plate and between the plate and the ends of one series of fins, and means to shift the casing and its wall fins relative to the radial plate and the radial plate and its fins relative to the clutch-plate on one of the series of fins to vary the projection of the fins relative to the clutch-plate to regulate the amount of power to be transmitted by the clutch.

4. An hydraulic clutch comprising a casing inclosing an impeller, a drive shaft on which the impeller is mounted to drive same, an enclosed

rotor, a driven shaft on which the rotor is mounted to be driven thereby, an apertured clutch-plate free of vanes mounted on the drive shaft and located between said impeller and said rotor and at all times telescopically interlocking with said impeller to rotate therewith, said impeller and rotor having opposed interfitting fins, the impeller being located at one side of the clutch-plate with the fins of the impeller overlapping the clutch-plate and projecting through the apertures thereof and means to shift the casing on the shafts whereby said fins of the impeller and rotor are progressively brought into varying telescopic relation beyond one side of said clutch-plate to vary the degree of overlap thereof and regulate the amount of power to be transmitted by the clutch.

5. An hydraulic clutch comprising a casing inclosing an impeller provided with a plurality of spaced fins arranged in spaced concentric rows, a drive shaft on which said impeller is mounted to drive same, an enclosed rotor provided with a plurality of spaced fins arranged in suitably spaced concentric rows interfitting with the fins of the impeller, a driven shaft on which said rotor is mounted to be driven thereby, a clutch-plate located between said impelled and said rotor and provided with apertures into which the fins of said impeller permanently extend and rotatable with said impeller, a means to shift the casing to move the impeller and rotor, and the impeller and clutch-plate respectively, one relative to the other, whereby the fins of said impeller are progressively passed through the apertures in the said clutch-plate to be brought into telescopic relation with the fins of said rotor to regulate the degree of overlap of the respective fins and amount of power to be transmitted by the clutch or to close off the areas between the fins of the impeller at the free ends of said fins to render the same ineffective to transmit power.

6. An hydraulic clutch comprising a casing inclosing an impeller, a drive shaft on which the impeller is mounted to drive same, an enclosed rotor, a driven shaft on which the rotor is mounted to be driven thereby, an apertured clutch-plate free of fins mounted on the drive shaft and located between said impeller and said rotor and at all times telescopically interlocking with said impeller to rotate therewith, said impeller and rotor having opposed overlapping circular series of fins, the fins of the impeller overlapping and extending through the apertures of the clutch-plate, the impeller being located at one side of the clutch-plate and the rotor being located at the opposite side of the clutch-plate and the fins of the rotor being located in fixed relation to the clutch-plate, and means to shift the casing on the shafts whereby the fins of the impeller and rotor are moved into varying overlapping relation at one side of the clutch-plate to regulate the amount of power to be transmitted by the clutch.

7. An hydraulic clutch comprising a fin-provided casing adapted to contain a liquid, drive and driven shafts on which said casing is mounted to rotate and with one of which said casing is operatively connected to, at times, turn the driven shaft, a fin-provided rotary member within said casing keyed to one of said shafts, an apertured finless clutch-plate located between the fins of said casing and said rotary member and at all times interfitting the fins of said fin-provided rotary member, and means to shift the casing whereby the fins of said casing and said

rotary member are progressively brought into telescopic relationship beyond one side of said clutch-plate to regulate the amount of power to be transmitted by the clutch.

8. An hydraulic clutch comprising a casing adapted to contain a liquid, two aligned shafts on one of which said casing is mounted to rotate and to one of which it is splined to slide, a plurality of fins spaced apart and arranged in spaced concentric circles projecting inwardly from one side of said casing, a rotary member keyed on one of said shafts, a plurality of fins spaced apart on the inner side of said rotary member and arranged in spaced concentric rows at radii greater or less than those of the spaced concentric circles of fins of said casing and opposed to the same, a clutch-plate free of vanes located between the fins of said casing and said rotary member to rotate around one of the shafts supporting said casing and provided with a plurality of openings arranged in spaced concentric rows through which operate certain of said groups of fins, and means to shift said casing longitudinally on said shafts to vary the overlap of the fins and regulate the amount of power to be transmitted by the clutch.

9. An hydraulic clutch comprising a casing adapted to contain a liquid, a plurality of spaced fins arranged in spaced concentric circles projecting inwardly from one side of said casing thus making the casing a rotor, aligned drive and driven shafts on which said casing is journalled to be moved longitudinally thereof, said casing driving said driven shaft, an impeller keyed to said drive shaft and provided on its inner side with a plurality of spaced fins arranged in spaced concentric circles at radii greater or less than those of the spaced concentric rows of fins of said rotor and opposed to the same for movement of the fins of the rotor into and out of overlapping relation with respect thereto, a clutch-plate independent of any fins, located between said rotor and its fins and said impeller to rotate around said drive shaft and provided with apertures through which operate the fins of said impeller in axially movable relation thereto and the fins of the rotor, and adapted at times to close off the areas between the free inner ends of the fins of the impeller to render the same ineffective to transmit power, the impeller being located at one side of the clutch-plate and the rotor being located at the opposite side of the clutch-plate with the fins of the rotor located in fixed relation to the clutch-plate, and means to shift said casing longitudinally on said shafts to regulate the distance the fins of the impeller project beyond said clutch-plate.

10. An hydraulic clutch comprising a casing adapted to contain a liquid, a plurality of spaced fins arranged in spaced concentric circles projecting inwardly from one side of said casing, aligned drive and driven shafts on which said casing rotates to be moved longitudinally thereof, said casing being positively rotated by said drive shaft making the casing an impeller, a rotor keyed to said driven shaft and provided on its inner side with a plurality of spaced fins arranged in spaced concentric circles of radii greater or less than those of the spaced concentric rows of said impeller and opposed to the same, a clutch-plate free of fins located between said impeller and said rotor to rotate around the drive shaft and provided with apertures through which operate the fins of said impeller, and means to shift said casing longitudinally on said shafts relative to the rotor and clutch-plate to regulate

the distance the fins of the impeller project beyond said clutch-plate to put the respective fins in varying degrees of overlapping relation or to close off the areas between the fins of the rotor at their ends to render the same inoperative to transmit power.

E. P. LALONDE.

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