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DRIVING MEANS FOR KINEMATOGRAPH FILM APPARATUS

Filed Feb. 2, 1940

Serial No.
316,982

2 Sheets-Sheet 1

Fig. 1

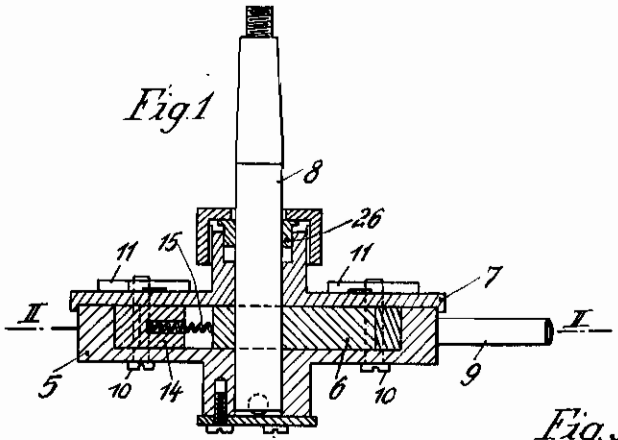

Fig. 3

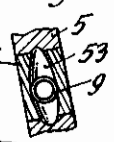

Fig. 2

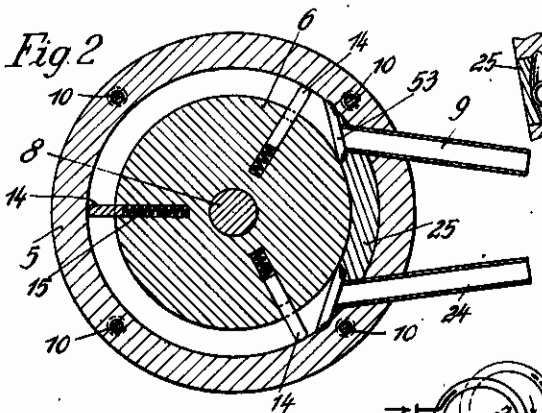

Fig. 5a

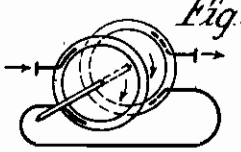

Fig. 4

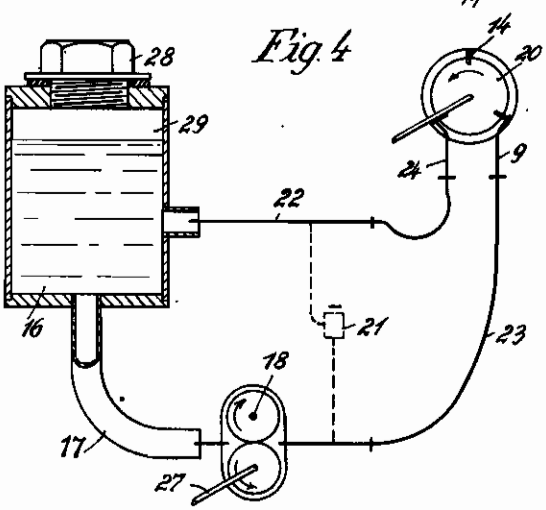

Fig. 5b

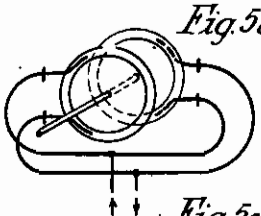

Fig. 5c

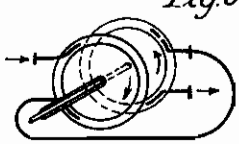

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Fig. 6

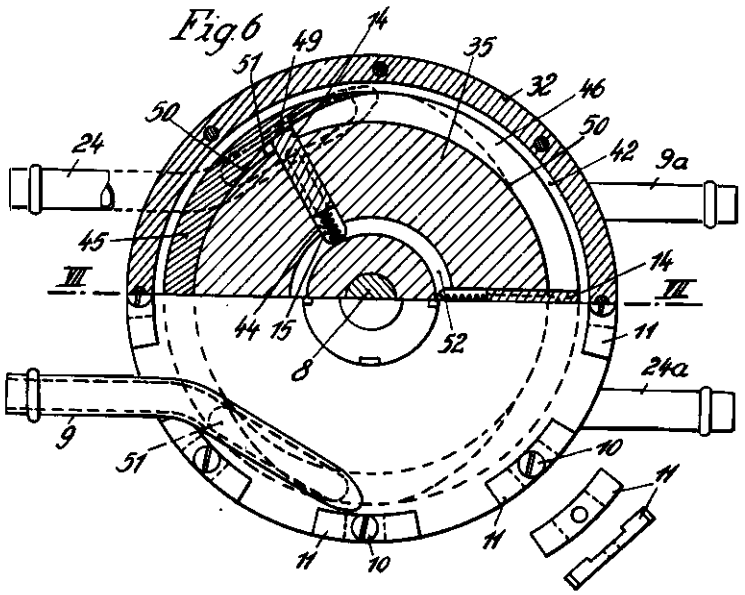

Fig. 8

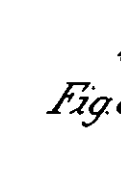

Fig. 7

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ALIEN PROPERTY CUSTODIAN

DRIVING MEANS FOR KINEMATOGRAPH FILM APPARATUS

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Application filed February 2, 1940

For actuating sound film apparatus it is requisite to obtain uniformity of speed of all devices that serve for reception and reproduction of the sounds. Recognition of this requirement led at an early stage in the history of the art to the development of suitable mechanisms in which the avoidance of irregularities of frequency by backlash of toothed gearing and other mechanical phenomena was effected in different ways. Also, in the combination of sound apparatus with kinematographic apparatus there is required synchronism of the picture and the sound, which presumes positiveness of the drive. In order to eliminate mechanical variations of frequency which would otherwise interfere with the correct reception and reproduction of sounds, there are used in known manner, for example, in disc apparatus, heavy discs acting as large fly-weights. On the other hand, with film apparatus there are used devices in which the damping of the variations of frequency is effected by governor tracks, elastic couplings, magnetic brakes, and the like. The use of devices which, by means of oil, cut out frequency variations in the cutting and in the copying of films, by the utilisation of the expansion or contraction of the film surface with curvature of the film, is also known.

Special provisions are to be made for effecting the uninterrupted feeding of films with apparatus in which the reception on the film band is effected mechanically by engraving the sound track by means of a stylus moved by speech-modulated currents, as in this case the forces opposing the effective turning moment are a multiple of those with apparatus with light or magnetic registration. The driving motor must therefore be more powerful, so that again the possibilities of irregularities of frequency are greater.

According to the invention, for the feeding of a film band for the purpose of reception and/or reproduction of sound according to any method the necessary forces for the turning moment are transmitted hydraulically. This has, first, the advantage that all mechanical irregularities which reach the sound controlling point when driving the motor by toothed gearing and sprocket gears are eliminated, as the operating liquid eliminates these in its flow. If necessary, simple additional provisions are provided in order to damp any very powerful disturbances of frequency. For example, the fluid conduits may be made elastic at certain points at which neutralisation of powerful disturbances is effected by expansion or contraction of the conduits.

It is known that in planing machine tools hydraulic transmissions are being used more and more in order to prevent chatter set up by toothed gearing.

As shown by experiments which aimed at adaptation of the methods used in planing machines to the sound film art, it is not directly possible to use merely on a smaller scale hydraulic devices employed in the machine tool industry, as the devices are too complicated for the reduced scale and the forces to be transmitted are relatively too large, so that mechanical disturbances are set up, rendering the apparatus useless. Further, the degree of exactitude of operation required with sound film apparatus is substantially greater than in connection with machine tools; also the special requirements of operation must be taken into account.

Broadly regarded, the invention consists in the incorporation in the drive to kinematograph film apparatus, particularly sound film apparatus, of a hydraulic transmitter including a rotary motor or turbine which drives the apparatus and which is driven by a rotary pump.

As hereinafter described, the operating liquid circulates in a closed circuit. Preferably the pump is a positive pump of the gear-wheel type; the motor is suitably of the sliding vane type.

In Figs. 1 to 8 of the accompanying drawings there is illustrated an hydraulic device applicable for actuating talking picture kinematograph apparatus.

Fig. 1 is a section through the fluid motor.

Fig. 2 a section of Fig. 1 on the line II—II of Fig. 1.

Fig. 3 is a view of the mouth of one of the conduits.

Fig. 4 shows the assembly.

Fig. 5*a* shows schematically the motor illustrated in Figs. 6 to 8, with working chambers arranged in series.

Fig. 5*b* shows a similar arrangement with the working chambers arranged in parallel;

Fig. 5c shows a connection of the working chambers sueh that the rotors turn in opposite directions.

Fig. 6 shows a motor with two working chambers, one half being in section on the line 40—41 of Fig. 7 and the other half being shown in plan.

Fig. 7 is a section on the line VII—VII of Fig. 6.

Fig. 8 comprises a front elevation and a side elevation of a piston.

As shown in Figs. 1 and 2, the motor consists of the casing 5 in which rotates the rotor 6 having three radial vanes 14 spaced 180° apart and

slidable in pockets in the rotor 6 and urged towards the wall of the casing 5 by springs 15. The cover 7 with the casing 5 encloses the rotor 6, being maintained by screws 10 and holding members 11 against the casing 5. A stuffing box 26 prevents escape of the operating liquid at the point where the shaft 8 penetrates the cover 7. The shaft 8 carries the rotor 6.

The operation is effected in this wise: For example, a gear wheel pump 18 driven by way of the shaft 27 (Fig. 4) sucks the operating liquid from the container 16 by way of the conduit 17 and discharges it by way of the elastic tubular connection 23. The liquid then passes through the pipe 9 to the motor 20, and after compelling the vanes 14, flows back to the container by way of the return connections 24, 22. The container 18 has a filling opening adapted to be closed by the plug 28. This has the advantage that, if the closure is effected after filling all the parts with operating liquid, a vacuum is set up above the liquid level at 29 in the container 16 with any loss of liquid in consequence of defective sealing, such vacuum counteracting any tendency to further loss of liquid. This point is of importance for portable apparatus. It is also important, however, to maintain the liquid chambers tightly closed in order to prevent ingress of the smallest foreign bodies which due to the smallness of the mechanical parts might readily interfere with the operation.

The formation of the motor shown in Figs. 1 and 2 is symmetrical with regard to the inlet and outlet connections 9 and 24, so that the motor can be used, depending on the direction of the flow of the liquid, for backward or forward running. A similar structure may also be used as a pump instead of the gear wheel pump 18. The rotor 6 (Fig. 2) is sealed relatively to the casing 5 by the sealing segment 25 into the two sides of which the pipes 9 and 24 debouch. The mouths of these pipes are so formed by milling as shown at 53 that the fluid meets with no resistance which prevents it from flowing away, because, as experiments have shown, the smallest space in which the liquid can be dammed up leads to instant blocking of the vanes 14 and thus brings the rotor 6 with the shaft 8 to rest. For this reason each milled recess 53 extends to a point beneath the rotor 8 and into the casing 5 (Fig. 3). The motor shown in Figs. 1 and 2 is designed for a very small output; for example, it is possible to use the power of a normal gramophone mechanism as a driving means for the pump 18, (Fig. 4) whereby to drive the hydraulic motor 20.

If larger outputs and consequently increased fluid pressure are to be taken care of, then the construction of the motor adopted is that illustrated in Figs. 6 to 8, which is so constructed as to realise symmetry; that is, the casing is built with two covers 30 and 31 constructed to be exchangeable with one another. The compartment between the covers is determined by the height of the intermediate ring 32 which is centred by the guiding spigots 33. Within said compartment are fitted the two rotors 34 and 35 which are also alike in construction. The rotor 34 is connected with the shaft 6 by the pin 37, while the rotor 35 is driven from the rotor 34 by the ring 38. By halving the height of the ring 32, it is possible to have only one rotor, for example, the rotor 34 within the casing, so as to employ a single motor as shown in Figs. 1 and 2. Further, if the pressure plate 39 is removed and a second stuffing box is provided at 38, the shaft 8 may be constructed to project from the casing at both ends. In order that the friction of the vanes 14 on the casing wall 32 may be reduced, the rotors 34 and 35 are provided with external rings 42 and 43 which rotate with the rotors. Further, the vane guides 44 are formed so as to extend to these external rings 42, 43, in the rotor bodies, whereby jamming of the vanes in their movement over the segments 45, 46 is prevented. For the purpose of obtaining good sealing of the vanes 14 with the rings 42, 43, the contact faces 47 (Fig. 8) are ground to the same radius; the corners are highly rounded at 49 (Fig. 6) to secure good running on the segments 45, 46. In order to prevent the operating liquid from being dammed up, there are provided recesses 48 through which residue of liquid can flow off when the vanes reach the point 58; further, the mouths of the passages 51 are extended somewhat beyond the contracting space at 50 so that also the liquid can flow off laterally.

As the number of operative rotations of the motor for sound appliances for direct actuation of discs, film tracks or toothed drums is between 78 and 360 revolutions per minute, the motor with a rotor having three vanes runs uniformly within this range of number of revolutions. Balancing of the liquid which may be present beneath the vanes 14 in the guides 44 is effected by the annular groove 52. If a large number of rotations is aimed at, then two rotors 34, 35 each with three vanes may be employed. In this connection the two segments 45, 46 are relatively displaced through 180° and the vanes 14 of the two rotors 34, 35 are 60° apart. This arrangement has the advantage that symmetry of the moving parts is afforded, thus avoiding necessity for special weighting of these parts.

The forms illustrated in Figs. 5*a*, 5*b*, and 5*c* employing two rotors in one casing show how by suitable connections for the operating liquid the device can be adapted to meet different practical requirements.

To sum up, the hydraulic actuation of sound film appliances gives with simple means the possibility of quiet running without mechanical irregularities of frequency.

The pump 18 of Fig. 4 may be driven in any suitable manner. For example, in sound film devices which are used in automobiles equipped with wireless the drive may be taken from the engine. As in sound film apparatus the number of revolutions and the direction of rotation are fixed for most cases, it is unnecessary to provide regulating and reversing devices; these may be fitted in the form of throttle valves or change-over cocks in known manner. For larger outputs there is suitably fitted in addition a safety valve 21, (Fig. 4) in order to permit the liquid to run back in case of interruption of the motor 20.

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