July 20, 1948. H. M. STEPHENSON 2,445,590

DRIVING MECHANISM

Filed July 8, 1944 2 Sheets-Sheet 1

Fig. 1.

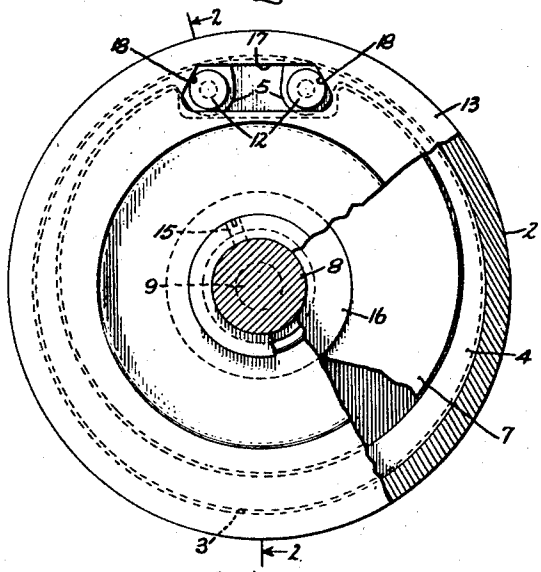

Fig. 2.

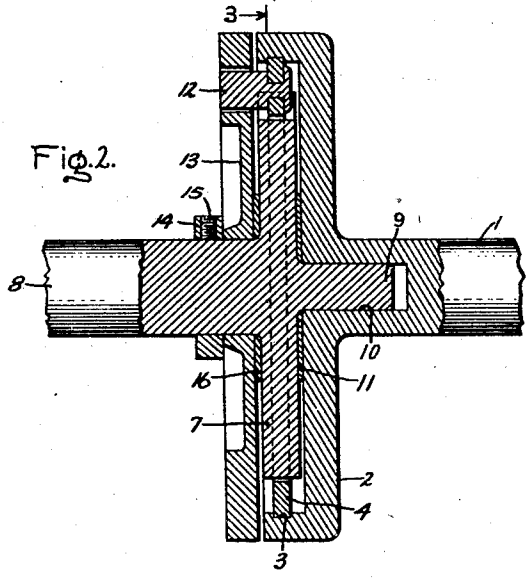

Fig. 3.

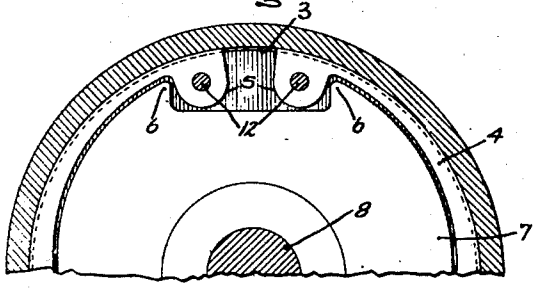

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Fig. 4.

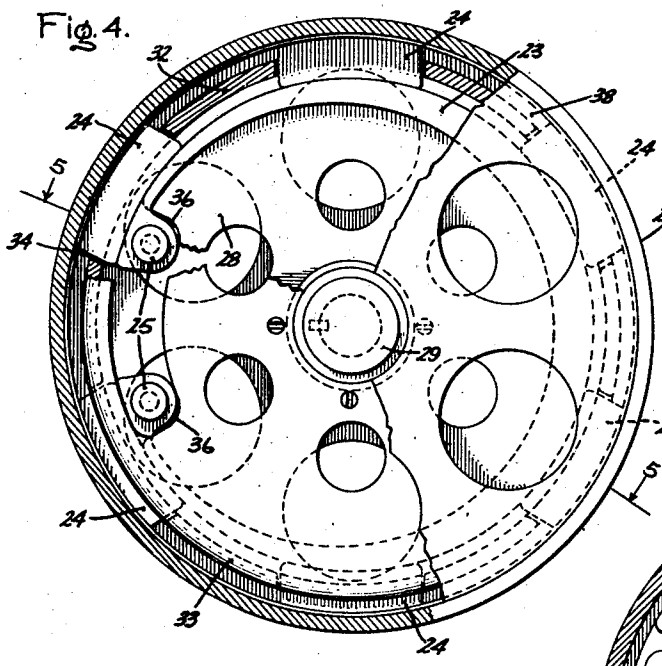


Fig. 6.

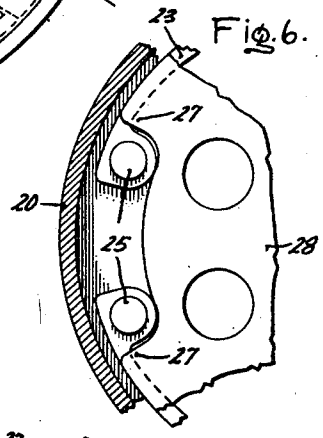
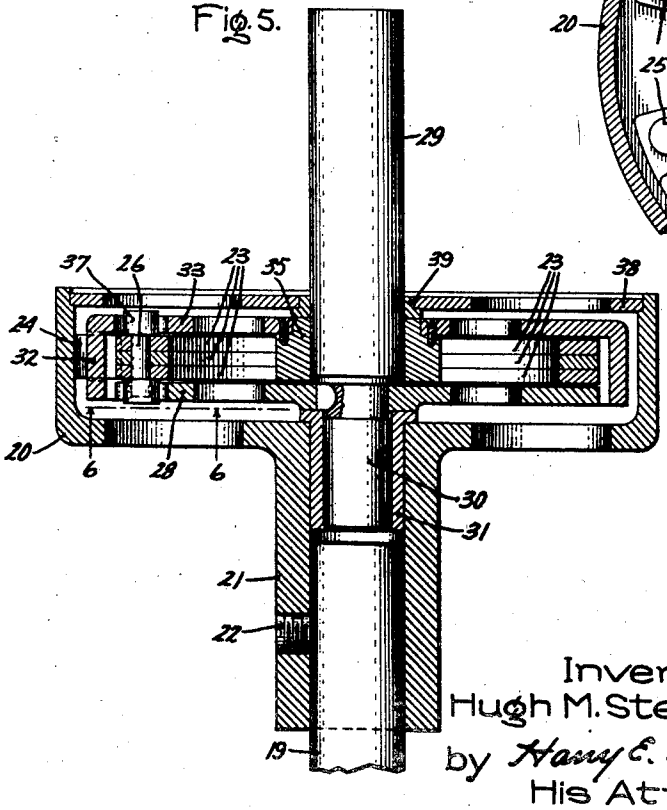


Fig. 5.



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Patented July 20, 1948 2,445,590

UNITED STATES PATENT OFFICE

2,445,590

DRIVING MECHANISM

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Application July 8, 1944, Serial No. 544,069

13 Claims. (Cl. 192—54)

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My invention relates to driving mechanism and particularly to an arrangement for releasing a driving connection on the occurrence of a sudden deceleration of the mechanism.

An object of my invention is to provide an improved driving mechanism provided with an inertia release arrangement for releasing the driving connection on sudden deceleration of the mechanism.

Another object of my invention is to provide an improved inertia release slip clutch.

Further objects and advantages of my invention will become apparent and my invention will be better understood from the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

In the drawing, Fig. 1 is an end elevational view, partly broken away, showing an embodiment of my improved driving mechanism with an inertia release drive; Fig. 2 is a side elevational view, partly in section taken along line 2—2 of Fig. 1; Fig. 3 is a fragmentary sectional view taken along the direction of the arrow 3 in Fig. 2; Fig. 4 is an end view, partly broken away, of another embodiment of my invention; Fig. 5 is a sectional elevational view taken along line 5—5 of Fig. 4; and Fig. 6 is a fragmentary view taken along line 6—6 of Fig. 5.

Referring to the drawing, I have shown in Figs. 1 to 3, inclusive, an embodiment of my improved driving mechanism which includes a pair of drive members comprising a driving member having a driving shaft 1 and drum 2 secured thereto with a spring seat groove 3 on the outer flange thereof. Driving torque is adapted to be transmitted from the driving shaft 1 to a driven member through an arcuate spring 4 having spaced apart ends and formed with a radial width which varies directly with the circumferential distance from the midpoint circumferentially of the spring. This spring 4 is arranged under compression to a smaller diameter than its released diameter in frictional engagement with the surface of the drum spring seat groove 3 to provide a frictional driving connection therewith. Each end of the spring is formed with an inwardly projecting driving part 5 which is adapted to engage a driving projecting part 6 formed on a drive plate 7 which is secured to a driven shaft 8. Torque is transmitted from the driving shaft 1 to the driven shaft 8 by engagement of the spring driving end part 5 with one or the other of the drive plate parts 6, and

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the end 9 of the driven shaft 8 is formed on a smaller diameter and is journaled in a hollow section 10 of the driving shaft 1 to assist in maintaining these two shafts in axial alignment. A thrust bearing 11 is arranged about the driving shaft 1 between the drive member drum 2 and the drive plate 7.

In this type mechanism, a sudden change in load or an overload may occur which may tend to stop or suddenly decelerate the mechanism, and a rigid connection between the driving and driven members might cause destructive stresses to be set up therein. In order to prevent such action, an inertia release device is provided for releasing the driving connection between the driving member drum and the spring to release the connection between the two drive members. This includes a spring release pin 12 secured to each end 5 of the spring 4 which projects in a direction away from the driving member drum 2, and an inertia load release plate or flywheel member 13 rotatably mounted on the driven shaft 8 and held in axial position by a positioning ring 14 which is secured to the shaft 8 by a setscrew 15. A thrust bearing 16 is mounted on the driven shaft 8 between the drive plate 7 and the inertia plate 13 in order to minimize the friction therebetween. The plate 13 is formed with an opening 17 arranged about the spring release pins 12 and is formed with tapered cam end-side surfaces 18 arranged for engagement with the spring release pins 12, such that when a sudden deceleration of the mechanism occurs, the inertia of the plate 13 tends to cause the plate to continue at its original speed, causing it to expend its inertia against the spring release pin 12 on the leading end of the spring, thus causing the spring to tend to wrap to a smaller diameter and relieving the driving friction between the spring and the drum spring seat for releasing the driving connection therebetween. The spring size and the degree of compression of the spring can be varied to provide any predetermined maximum torque to be transmitted by the driving mechanism, such that torque above this maximum value will cause slipping between the spring and the driving drum and prevent the transmittal of destructive forces through the mechanism. In this manner, a combined slip clutch and inertia release mechanism is provided for releasing the connection when undesirable stresses might be set up if a rigid connection were provided.

Referring to Figs. 4, 5 and 6 of the drawing, I have shown another embodiment of my improved driving mechanism which includes a driving

member and a driven member having respectively a driving shaft and a driven shaft adapted to be coupled by a slip clutch. In this construction, a driving shaft 19 is provided with a drum 20 having a hub 21 for mounting the drum on the shaft 19, and the assembly is secured together by a setscrew 22. Driving torque is adapted to be transmitted from the driving shaft 19 to a driven member through a set of three arcuate springs 23 having spaced apart ends and formed with a radial width which varies directly with the circumferential distance from the midpoint circumferentially of the spring. A plurality of circumferentially spaced apart friction shoe members 24 are arranged in the drum and extend into engagement with the outer periphery of the arcuate springs 23 which are held under compression within the drum 20 in engagement with the inner surface of the friction shoe members for biasing these shoe members into frictional driving connection with the inner surface of the drum. Each of these springs is formed with a driving part 25 in the form of a head of a pin 26 on each end of the spring, and these pinheads 25 are spaced a slight distance from driving parts 27 which project outwardly on a drive plate 28 secured to a driven shaft 29. Axial alignment of the two shafts is maintained by forming the end portion 30 of the driving shaft 29 of reduced diameter and journaling it in a bearing 31 mounted within the hub 21 of the drum 20. The fraction shoe members 24 are held in circumferentially spaced apart relationship by an axially extending flange 32 which is formed on the outer periphery of an inertia plate member 33 and which is provided with a plurality of openings 34 through which the shoe members loosely extend to provide for free relative radial movement of the shoe members. The inertia plate 33 is secured to a bearing hub 35 which is rotatably mounted on the drive shaft 29 and is formed with a circumferentially extending opening 36 which extends about ends 37 of the pins 26 which are adapted to act as spring release pins for releasing the pressure of the springs 23 on the friction shoe members 24 under certain operating conditions.

In this construction, torque is adapted to be transmitted between the two drive members from the driving shaft 19 to the driven shaft 29 through the frictional driving connection formed by the engagement of the friction shoe members with the drum 20 under the action of centrifugal force on the shoe members augmented by the radial frictional pressure engagement of the springs 23 wtih the inner surfaces of the shoe members 24 and the mechanical connection of the springs through the pinheads 25 and the driving parts 27 of the drive plate 28. If an overload or sudden stop is imposed on this driving mechanism such that there is a sudden deceleration of the mechanism, the inertia device will tend to release the pressure of the friction shoe members 24 on the drum 20 and permit the clutch to slip, thereby preventing destructive stresses from being set up in the mechanism. This action is provided by the inertia plate 33 which tends to continue to rotate at its original speed such that an end of the opening 36 forms a mechanical connection with one of the pinheads 25 and tends to expend the inertia of the plate against the spring release pin 26 on the leading end of the springs 23, thus causing the springs to tend to wrap to a smaller diameter and relieving the pressure of the spring on the shoe members for releasing the driving connection between the shoe members and the drum 20. As in the construction shown in Figs. 1, 2 and 3, the size and the degree of compression of the springs can be varied to provide any predetermined maximum torque to be transmitted by the driving mechanism, and the number of springs and size of the friction shoe members may also be varied in accordance with the desired maximum torque to be transmitted by the mechanism. This arrangement is adapted to be held in assembled relationship by a closure plate 38 which is mounted on the outer end of the drum 20 and on a rotatably mounted ring 39 on the driven shaft 29.

While I have illustrated and described particular embodiments of my invention, modifications thereof will occur to those skilled in the art. I desire it to be understood, therefore, that my invention is not to be limited to the particular arrangements disclosed, and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A driving mechanism including a driving member and a driven member adapted to be coupled by a slip clutch comprising a drum secured to said driving member, means including an arcuate spring having spaced apart ends and formed with a radial width which varies inversely with the circumferential distance from the midpoint circumferentially of the spring and arranged under compression in said drum for providing a frictional driving connection with said drum, means including a drive plate secured to said driven member arranged to apply force on said spring for transmitting torque from said driving member to said driven member through said spring, means including an inertia load release device comprising a plate member rotatably mounted on said driven member and arranged for mechanical connection with said spring for biasing said spring to a smaller diameter for releasing the driving connection therebetween on sudden deceleration of said mechanism.

2. A driving mechanism including a driving member having a drum secured thereto, an arcuate spring having spaced apart ends and arranged under compression in said drum for providing a frictional driving connection with said drum, a driving part on each end of said spring, a driven member including a drive plate secured thereto, means including driving parts on said drive plate arranged for engagement with said spring driving parts for transmitting torque from said driving member to said driven member through said spring, means including a spring release pin on each end of said spring and an inertia load release device including a plate rotatably mounted on said driven member and arranged for engagement with said spring release pins for biasing said spring to a smaller diameter and relieving the driving friction between said spring and said drum for releasing the driving connection therebetween on sudden deceleration of said mechanism.

3. A driving mechanism including a driving member having a drum secured thereto, an arcuate spring having spaced apart ends and arranged under compression in engagement with the inner surface of said drum, a driving part on each end of said spring, a driven member including a drive plate secured thereto arranged in said drum within said spring, means including driving parts

on said drive plate arranged for engagement with said spring driving parts for transmitting torque from said driving member to said driven member through said spring, a spring release pin projecting from each end of said spring away from said drum, and an inertia load release means including a plate rotatably mounted on said driven member and arranged for engagement with said spring release pins for biasing said spring to a smaller diameter and relieving the driving friction between said spring and said drum for releasing the driving connection therebetween on sudden deceleration of said mechanism.

4. A driving mechanism including a pair of shafts adapted to be coupled by a slip clutch comprising a drum secured to one of said shafts, an arcuate spring having spaced apart ends and arranged under compression in engagement with the inner surface of said drum, a driving part on each end of said spring, a drive plate secured to the other of said shafts, means including driving parts on said drive plate arranged for engagement with said spring driving parts for transmitting torque from one of said shafts to the other of said shafts through said spring, means including a spring release pin on each end of said spring and an inertia load release device including a plate rotatably mounted on one of said shafts and arranged for engagement with said spring release pins for biasing said spring to a smaller diameter and relieving the driving friction between said spring and said drum for releasing the driving connection therebetween on sudden deceleration of said mechanism.

5. A driving mechanism including a driving member having a driving shaft and a drum secured thereto, an arcuate spring having spaced apart ends and arranged under compression in said drum for providing a frictional driving connection with said drum, a driving part on each end of said spring, a driven member including a driven shaft with a drive plate secured thereto, means including driving parts on said drive plate arranged for engagement with said spring driving parts for transmitting torque from said driving member to said driven member through said spring, a spring release pin on each end of said spring, and an inertia load release means including a plate rotatably mounted on said driven shaft and provided with an opening having tapered cam side surfaces arranged for engagement with said spring release pins for biasing said spring to a smaller diameter and relieving the driving friction between said spring and said drum for releasing the driving connection therebetween on sudden deceleration of said mechanism.

6. A driving mechanism including a pair of members adapted to be coupled by a slip clutch comprising a drum secured to one of said members, an arcuate spring having spaced apart ends and formed with a radial width which varies inversely with the circumferential distance from the midpoint circumferentially of the spring and arranged under compression in engagement with the inner surface of said drum, a driving part on each end of said spring, a drive plate secured to the other of said members, means including driving parts on said drive plate arranged for engagement with said spring driving parts for transmitting torque from one of said members to the other of said members through said spring, means including a spring release pin on each end of said spring and an inertia load release device including a plate rotatably mounted on one of said members and arranged for engagement with said spring release pins for biasing said spring to a smaller diameter and relieving the driving friction between said spring and said drum for releasing the driving connection therebetween on sudden deceleration of said mechanism.

7. A driving mechanism including a driving member having a drum secured thereto with a spring seat groove therein, an arcuate spring having spaced apart ends and formed with a radial width which varies inversely with the circumferential distance from the midpoint circumferentially of the spring and arranged under compression in engagement with the surface of said drum spring seat groove, a driving part on each end of said spring, a driven member including a drive plate secured thereto, means including driving parts on said drive plate arranged for engagement with said spring driving parts for transmitting torque from said driving member to said driven member through said spring, means including a spring release pin on each end of said spring and an inertia load release device including a plate rotatably mounted on said driven member and arranged for engagement with said spring release pins for biasing said spring to a smaller diameter and relieving the driving friction between said spring and said drum spring seat for releasing the driving connection therebetween on sudden deceleration of said mechanism.

8. A driving mechanism including a driving member having a driving shaft and a drum secured thereto with a spring seat groove therein, an arcuate spring having spaced apart ends and formed with a radial width which varies inversely with the circumferential distance from the midpoint circumferentially of the spring and arranged under compression in engagement with the surface of said drum spring seat groove, a driving projecting part on each end of said spring, a driven member including a driven shaft with a drive plate secured thereto arranged in said drum within said spring, means including driving projecting parts on said drive plate arranged for engagement with said spring driving projecting parts for transmitting torque from said driving member to said driven member through said spring, a spring release pin projecting from each end of said spring away from said drum, and in inertia load release means including a plate rotatably mounted on said driven shaft and provided with an opening having tapered cam side surfaces arranged for engagement with said spring release pins for biasing said spring to a smaller diameter and relieving the driving friction between said spring and said drum spring seat for releasing the driving connection therebetween on sudden deceleration of said mechanism.

9. A driving mechanism including a driving member and a driven member adapted to be coupled by a slip clutch comprising a drum secured to said driving member, means including friction shoe members and an arcuate spring having spaced apart ends and arranged under compression in engagement with the inner surface of said friction shoe members for biasing said friction shoe members into frictional driving connection with said drum, means including a drive plate secured to said driven member arranged to apply force to said spring for transmitting torque from said driving member to said driven member through said spring, means including an inertia load release device including a plate member rotatably mounted on said driven member and arranged for mechanical connection with said spring for biasing said spring to a smaller diameter for

releasing the driving connection between said driving and driven members on sudden deceleration of said mechanism.

10. A driving mechanism including a driving member and a driven member adapted to be coupled by a slip clutch comprising a drum secured to said driving member, means including friction shoe members and an arcuate spring having spaced apart ends and arranged under compression in engagement with the inner surface of said friction shoe members for biasing said friction shoe members into frictional driving connection with said drum, means including a drive plate secured to said driven member arranged to apply force to said spring for transmitting torque from said driving member to said driven member through said spring, means including a spring release pin on each end of said spring and an inertia load release device including a plate member rotatably mounted on said driven member and arranged for engagement with said spring release pins for biasing said spring to a smaller diameter for releasing the driving connection between said driving and driven members on sudden deceleration of said mechanism.

11. A driving mechanism including a driving member and a driven member adapted to be coupled by a slip clutch comprising a drum secured to said driving member, means including friction shoe members and an arcuate spring having spaced apart ends and arranged under compression in engagement with the inner surface of said friction shoe members for biasing said friction shoe members into a frictional driving connection with said drum, a driving part on each end of said spring, a drive plate secured to said driven member, means including driving parts on said drive plate arranged to apply force to said spring driving parts for transmitting torque from said driving member to said driven member through said spring, means including an inertia load release device comprising a plate member rotatably mounted on said driven member and arranged for mechanical connection with said spring for biasing said spring to a smaller diameter for releasing the driving connection between said driving and driven members on sudden deceleration of said mechanism.

12. A driving mechanism including a driving member and a driven member adapted to be coupled by a slip clutch comprising a drum secured to said driving member, means including circumferentially spaced apart friction shoe members in said drum and an arcuate spring having spaced apart ends and arranged under compression in engagement with the inner surface of said friction shoe members for biasing said friction shoe members into a frictional driving connection with said drum, a driving part on each end of said

spring, a drive plate secured to the said drive member, means including driving parts on said drive plate arranged for mechanical connection with said spring driving parts for transmitting torque from said driving member to said driven member through said spring, means including a spring release pin on each end of said spring and an inertia load release device including a plate member rotatably mounted on said driven member and arranged for engagement with said spring release pins for biasing said spring to a smaller diameter for releasing the driving connection between said driving and driven members on sudden deceleration of said mechanism, said inertia plate member having an axially extending flange with guide openings therein through which said shoe members loosely extend.

13. A driving mechanism including a driving member and a driven member adapted to be coupled by a slip clutch comprising a drum secured to said driving member, means including friction shoe members and an arcuate spring having spaced apart ends and formed with a radial width which varies directly with the circumferential distance from the midpoint circumferentially of the spring and arranged under compression in engagement with the inner surface of said friction shoe members for biasing said friction shoe members into a frictional driving connection with said drum, a driving part on each end of said spring, a drive plate secured to said driven member, means including driving parts on said drive plate arranged for mechanical connection with said spring driving parts for transmitting torque from said driving member to said driven member through said spring, means including a spring release pin on each end of said spring and an inertia load release device including a plate member rotatably mounted on said driven member and arranged for engagement with said spring release pins for biasing said spring to a smaller diameter for releasing the driving connection between said driving and driven members on sudden deceleration of said mechanism.

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