Dec. 14, 1937. W. W. SLOANE 2,102,441

DRIVE MECHANISM

Original Filed July 5, 1935 2 Sheets-Sheet 1

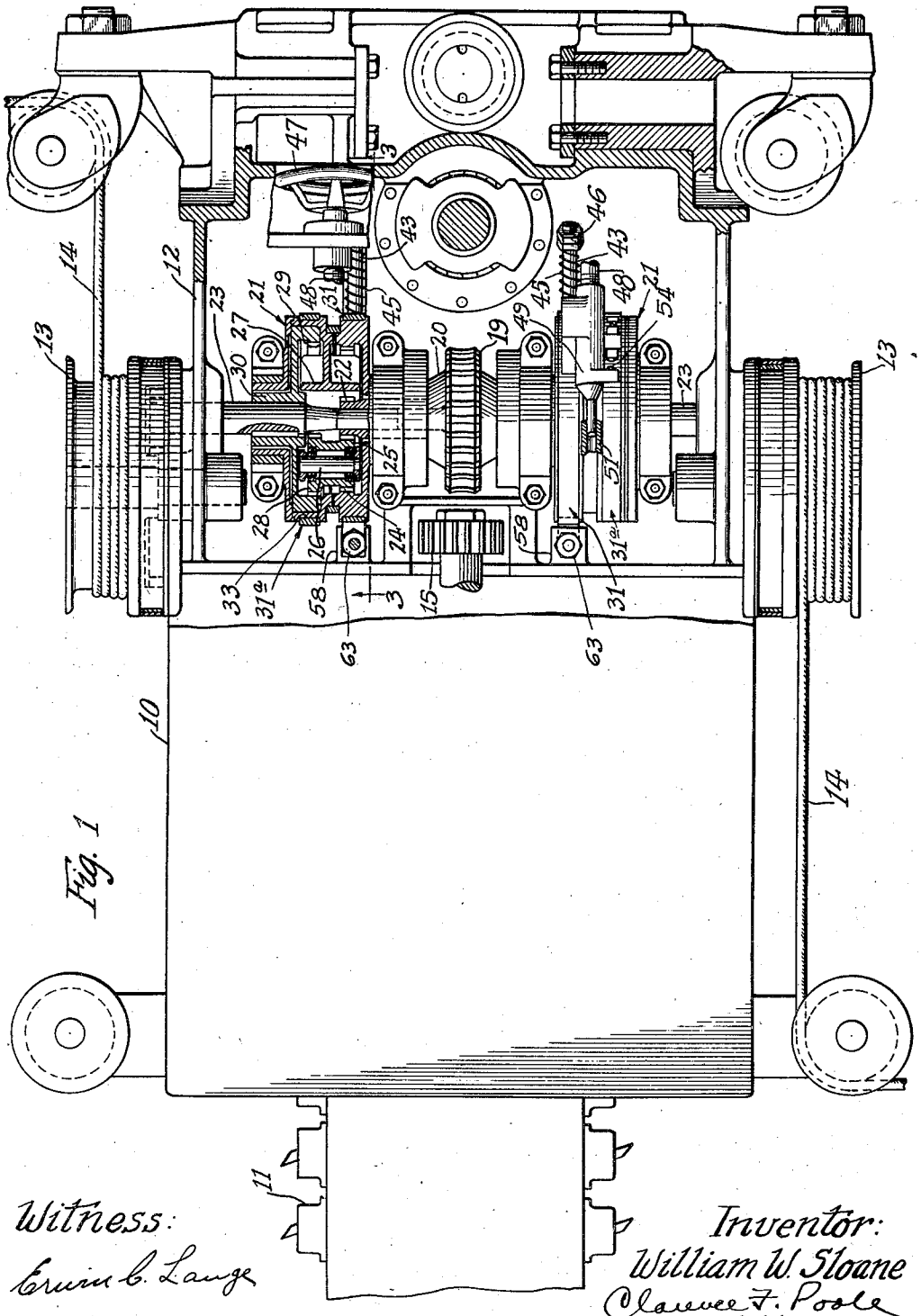

Fig. 1

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Original Filed July 5, 1935 2 Sheets-Sheet 2

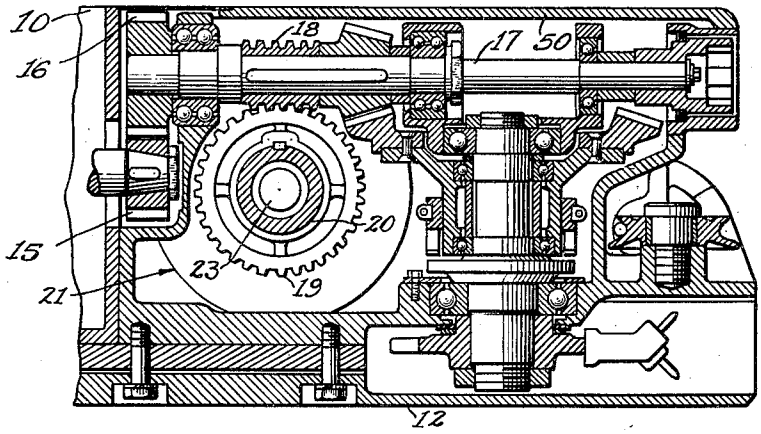

Fig. 2

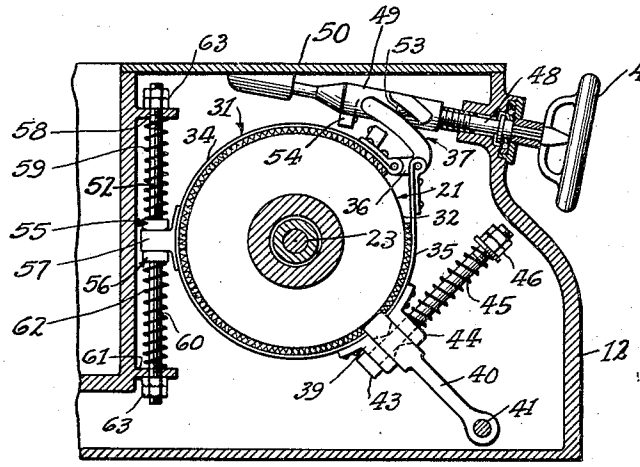

Fig. 3

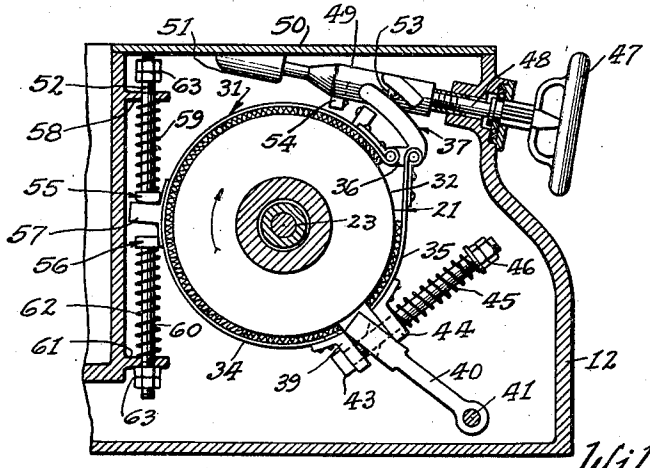

Fig. 4

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Patented Dec. 14, 1937 2,102,441

UNITED STATES PATENT OFFICE

2,102,441

DRIVE MECHANISM

William W. Sloane, Chicago, Ill., assignor to Goodman Manufacturing Company, Chicago, Ill., a corporation of Illinois

Application July 5, 1935, Serial No. 29,791
Renewed August 14, 1936

20 Claims. (Cl. 188—77)

This invention relates to improvements in drive mechanisms particularly adapted for use in mining machines and more particularly to a safety device for automatically releasing a variable feed mechanism upon a predetermined torque load thereon.

Among the objects of my invention are to provide a new and improved feed mechanism including a planetary geared variable feed drum so arranged that said drum may be released upon a predetermined torque load thereon and may resume its driving operation when the overload conditions subside. Another object of my invention is to provide such a device which is operative when the variable feed drum is rotating in either direction. Other objects of my invention will appear from time to time as the following specification proceeds.

My invention may best be understood by reference to the accompanying drawings wherein:

Figure 1 is a top plan view of a mining machine illustrating one form in which my invention may be embodied, with the gear cover removed and certain parts broken away and shown in horizontal section;

Figure 2 is a longitudinal vertical sectional view taken through the feeding mechanism of the mining machine;

Figure 3 is a vertical sectional view taken substantially along line 3—3 of Figure 1; and

Figure 4 is a sectional view somewhat similar to Figure 3, but with the release mechanism shown in a different position than in Figure 3.

In the embodiment of my invention illustrated in the drawings, my improved form of feed mechanism is shown as being incorporated in a mining machine of the room and pillar type. Said mining machine is of a construction similar to that illustrated in a prior Patent No. 2,075,370 which issued April 6, 1937, so will only herein be described insofar as is necessary to make my present invention readily understandable.

The main elements of the mining machine illustrated include a motor 10 and a chain carrying cutter bar 11 projecting forwardly therefrom, a frame 12 disposed rearwardly of said motor and a pair of independently operable feed drums 13, 13 disposed on each side of said frame. Said feed drums are each adapted to have a feeding cable 14 wound thereon and be trained therefrom to fixed abutments remote from the machine for sumping said cutter bar into the coal and moving the machine across the coal face in a manner well known to those skilled in the art.

The drive from the motor to the feed drums includes an armature pinion 15 meshing with and driving a spur gear 16 on a longitudinal shaft 17. Said longitudinal shaft besides forming a means for driving the feed mechanism also forms a means for driving the cutter chain about the cutter bar in a manner which will not herein be described since it is no portion of my present invention. A worm 18 is keyed on said longitudinal shaft and meshes with and drives a worm gear 19 on a sleeve 20 journaled in the frame 12 in a usual manner. The ends of said sleeve extend within a pair of parallel spaced variable feed drums 21, 21 which are herein shown as being planetary geared reduction devices. The ends of said sleeves have pinions 22, 22 formed integral therewith which serve as sun gears for said planetary geared reduction mechanisms.

The planetaries 21, 21 may be of any type well known to those skilled in the art, but as herein shown are of the plural speed frictionally controlled type so arranged that a pair of coaxial shafts 23, 23 may be driven independently of each other at either a high or a low frictionally controlled speed for independently driving the feed drums 13, 13 in the usual manner.

Each of said planetaries as shown in Figure 1, includes an internal gear 24 meshed with planetary pinions 25, 25 which are driven from the sun gear 22. Said pinions are journaled on shafts 26, 26 which are mounted within a cage 27. Planetary pinions 28, 28 are formed integral with the planetary pinions 25, 25 to one side thereof, and mesh with an internal gear 29. Said internal gear is provided with a hub 30 keyed to the shaft 23 for driving said shaft.

The internal gear 24 is so arranged that its outer periphery forms a drum 32 adapted to be engaged by a friction member, generally indicated by reference character 31, to hold said internal gear from rotation. A flange 33 extends outwardly from the cage 27 over the outer periphery of the internal gear 29, and the outer periphery of said flange forms another drum adapted to be engaged by a friction member, generally indicated by reference character 31*a*, for holding said cage from rotation.

When the cage 27 is held from rotation and the internal gear 24 is free to rotate, the internal gear 29 is driven through the sun pinion 22 and planetary pinions 25 and 28 for driving the shaft 23 at a relatively high frictionally controlled speed.

When the internal gear 24 is held from rotation, the planetary pinions 25, 25 orbitally move within

said gear and rotate said cage. The shaft 23 is in turn driven at a low frictionally controlled speed by the planetary pinions 28, 28 and internal gear 29.

The device of my invention is herein shown as being applied to the friction band 31 and the low speed drive connection only, although it may be applied to both high and low speed drive connections, and since the construction and operation of said low speed friction members on each of said drums is similar, one only will herein be described and shown in detail.

The friction member 31, as herein shown in Figures 3 and 4, includes a friction band 34 encircling a greater portion of the drum 32 forming the outer periphery of the internal gear 24, and another friction band 35 encircling a minor portion of said drum. One end of the friction band 34 is pivotally connected to the lower end of a lever arm 36 of an operating lever 37. The other end of said friction band has a drilled lug 39 extending outwardly therefrom which abuts a rocking member 40.

The rocking member 40 is pivoted in the frame 12 on a shaft 41 herein preferably shown as being disposed parallel to the shaft 23 and spaced rearwardly and downwardly from the drum 32 in such a manner that said rocking member extends radially with respect to the axis of rotation of said drum under ordinary operating conditions when there is no slippage between said drum and friction bands, as is illustrated in Figure 3. Said rocking member is drilled in alignment with the drilled portion of the lug 39 to receive a suitable bolt 43 extending through said lug and rocking member. The drilled portion of said rocking member tapers outwardly from the center thereof in opposite directions to permit rocking movement of said rocking member with respect to said drum. The bolt 43 also extends through a lug 44 abutting the opposite face of said rocking member and extending from one end of the friction band 35. A compression spring 45 encircles said bolt and abuts the outer face of said last-mentioned lug and is held on said bolt by means of a washer and lock nuts, indicated by reference character 46. Said compression spring is adapted to yield upon a predetermined load thereon to permit said rocking member to separate the ends of said bands and disengage them from the drum 32 upon movement of said bands with said drum, as is clearly illustrated in Figure 4.

The end of the friction band 35 opposite the lug 44 is pivotally connected to the operating lever 37 at a point spaced from the point of pivotal connection of the friction band 34 thereto, so that pivotal movement of said operating lever about its axis of pivotal connection to the friction band 34 in one direction will tighten said friction bands on said drum, and permit said friction bands to be disengaged from said drums when moved in an opposite direction.

The operating lever 37 is operated by means of a hand wheel 47 on the outer end of a threaded shaft 48 journaled within the main frame 12 and threaded within a threaded member 49. Said shaft and threaded member extend angularly upwardly towards a cover 50 for said main frame, and the forward end of said threaded member is slidably mounted within a bracket 51 depending from said cover. A lug 53 extends outwardly from one side of said threaded member and engages an arcuate engaging surface of the operating lever 37. Said arcuate surface extends along the band 34 at a suitable distance therefrom and generally conforms to an arc whose center is the center of rotation of the drum 32 when the friction bands 34 and 35 are tight on said drum. This permits automatic disengagement of said bands from said drum when said sleeve is in a stationary position and prevents said operating lever from tightening said bands on said drum when said bands have the tendency to rotate with said drums in a manner which will more clearly appear as this specification proceeds.

It should herein be noted that the friction member 31*a* is operated from the threaded member 49, by a lug 54 extending outwardly therefrom in an opposite direction from the lug 53, and that said lug is so positioned that said friction member will be released when the friction member 31 is applied and vice versa to prevent the internal gear 24 and cage 27 from being held from rotation at the same time.

The means for controlling release of the friction bands 34 and 35 from the drum 32, besides including the rocking member 40 and spring 45, includes a pair of opposed spring pressed members or plungers 55 and 56 abutting opposite faces of a lug 57 extending outwardly from the friction band 34 in a horizontal plane, as shown in Figure 3. The spring pressed plunger 55 includes a bolt 52 depending from a support bracket 58. A compression spring 59 encircles said bolt and is interposed between its head and the under surface of said support bracket for yieldably engaging said head with the upper face of said lug. In a like manner, the opposing spring-pressed plunger 56 includes a bolt 60 extending upwardly from a support bracket 61. A compression spring 62 encircles said bolt and is interposed between its head and the upper surface of said support bracket for yieldably engaging said head with the under surface of said lug. Tension of said springs may be adjusted by suitable lock nuts 63, 63 threaded on the ends of said bolts.

Since opposite faces of the lug 57 are engaged by opposed spring-pressed plungers in parallel planes, said plungers serve to hold the friction band 34 in position on the drum under normal conditions. When the torque load of the drum 32 increases a certain predetermined amount, determined by the tension of the springs in said spring-pressed plunger, said drum will rotate the friction bands 34 and 35 against one of said plungers depending upon the direction of rotation of the feed drum. When this predetermined load limit is reached and the drum 32 tends to rotate in a clockwise direction, as shown in Figure 4, the spring 59 will be compressed which will permit movement of the lug 57 in the direction which said drum tends to rotate. This will pivot the rocking member 40 and compress the spring 45 and spread apart the ends of the friction bands 34 and 35 for disengaging said bands from the outer periphery of the internal gear 24, as is clearly illustrated in Figure 4.

When the torque load on said drum decreases, the spring 59 will again move the lug 57 to a normal position and permit the brake bands 34 and 35 to be in an engaged position on said drum, the spring 45 closing the ends of said brake bands and the rocking member 40 returning to a normal position.

It should be noted herein that inasmuch as the outer face of the operating lever 37 is formed on an arc coaxial with the center of the shaft 26, that when the bands 34 and 35 are released, said lever will slide along the lug 53 and permit said

friction bands to be released from the outer periphery of said internal gear.

It should also be apparent that inasmuch as the construction of each spring-pressed plunger engaging the lug 57 is the same, and inasmuch as the loading of each of the springs in said plunger is the same, that the device of my invention is as effective when the variable feed drum is operating in one direction as in the other.

While I have herein shown and described one form in which my invention may be embodied, it will be understood that the construction and arrangement of the various parts may be changed or altered without departing from the spirit or scope thereof. Furthermore, I do not wish to be construed as limiting myself to the precise construction illustrated, excepting as it may be limited in the appended claims.

I claim as my invention:

1. In a power transmission device, a driven member, geared drive means for driving said member including a rotatable member, and means under the control of friction for automatically releasing said drive means upon a predetermined torque load on said driven member including a friction member engageable with said rotatable member, manually operable means for engaging said friction member with said rotatable member, a rocking member engageable with said friction member and having connection with said means for manually engaging said friction member with said rotatable member, and a yieldable member engaging said friction member and adapted to yield upon a predetermined torque load on said shaft and drum to permit said friction member to rock said rocking member and release said manual engaging means.

2. In a power transmission device, a driven member, a geared drive means for driving said member including a rotatable member, and means under the control of friction for automatically releasing said drive means upon a predetermined torque load on said shaft including a friction member engageable with said rotatable member, means for engaging said friction member with said rotatable member, a rocking member pivotally movable about a fixed axis and engageable with said friction member and having connection with said means for manually engaging said friction member with said rotatable member, and a pair of opposed yieldable members engaging said friction member, one of said members being adapted to yield upon a predetermined torque load on said shaft and rotatable member depending upon the direction of rotation of said driven member to permit said friction member to rock said rocking member and release said manual engaging means.

3. In a power transmission device, a driven shaft, geared drive means for driving said shaft including a drum, and means under the control of friction for automatically releasing said drive means upon a predetermined torque load on said shaft including a friction member engageable with said drum, manually operable means for engaging said friction member with said drum including a lever arm having pivotal connection with an end of said friction member, a rocking member pivotally movable about a fixed axis and having connection with the end of said friction member which is opposite its point of connection to said lever arm, a connection from said rocking member to said lever arm, and a yieldable member engaging said friction member adapted to yield upon a predetermined torque load on said shaft and drum to permit movement of said friction member to rock said rocking member.

4. In a power transmission device, a driven member, geared drive means for driving said shaft including a rotatable member, and means under the control of friction for automatically releasing said drive means upon a predetermined torque load on said shaft including a friction member engageable with said rotatable member, means for engaging said friction member with said rotatable member including a lever arm having pivotal connection with an end of said friction member, a rocking member pivotally movable about a fixed axis and having connection with the end of said friction member which is opposite its point of connection to said lever arm, a connection from said rocking member to said lever arm, and a pair of opposed yieldable members engaging said friction member, one of said members being adapted to yield upon a predetermined torque load on said rotatable member and shaft depending upon the direction of rotation of said shaft to permit movement of said friction member to rock said rocking member and disengage said friction member from said rotatable member.

5. In a power transmission device, a driven member, geared drive means for driving said member including a rotatable member, and means under the control of friction for automatically releasing said drive means upon a predetermined torque load on said shaft including a friction member engageable with said rotatable member, another friction member engageable with said rotatable member, manually operable means having connection with adjacent ends of said friction members for engaging said friction members with said rotatable member, a rocking member engageable with the ends of said friction members which are opposite their point of connection to said engaging means, and a yieldable member engaging said first-mentioned friction member and adapted to yield upon a predetermined torque load on said driven member to permit movement of said friction member, whereby said friction member may rock said rocking member and disengage said friction members from said rotatable member.

6. In a power transmission device, a driven member, geared drive means for driving said member including a rotatable member, and means under the control of friction for automatically releasing said drive means upon a predetermined torque load on said shaft including a friction member engageable with said rotatable member, another friction member engageable with said rotatable member, manually operable means having connection with adjacent ends of each of said friction members for engaging said friction members with said rotatable member, a rocking member engageable with the ends of said friction members which are opposite their points of connection to said engaging means, and a pair of opposed yieldable members engaging said first-mentioned friction member, one of said members being adapted to yield upon a predetermined torque load on said shaft and drum depending upon the direction of rotation of said shaft to permit movement of said friction member whereby said friction member may rock said rocking member and said rocking member may disengage said friction members from said rotatable member.

7. In a planetary geared reduction device, a driven member, a reaction member, means for

holding said reaction member from rotation and automatically releasing said reaction member upon a predetermined torque load on said driven member comprising a friction member engageable with said reaction member, manually operable means for engaging said friction member with said reaction member, a rocking member engageable with said friction member and having operative connection with said means for manually engaging said friction member with said reaction member, and a yieldable member engaging said friction member and adapted to yield upon a predetermined torque load on said driven member to permit said friction member to move and rock said rocking member and release said manual engaging member.

8. In a planetary geared reduction device, a driven member, a reaction member, means for holding said reaction member from rotation and automatically releasing said reaction member upon a predetermined torque load on said driven member comprising a friction member engageable with said reaction member, manually operable means for engaging said friction member with said reaction member, a rocking member engageable with said friction member and having connection with said means for manually engaging said friction member with said rotatable member, and a pair of opposed yieldable members engaging said friction member and adapted to yield upon a predetermined torque load on said driven member depending upon the direction of rotation of said driven member to permit said friction member to rock said rocking member and release said manual engaging means.

9. In a planetary geared reduction device, a driven shaft, a drum, means for holding said drum from rotation and automatically releasing said drum upon a predetermined torque load on said shaft comprising a friction band engageable with said drum, another friction band engageable with said drum, means for engaging said friction bands with said drum including a lever having pivotal connection with an end of said first band and an end of said second band at a point spaced from the point of connection of said first band thereto, a rocking member pivotally movable about a fixed axis and engageable with the ends of said bands opposite their point of connection to said lever, and a yieldable member engaging said first-mentioned friction band and adapted to yield upon a predetermined torque load on said shaft and drum.

10. In a planetary geared reduction device, a driven shaft, a drum, means for holding said drum from rotation and automatically releasing said drum upon a predetermined torque load on said shaft comprising a friction band engageable with said drum, another friction band engageable with said drum, means for engaging said friction bands with said drum including a lever having pivotal connection with an end of said first band and an end of said second band at a point spaced from the point of connection of said first band thereto, a rocking member pivotally movable about a fixed axis and engageable with the ends of said bands opposite their point of connection to said lever, and a pair of opposed yieldable members engaging said first-mentioned band, one of said members being adapted to yield upon a predetermined torque on said drum depending upon the direction of rotation of said shaft.

11. In a planetary geared reduction device, a driven shaft, a drum, means for holding said drum from rotation and automatically releasing said drum upon a predetermined torque load on said shaft comprising a friction band engageable with said drum, another friction band engageable with said drum, means for engaging said friction bands with said drum including a lever having pivotal connection with an end of said first band and an end of said second band at a point spaced from the point of connection of said first band thereto, a rocking member pivotally movable about a fixed axis and engageable with the ends of said bands opposite their point of connection to said lever, yieldable means engaging said ends of said bands with said rocking member, and a yieldable member engaging said first-mentioned friction band and adapted to yield upon a predetermined torque load on said shaft and drum.

12. In a planetary geared reduction device, a driven shaft, a drum, means for holding said drum from rotation and automatically releasing said drum upon a predetermined torque load on said shaft comprising a friction band engageable with said drum, another friction band engageable with said drum, means for engaging said friction bands with said drum including a lever having pivotal connection with an end of said second band at a point spaced from the point of connection of said first band thereto, a rocking member pivotally movable about a fixed axis and engageable with the ends of said bands opposite their point of connection to said lever, yieldable means engaging said ends of said bands with said rocking member, and a pair of opposed yieldable members engaging said first-mentioned band, one of said members being adapted to yield upon a predetermined torque load on said shaft and drum depending upon the direction of rotation of said shaft.

13. In a variable speed geared reduction device, a drum, means for holding said drum from rotation whereby said geared reduction device may act as a positive driving means comprising a friction band engageable with said drum, another friction band engageable with said drum, manually operable means for engaging said friction bands with said drum or releasing them therefrom, and means for automatically releasing said friction bands from said drum upon a predetermined torque load thereon comprising a rocking member engaging said friction bands, yieldable means for engaging said bands with said rocking member, and a yieldable member engaging one of said friction bands and adapted to yield upon a predetermined torque load on said drum to permit rotational movement of said band and drum and cause pivotal movement of said rocking member to disengage said bands from said drum.

14. In a variable speed geared reduction device, a drum, means for holding said drum from rotation whereby said geared reduction device may act as a positive driving means comprising a friction band engageable with said drum, another friction band engageable with said drum, manually operable means operatively connected with an end of each of said friction bands for engaging said bands with said friction drum or releasing them therefrom, and means for automatically releasing said friction bands from said drum upon a predetermined torque load thereon comprising a rocking member engaging the ends of said friction bands opposite their point of connection with said manual engaging means, yieldable means for engaging said rocking member with said friction bands, and a yieldable mem-

ber engaging one of said friction bands in a plane perpendicular to a radial line extending through the center of said drum, said yieldable member being adapted to yield upon a predetermined load on said drum to permit movement of said band and drum and effect pivotal movement of said rocking member to separate the ends of said bands and release said bands from said drum.

15. In a variable speed geared reduction device, a drum, means for holding said drum from rotation whereby said geared reduction device may act as a positive driving means comprising a friction band engageable with said drum, another friction band engageable with said drum, manually operable means for engaging said friction bands with said drum or releasing them therefrom, and means for automatically releasing said friction bands from said drum upon a predetermined torque load thereon when the variable speed device is rotating in either direction comprising a rocking member engaged by said friction bands, yieldable means for engaging said bands with said rocking member, and a pair of opposed yieldable members engaging one of said friction bands, one of said yieldable members being adapted to yield upon a predetermined load on said drum to permit movement of said band and drum and effect pivotal movement of said rocking member to separate the ends of said bands and release said bands from said drum.

16. In a variable speed geared reduction device, a drum, means for holding said drum from rotation whereby said geared reduction device may act as a positive driving means comprising a friction band engageable with said drum, another friction band engageable with said drum, manually operable means operatively connected with an end of each of said friction bands for engaging said bands with said drum or releasing them therefrom, and means for automatically releasing said friction bands from said drum upon a predetermined torque load thereon when the variable speed device is rotating in either direction comprising a rocking member engaging the ends of said friction bands opposite their point of connection with said manual engaging means, yieldable means for engaging said rocking member with said friction bands, and a pair of opposed yieldable members engaging one of said friction bands in a plane normal to the inner periphery thereof, one of said yieldable members being adapted to yield upon a predetermined load on said drum to permit movement of said band and drum and effect pivotal movement of said rocking member to separate the ends of said bands, and release said bands from said drum.

17. In a planetary geared reduction device, a driven shaft, a drum, means for holding said drum from rotation and automatically releasing said drum upon a predetermined torque load on said shaft comprising a friction band engageable with said drum, another friction band engageable with said drum, means for engaging said friction bands with said drum including an operating lever having one lever arm pivotally connected at one of its ends with an end of said first-mentioned band and with an end of said second band at a point spaced from the point of connection of said first band thereto, and another arm extending along said first-mentioned band in the same general direction as said band but spaced therefrom and having an arcuate engaging surface, means for engaging said arcuate engaging surface for pivoting said lever arm about its axis of pivotal connection to said first band, said means and said arm being so arranged as to prevent said means from pivotally moving said lever arm upon movement of said friction bands with said drum, a rocking member engageable with the ends of said bands opposite their point of connection to said operating lever, and a yieldable member engaging said first-mentioned friction band, said member being adapted to yield upon a predetermined torque load on said drum to permit limited rotation of said drum and band whereby said rocking member may separate the ends of said band with which it is engaged.

18. In a planetary geared reduction device, a driven shaft, a drum, means for holding said drum from rotation and automatically releasing said drum upon a predetermined torque load on said shaft comprising a friction band engageable with said drum, another friction band engageable with said drum, means for engaging said friction bands with said drum including an operating lever having one lever arm pivotally connected at one of its ends with an end of said first-mentioned band and with an end of said second band at a point spaced from the point of connection of said first band thereto, and another arm extending along said first-mentioned band in the same general direction as said band but spaced therefrom and having an arcuate engaging surface, means for engaging said arcuate engaging surface for pivoting said lever arm about its axis of pivotal connection to said first band, said means and said arm being so arranged as to prevent said means from pivotally moving said lever arm upon movement of said friction bands with said drum, a rocking member engageable with the ends of said bands opposite their point of connection to said operating lever, and a pair of opposed yieldable members engaging said first-mentioned friction band, one of said members being adapted to yield upon a predetermined torque load on said drum to permit limited rotation of said drum and band whereby said rocking member may separate the ends of said band with which it is engaged.

19. In a planetary geared reduction device, a driven shaft, a drum, means for holding said drum from rotation and automatically releasing said drum upon a predetermined torque load on said shaft comprising a friction band engageable with said drum, another friction band engageable with said drum, means for engaging said friction bands with said drum including an operating lever having one lever arm pivotally connected at one of its ends with an end of said first-mentioned band and with an end of said second band at a point spaced from the point of connection of said first band thereto, and means for automatically releasing said friction bands from said drum upon a predetermined torque load on said drum comprising a compression member engaging said first-mentioned friction band, said member being adapted to yield upon a predetermined load thereon, and a rocking member engaging the ends of said friction bands opposite their point of connection to said operating lever, compression means being provided for engaging said bands with said rocking member, said compression means being adapted to yield upon a predetermined load on said rocking member whereby said rocking member may rock and separate the ends of said bands upon yieldable movement of said first-mentioned compression member.

20. In a planetary geared reduction device, a driven shaft, a drum, means for holding said

drum from rotation and automatically releasing said drum upon a predetermined torque load on said shaft comprising a friction band engageable with said drum, another friction band engageable with said drum, means for engaging said friction bands with said drum including an operating lever having one lever arm pivotally connected at one of its ends with an end of said first-mentioned band and with an end of said second band at a point spaced from the point of connection of said first band thereto, and means for automatically releasing said friction bands from said drum upon a predetermined torque load on said drum comprising a pair of opposed compression members engaging said first-mentioned friction band, said members being adapted to yield upon a predetermined torque load on said drum when there is a tendency for said drum to rotate in either direction, a rocking member engaging the ends of said friction bands opposite their point of connection to said operating lever, and compression means engaging said ends of said bands with said rocking member, said compression means being adapted to yield upon a predetermined load on said rocking member whereby said rocking member may rock and separate the ends of said bands upon yieldable movement of one of said first-mentioned compression members.

WILLIAM W. SLOANE.