

Aug. 31, 1943.

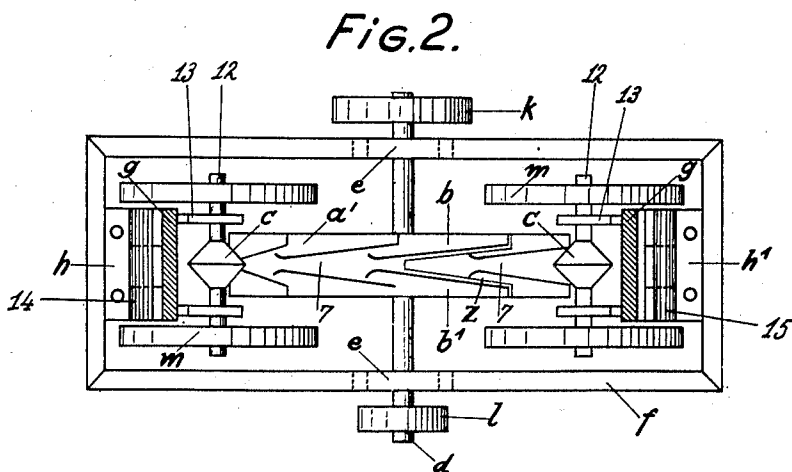
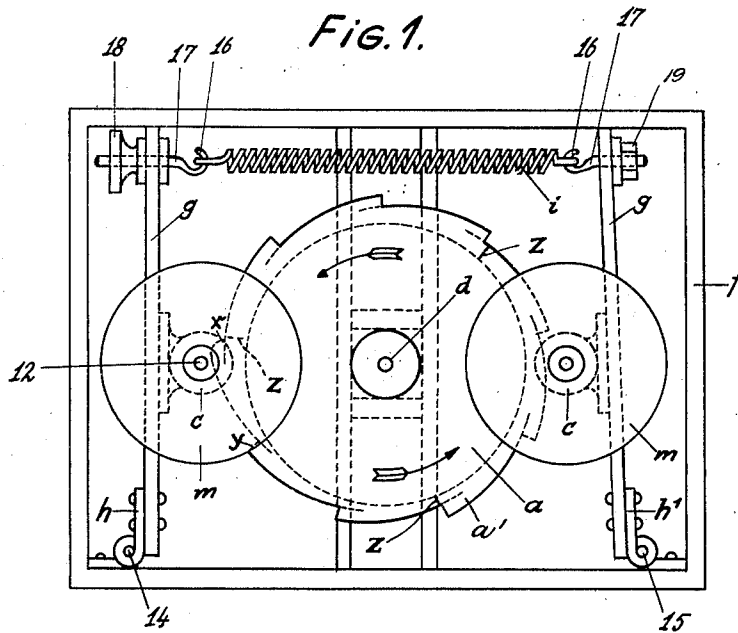
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2,328,501

MACHINE

Filed Dec. 9, 1939

4 Sheets-Sheet 1



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Fig. 3.

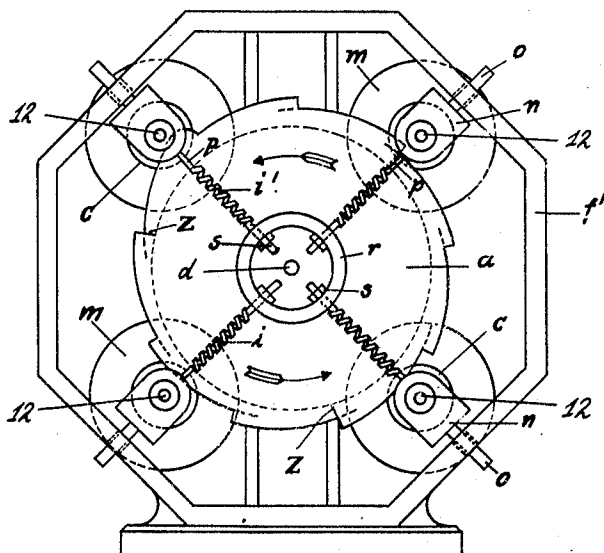
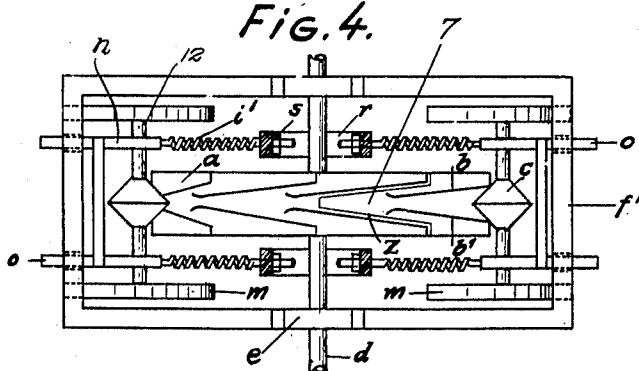


Fig. 4.



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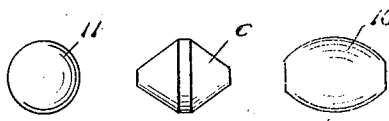


Fig. 5.

Fig. 6

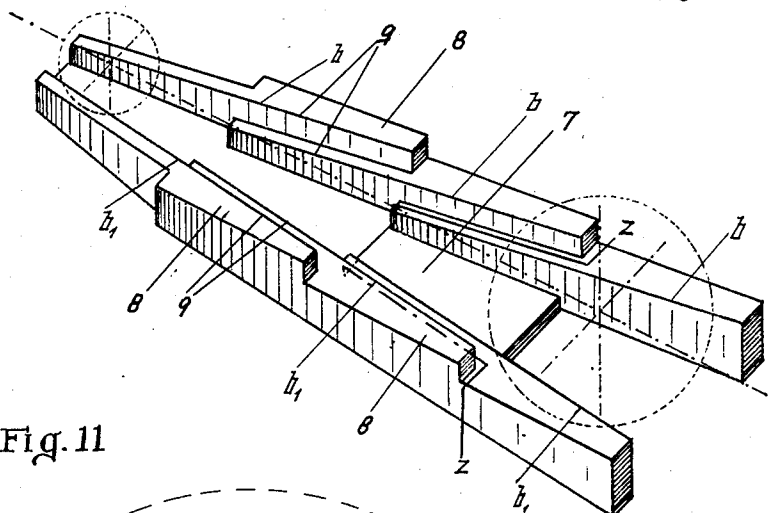


Fig. 11

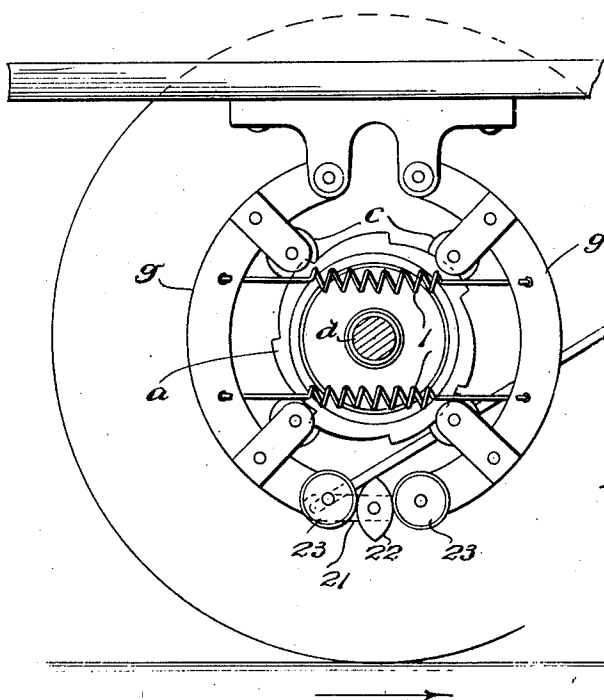
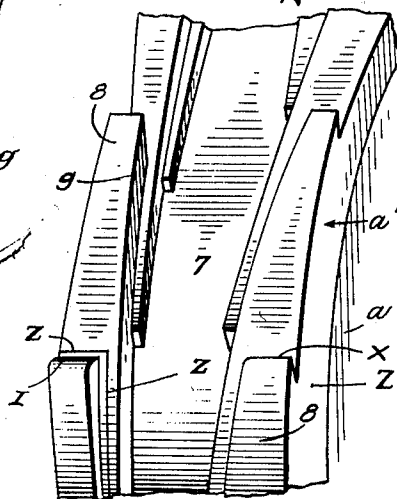


Fig. 2a.



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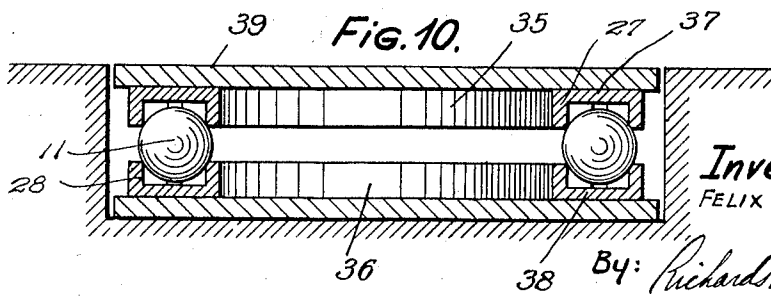
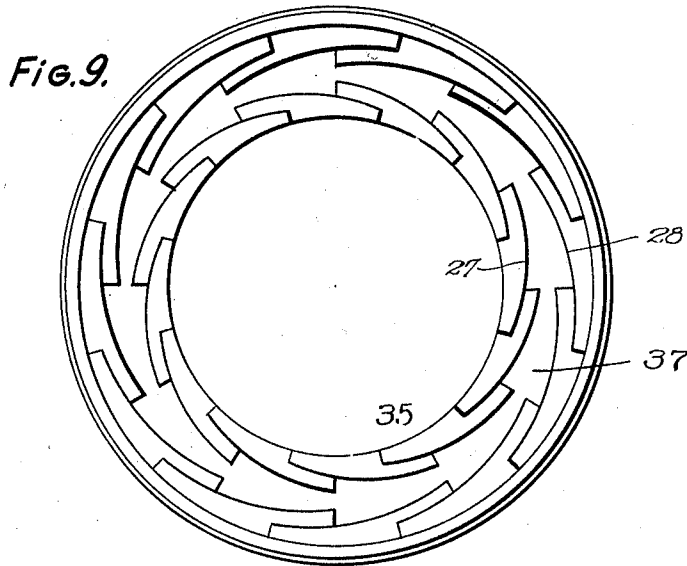
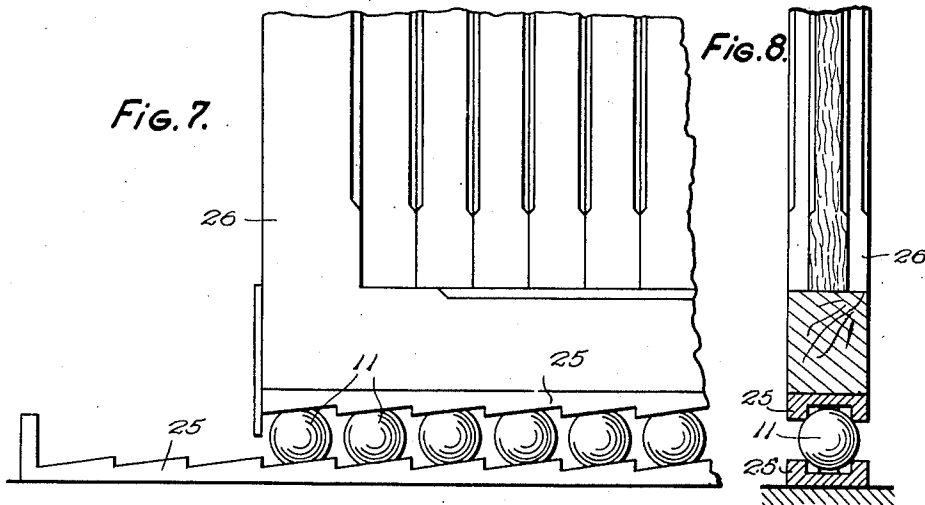
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,328,501

MACHINE

Felix Schanzer, Berlin, Germany; vested in the
Alien Property Custodian

Application December 9, 1939, Serial No. 308,410
In Germany December 29, 1936

1 Claim. (Cl. 74—393)

This invention relates to a machine, and refers more particularly to an auxiliary machine capable of use as a power-transmitting drive, a braking device, a bearing, or as a runway for sliding gates or rotary discs, and for other purposes.

An object of the present invention is the provision of an auxiliary machine of the described type which will afford an excellent transmission of forces and power and wherein frictional losses will be diminished to a considerable extent.

Other objects of the present invention will become apparent in the course of the following specification.

The United States Patent No. 2,153,028 issued April 4, 1939, describes a bearing the supporting rings of which comprise interengaging pairs of ribs or supports which carry the rolling elements of the bearing and which diverge in relation to the direction of movement of the rolling elements. Furthermore, these ribs or supports are upwardly inclined in relation to the direction of this movement, so that the rolling elements roll upon them in a manner which is similar to the movements of an upwardly rolling ball. The inclined and diverging ribs are so arranged that before a rolling element reaches the end of one pair of the ribs, said element will engage another pair of ribs.

In accordance with the present invention, the described runway for a rolling element is utilized as power-transmitting or supporting means for drives, brakes, sliding gates, rotary supports, and other machines. The objects of the present invention may be realized, therefore, by providing a rotary body, such as a rotary disc or a cylinder, with one or more runways described in the said patent and consisting of pairs of ribs at least some of which diverge and are inclined, preferably, upwardly in relation to the periphery of the supporting body, an end of each rib being situated intermediate the ends of a rib belonging to another pair of ribs. Rolling bodies which are in rolling engagement with said runway or runways are pressed against a runway or runways, preferably, by resilient means. Either the rotary body or the rolling bodies may constitute the driving elements of the machine.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings showing by way of example preferred embodiments of the inventive idea.

In the drawings:

Figure 1 is a side elevation of a machine having two rolling bodies;

Figure 2 is a top view partly in section, of the machine shown in Figure 1;

Figure 2a is a perspective view of a segment of the runway shown in Figs. 1 and 2;

5 Figure 3 shows in side elevation a machine having four rolling bodies, with some parts removed;

Figure 4 is a view partly in section, of the machine shown in Figure 3;

10 Figure 5 is a perspective view of a development of an annular runway with which the machines shown in Figures 1 to 4 are provided; and

Figure 6 shows three rolling bodies of different shapes.

15 Figure 7 shows in front elevation a part of a sliding door provided with rolling bodies.

Figure 8 is partly a side view and partly a vertical section through the device shown in Figure 7.

20 Figure 9 shows in side elevation a ball bearing provided with runways constructed in accordance with the present invention.

Figure 10 is partly a top view and partly a section through the device shown in Figure 9.

25 The machine shown in Figures 1 and 2 of the drawings comprises a rotary body *a*, which may have the form of a disc, drum, or wheel, and which may be made of steel, light metal or the like. The circumferential side surfaces of the rotary body *a* are provided with an annular runway *a'* which is shown in perspective development in Figure 5 of the drawings and which is described in greater detail in the said U. S. Patent No. 2,153,028. The annular runway *a'* is firmly mounted on the body *a*.

30 This runway comprises a plurality of pairs of ribs *b* and *b₁* which form interengaging pairs diverging in relation to each other and to the central axis of the rotary body. The rib of each pair constitutes a continuation of a rib of another pair and has an end which is situated intermediate the ends of that rib. The ribs enclose a groove 7 and the individual ribs may be upwardly inclined in relation to the periphery of the groove 7.

35 The closed annular runway constituted by the groove 7 and the ribs *b* and *b₁* is in engagement with rolling bodies *c*, shown in Figures 1, 2, and 6. It is apparent that the engagement of the rolling bodies *c* with the runway is such that the rolling bodies *c* contact only a part of the length of each pair of ribs in the course of their rolling, so that a rolling body will roll without jerks from one pair of diverging ribs *b*, *b₁* to another pair of diverging ribs *b*, *b₁* before it reaches the ends of the first-mentioned pair of

ribs, the two points of the rolling body which are first to contact the following pair of ribs being situated at a smaller distance from the center of the rotary body *a* than the axis of rotation of the rolling body.

The upper surfaces 3 of the ribs *b* and *b*₁ and their inner edges 9 are obviously not located at the same distance from the center of the body *a*; they may be of such curvature that the centers of a plurality of rolling bodies *c*, which are resiliently pressed against the runway and exert uniform forces upon it, describe a spiral path over a greater part of the circumference of the annular runway, for instance, over eight-ninths of the circumference, the spiral path converging toward the center of the rotary body *a*. The remaining part of the runway for instance, one-ninth of its circumferential length, is so formed that the rolling bodies *c* are caused to rise upwardly from the end of the spiral path of the beginning thereof. This shorter distance connecting the beginning and the end of the spiral path may be situated between the points represented by letters *x* and *y* in Figure 1. The ribs *b* and *b*₁ situated within that smaller portion of the circumferential length of the runway may be divergent; the rolling bodies which have approached closer to the center of the rotary body *a* at the point *x* are moved back to the point *y* of beginning of the spiral path upon these ribs. The ends of the ribs at the point *x* may be slightly curved instead of being rectangular, as shown in Fig. 2*a*, to facilitate the movement of the rolling bodies.

In order to facilitate mounting the runway *a'* is made of at least three parts which engage each other and the contacting surfaces of which extend in broken lines between the pairs of ribs, as indicated by the lines Z—Z in Figures 1 to 5. Then the edges of the contacting surfaces are out of contact with the rolling bodies while the bodies roll over the runway (Figs. 1 and 2).

In the construction shown in Figures 1 and 2, two rolling bodies *c* are situated diametrically opposite each other and on opposite sides of the center of the rotary body *a*. While any suitable number of rolling bodies may be used, it is advisable to provide an even number, and at least two rolling bodies *c*, which when situated diametrically opposite each other, will not exert eccentric pressures upon the shaft *d* of the rotary body *a*. The forces transmitted by the rolling bodies will then be similarly directed with reference to the rotary body *a*, so that these forces and the turning moments created thereby will be added to each other, thus increasing the turning moment acting upon the body *a*.

The rolling bodies *c* are carried by shafts 12, which are supported in bearings 13 firmly connected with substantially narrow elongated plates *g*. One end of a plate *g* is firmly connected with a smaller plate *h*. The plate *h* is pivotally connected at 14 to the casing *f* of the machine. The second plate *g* carrying the bearings for the second shaft 12 is firmly connected with a plate *h*¹, which is pivotally connected at 15 to the frame *f*. Due to this arrangement, the two plates *g* are situated on opposite sides of the rotary body *a* and may be inclined in a direction toward and away from the body *a*.

The two plates *g* are pressed in the direction of the body *a* by a coil spring *i*, the ends of which are carried by hooks 16 which form a part of bolts 17 extending through the plates *g* and carrying nuts 18 and 19. The nut 18 can be easily

turned upon the bolt 17, thus adjusting or regulating the force exerted by the spring *i* upon the plates *g*.

The coil springs *i* can be easily removed and replaced, whenever necessary.

The shafts 12 which carry the rolling bodies *c* are also provided with flywheels *m* situated in pairs on opposite sides of each rolling body *c* and used to assure the uniform operation of the device.

The rotary body *a*, which carries the runway *a'*, is firmly mounted upon the shaft *d* carried by the bearings *e* of the frame *f* and provided with pulleys *k* and *l*.

The rolling bodies *c* shown in Figures 1 to 4 and 6 have two outer conical surfaces. However, these rotary bodies may be conveniently substituted by barrel-shaped rolling bodies 10 or spherical bodies 11, shown in Figure 6.

If the machine is to be used as a transmission drive, then one of the pulleys *k* or *l* may be connected by an endless belt with a driving motor, not shown in the drawings. The rotation of the pulley is transmitted by the shaft *d* to the rotary body *a*, which should rotate in the direction of the arrows shown in Figure 1. Since the spring *i* presses the plates *g* in the direction toward the rotary body *a*, the rolling bodies *c* will be pressed against the runway and will be rotated by the rotary body *a*. The flywheels *m* will rotate along with the rolling bodies *c*. The flywheels *m* may operate as pulleys carrying belt transmissions or the like (not shown), which will transmit the rotation of the flywheels to any suitable devices.

Thus by means of the described machine the necessity of using gear drives is eliminated and yet a strong and firm connection between the runway and the rolling bodies is assured.

The machine illustrated in Figures 1 and 2 may be located vertically, horizontally, or in any intermediate position.

The machine shown in Figures 3 and 4 comprises four rolling bodies *c*, which are arranged around the rotary body *a*. The rotary body *a* is substantially of the same construction as the one previously described and is provided with a similar runway having diverging ribs *b* and *b*₁. The body *a* is carried by a shaft *d* which is mounted in bearings *e* firmly connected with a casing *f'*. As shown in Figure 3, the casing *f'* may be substantially octagonal in form.

The rolling bodies *c* of the machine shown in Figures 3 and 4 are mounted upon shafts 12, which are supported by bearings *n* and carry flywheels *m*. The bearings *n* are provided with pivots *o*, which extend through suitable openings formed in the casing *f'*. The pivots *o* can reciprocate freely within these openings. Due to this arrangement, the bearings *n* along with the shafts 12 and the rolling bodies *c* carried thereby may be moved radially in a direction toward and away from the center of the rotary body *a*.

The bearings *n* are firmly connected by the pins *p* with springs *i'*, which extend radially and the inner ends of which are attached by the nuts *s* to rings *r* which surround the shaft *d*. The nuts *s* may be used to vary the force of the springs *i'*. As shown in Figure 4, two rings *r* connected with separate sets of springs *i'* may be used, although obviously the number of the rings *r* may be conveniently diminished or increased. The rings *r* are freely suspended around the shaft *d* by the springs *i'*.

The operation of this machine is substantially similar to the one previously described. When a

driving force is to be transmitted by the rotary body *a* to the rolling bodies *c*, then a pulley (not shown) carried by the shaft *d* is connected with the driving means and the rotary body *a* driven by this pulley will transmit its rotation to the rolling bodies *c*, the flywheels *m* of which transmit the rotation of the bodies *c* elsewhere.

In Figures 7 and 8, the sliding door 26 carries the upper straight runway 25, while the lower straight runway 25 is attached to the floor. The rolling bodies 11 are located between the runways 25 to facilitate the movements of the sliding door 26.

The bearing shown in Figures 9 and 10 includes two discs 35 and 36 situated opposite each other. Each of the runways 27 and 28 consists of two parts. One part of the inner runway 27 is carried by the disc 35 and is connected by a web 37 with one part of the outer runway 28. The other part of the inner runway 27 is carried by the disc 36 and is connected by a web 38 with the other part of the outer runway 28. As shown in Fig. 10, the rolling bodies 11 may be used as a support for the disc 35 and the web 37 connected therewith. The illustrated bearing may be used for turning a plate 39 attached to the disc 35.

It is apparent that the specific illustrations

shown above have been given by way of illustration and not by way of limitation, and that the structures above described are subject to wide variation and modification without departing from the scope or intent of the invention.

What is claimed is:

A machine, comprising a rotary body, means connected with said body and rotatable therewith and constituting at least one annular runway comprising a plurality of pairs of ribs, a groove being formed between said ribs, an end of each rib being situated intermediate the ends of a rib belonging to another pair of ribs, said pairs of ribs diverging and being upwardly inclined in relation to the periphery of said groove; a plurality of rolling bodies adapted to be in rolling engagement with said runway, whereby said rolling bodies contact only a portion of each pair of ribs in the course of their rolling, a separate axle carrying each of said rolling bodies, a plurality of supports carrying said axles, a plurality of plates carrying said supports, means pivotally supporting some of the ends of said plates, and springs interconnecting other ends of said plates and causing said rolling bodies to press against said runway.

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