Nov. 11, 1947. H. B. WESSENGER 2,430,487

COMPENSATING ROLLER SUPPORT

Filed June 6, 1945 3 Sheets-Sheet 1

Fig - 1 -

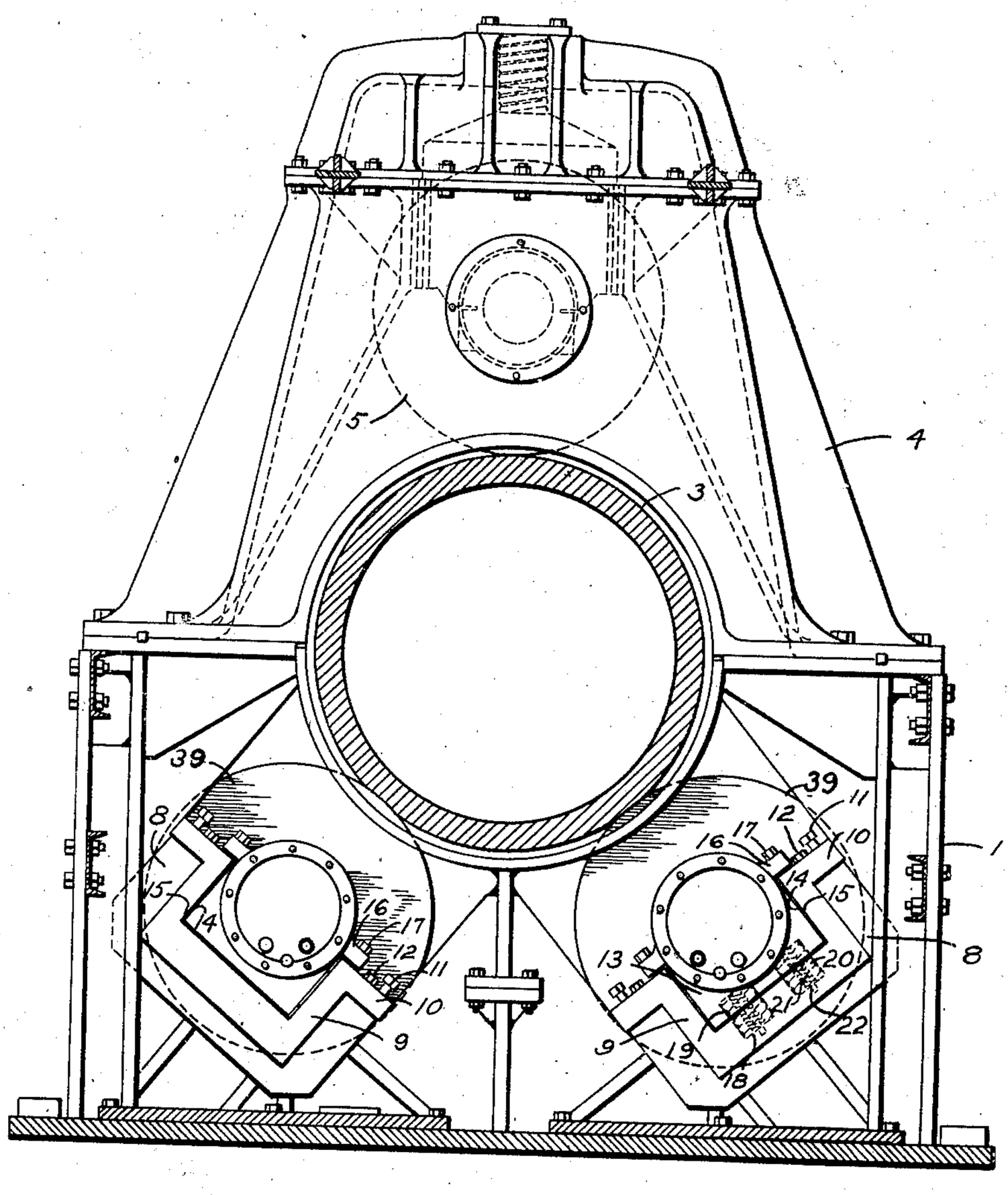

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Fig - 2 -

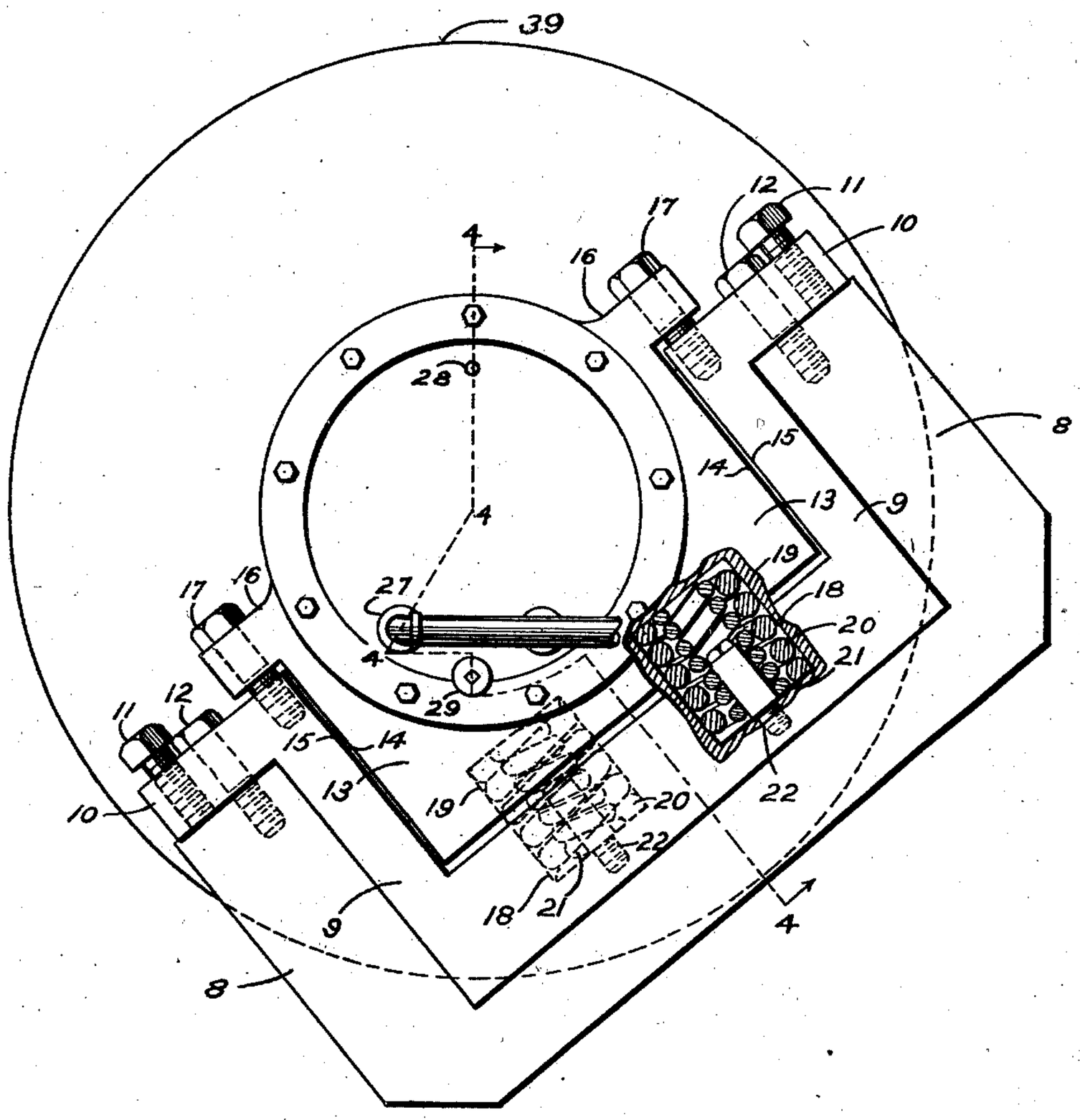

Fig - 3 -

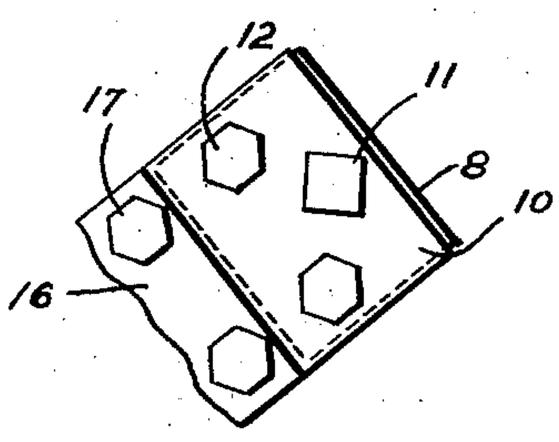

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Fig — 4 —

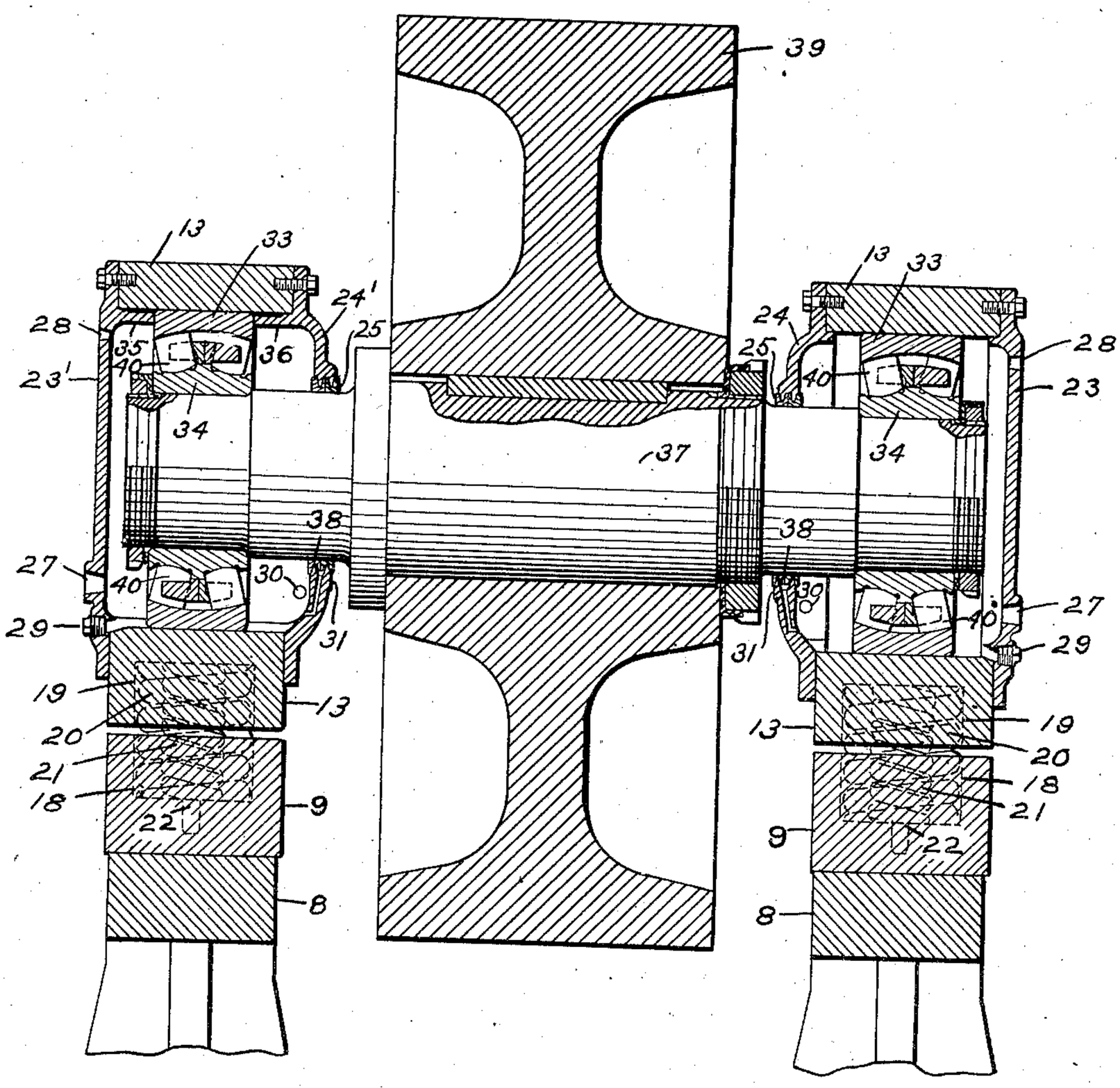
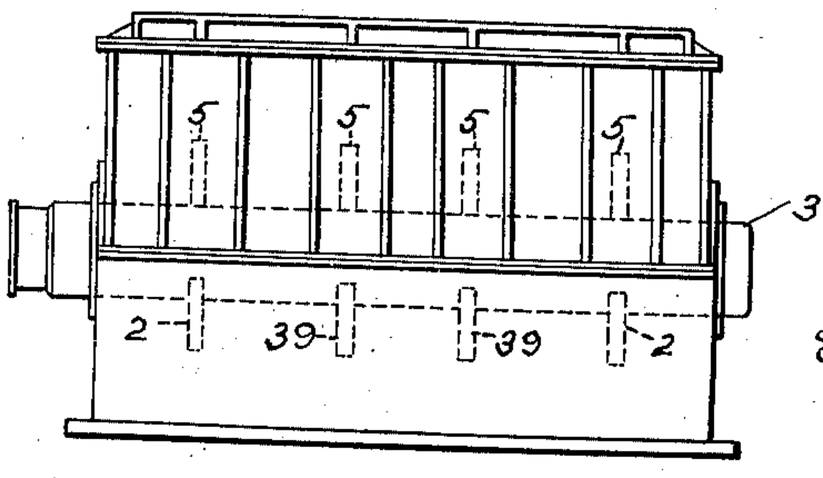


Fig — 5 —



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UNITED STATES PATENT OFFICE

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COMPENSATING ROLLER SUPPORT

Harold B. Wessenger, Medford, Mass.

Application June 6, 1945, Serial No. 597,927

3 Claims. (Cl. 308—203)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to a compensating roller assembly for supporting a rotating member.

In centrifugal casting machines for producing long cylindrical objects such as gun tubes, the rotor or mold is sometimes too long to retain its alignment when supported only at the ends, hence intermediate support is necessary. However, experience has shown that rigid supports are not practical since the expansion of the rotor or mold, as a result of heat absorbed from the molten metal supplied thereto, is not uniform throughout the mold length and circumference. The result is that the outside of the rotor changes in dimensions and configuration, the diameter and circumference increasing in the mid-section, sometimes in an irregular manner so that the perimeter of any particular section may not only be of increased dimension, but may also become eccentric with the axis of rotation.

It is, therefore, evident that any intermediate support must be of such character that it will automatically compensate for this expansion or eccentricity and retain the rotating member in axial alignment at all times.

Accordingly, it is a purpose of this invention to provide a compensating roller support device for a rotating member which is subject to change in dimensions and/or configuration, such compensating rollers being maintained in axial parallelism but in non-rigid relation to said rotating member. It is a particular purpose of this invention to provide a compensating roller support device for a rotating member which is subject to change in dimensions and/or configuration, such compensating rollers arranged to be adjusted in such manner that each carries an equal share of the load of the rotating member and the contents thereof.

The specific nature of the invention as well as other objects and advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawings in which:

Fig. 1 shows a vertical transverse section of a complete assembly.

Fig. 2 shows a transverse elevation section of a roller assembly.

Fig. 3 shows an adapter bolt arrangement.

Fig. 4 shows a longitudinal section through a roller assembly.

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Fig. 5 shows a schematic longitudinal elevation.

The invention is illustrated in connection with a centrifugal casting machine for gun tubes consisting of a base 1, on which are provided two pairs of axially-parallel, transversely-spaced end-support rollers 2 adjacent each end thereof and rotatably supporting a rotor or mold 3. A superstructure 4 is provided on base 1, as shown, and a single roller 5 is provided therein, centrally above and in transverse alignment with each pair of end support rollers. This single roller 5 is resiliently secured in superstructure 4 and arranged to bear downwardly against rotor 3 thereby maintaining the rotor in position on end-support rollers 2.

One or more pairs of compensating roller supports embodying this invention are provided intermediate the end-support rollers 2, such compensating roller supports comprising paired channels 8, intermediate the end-support rollers 2 and arranged in side by side relationship integral with base 1 and equally spaced below and on each side of rotor 3, with their floors perpendicular to a plane through the center thereof and the axis of rotation of the rotor.

Two U-shaped adapters 9 are provided in adjustable relationship in each channel, each adapter being provided with two shoulders 10 extending outwardly over the sides of channel 8. These shoulders are provided with two sets of bolts 11 and 12, one set 11 threadably engaged through shoulders 10 and bearing against the tops of the sides of the channels 8, the other set 12 slidably engaged through shoulders 10 and threadably engaged in the tops of channels 8, the two sets together providing means whereby adapters 9 can be adjusted toward or away from the axis of the rotor.

A housing 13 is slidably mounted in each adapter 9. Cooperating guides 14 on housing 13, and 15 on adapter 9 are provided to maintain housings 13 in alignment with adapters 9. Shoulders 16 are provided on housings 13 extending outwardly over the sides of adapters 9 and bolts 17 are provided in slidable engagement therethrough and in threadable engagement in the sides of adapters 9, whereby the housings 13 are secured in location in adapters 9.

Two cylindrical recesses 18 are provided in the floor of each adapter 9 and two cylindrical recesses 19 are provided in the bottom of each housing 13, each pair of recesses being in axial alignment. Nested helical springs 20 and 21 are provided in each pair of aligned cylindrical re-

cesses, and are arranged to exert a thrust stress therebetween, and hence between each adapter and its associated housing, stressing the housing toward the axis of the rotor. While in the preferred embodiment multiple nested springs of reverse hand are shown with a guide stud **22** secured in the axis of each recess, it is to be understood that the multiple spring construction was selected in this case because of the necessity for the natural frequency of the springs being greater than the R. P. M. of the rotor, in this particular application 1200 R. P. M. In applications where the R. P. M. of the rotor is substantially lower, it may still be necessary to use multiple springs because of the inherent difficulty of making springs of large cross-section.

These springs **20** and **21** provide a supporting thrust against housings **13** and are arranged so that with sliding housings **13** in median adjustment, the thrust just compensates the normal load of the fully loaded rotor.

As shown in Fig. 4, one of the housings **13** is provided with an outer and inner cover **23** and **24** respectively, while the other, and identical housing **13**, is provided with an outer and inner cover **23'** and **24'** having a variation to be described. Outer covers **23** and **23'** are arranged to provide a complete closure of the outer faces of housings **13**, whereas inner covers **24** and **24'** are each provided with a centrally located circular opening **25**. Outer covers **23** and **23'** are each provided with an oil connection **27**, a vent **28**, and a drain plug **29**. Inner covers **24** and **24'** are each provided with an oil connection **30** and a sealing ring **31** around opening **25**.

A roller bearing comprising an outer ring **33** and an inner ring **34**, together with rollers **40**, is provided in each housing, the outer ring in each case being slidably engaged therein. Cylindrical flanges **35** and **36** are provided on outer and inner covers **23'** and **24'** respectively, these flanges, when the covers are in the assembled position contact outer ring **33** of the included bearing and secure it in fixed location. The covers **23** and **24** on the other housing are not provided with flanges, hence the included bearing is free to move axially therein.

A short shaft or axle **37** is provided between each pair of bearings, the inner rings **34** being tightly secured on the end portions thereof. Axle **37** extends through openings **25** in inner covers **24** and **24'** and is provided with two sets of sealing rings **38** for association with rings **31** thereby completing the enclosure of housing **13**. A roller **39** is secured on the mid-portion of axle **37** by conventional means, and engages rotor **3** providing support thereto in the zone of contact.

An additional single resiliently mounted roller **5** is provided in superstructure **4** in vertical opposition to each pair of compensating rollers **39** to insure rotor **3** being retained in contact with compensating support rollers **39** during operation.

In setting up the casting machine, compensating roller supports are adjusted by means of adapters **9** so that the coercive thrust of springs **20** and **21** just compensates for the normal load of the fully loaded rotor. This may be accomplished by adjusting bolts **17** so that springs **20** and **21** are compressed to the desired load. Adapters **9** are then shimmed up till compensating rollers **39** firmly contact rotor **3** and one secured in adjustment by means of bolts **11** and **12**. Bolts **17** are then backed off an amount sufficient to permit free sliding motion of housing **13** through a range in excess of the expected variation in eccentricity or dimensions of rotor **3**.

In operation the rotor or mold **3** is rotated at the desired speed (1200 R. P. M. in this application) and the molten metal poured in by the usual means. As soon as molten metal has been introduced into the mold, heat transfer starts and the rotor begins to expand, often in an uneven manner, especially in the mid-portion. This uneven expansion leads to change in configuration as well as change in dimensions in the portion affected and thus results in eccentric rotation of the mid-portion. In this situation the compensating arrangement of the intermediate rollers comes into effect, enabling these rollers to support the rotor without bumping or hammering at the required high rotational speed.

It is thus apparent that this invention provides compensating support for the rotor of a centrifugal casting machine, such compensating support operating to rotatably and resiliently support the rotor, automatically compensating for eccentricity and/or variation in dimensions at the rotative speeds required for operation of such a centrifugal casting machine.

I claim:

1. In centrifugal casting machines for producing long cylindrical objects, the combination of a frame, a rotor member arranged to receive liquid metal for centrifugal casting thereof, said member subject to variation in eccentricity when in rotation, a roller mounted in the upper portion of said frame and arranged to bear resiliently against the outside surface of said rotor member, a pair of spaced compensating roller supports mounted in the lower portion of said frame and adapted to contact said rotor member in an isosceles relationship with said upper roller, and resilient means included in said roller supports, said means being adapted to be prestressed to the tension equal to the normal weight of said rotor member and the contents thereof, all adapted and arranged whereby said rotor member is rotatably and resiliently supported and automatically compensated for any eccentricity arising at the rotative speeds required for the operation of centrifugal casting machines.

2. In centrifugal casting machines for producing long cylindrical objects, the combination of, a frame, a rotor member arranged to receive liquid metal for centrifugal casting thereof, a roller mounted in the upper portion of said frame and arranged to bear resiliently against said rotor member, a pair of compensating roller supports mounted in the lower portion of said frame, each of said supports having a roller mounted thereon adapted to contact said rotor member in an isosceles relationship with said upper roller, each of said roller supports having a channel-shaped base integral with said frame, an adapter adjustably mounted within each of said bases, each of said adapters arranged to be adjusted towards or away from the axis of rotation of said rotor member, means for securing said adapters in the adjustment selected, a housing slidably mounted in each of said adapters, means for adjusting said housings towards or away from the axis of rotation of said rotor an amount sufficient to permit free sliding movement of said housings through a range in excess of the expected variation in eccentricity of said rotor member, and resilient means between said housings and adapters arranged to automatically compensate for the variation in eccentricity of said rotor by per-

mitting movement of said roller supports towards or away from the axis of rotation of said rotor.

3. The combination in claim 2 wherein said resilient means comprise, a pair of helical coil expansive springs arranged to exert a thrust stress against said channel-shaped base and towards the axis of rotation of said rotor, and wherein said resilient means are arranged to be prestressed an amount equal to the normal weight of said rotor and its load and maintained in said prestressed relationship by means of shims between said adapters and housings, all adapted and arranged whereby said prestressing assures equal distribution of load among said upper roller and said roller supports.

HAROLD B. WESSENGER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
351,279	Morell	Oct. 19, 1886
1,479,173	Cole	Jan. 1, 1924
1,642,834	Yeomans	Sept. 20, 1927
2,072,219	Robison	Mar. 2, 1937
2,316,827	Wessenger	Apr. 20, 1943