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TIMING GEAR-TRAIN ASSEMBLIES

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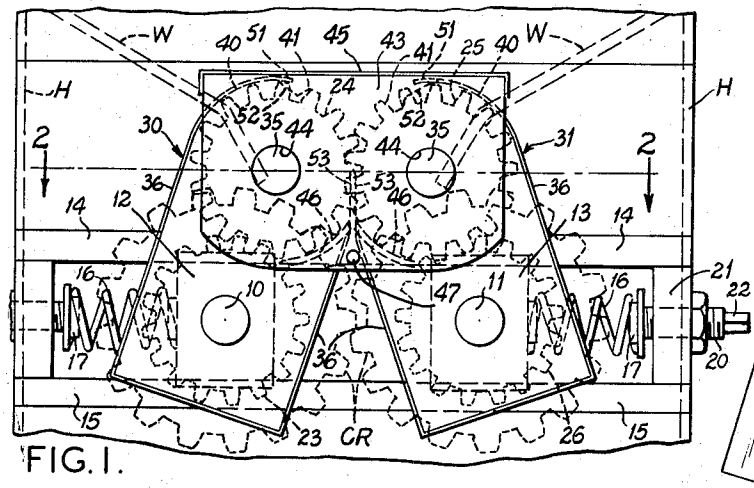


FIG. 1.

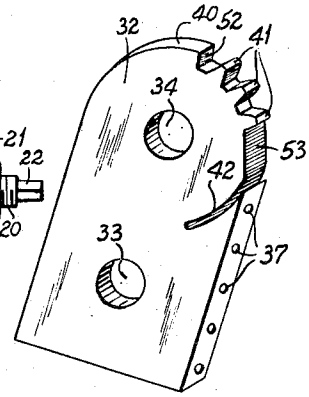


FIG. 4.

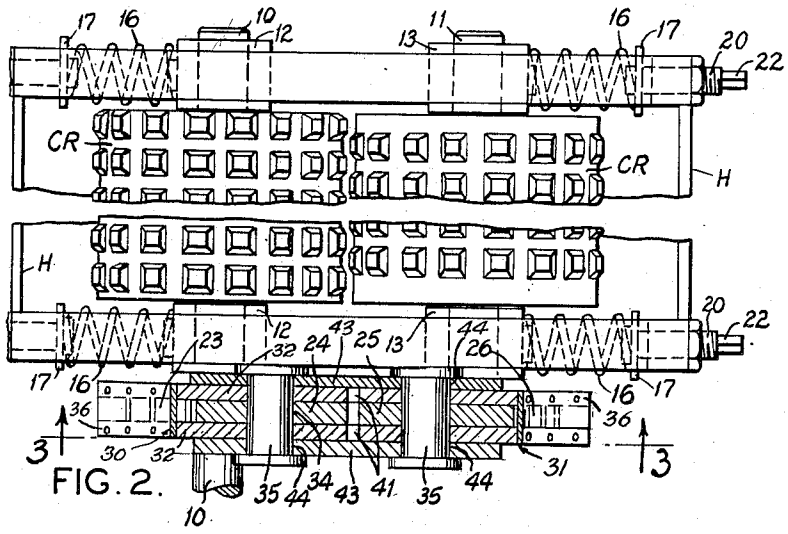


FIG. 2.

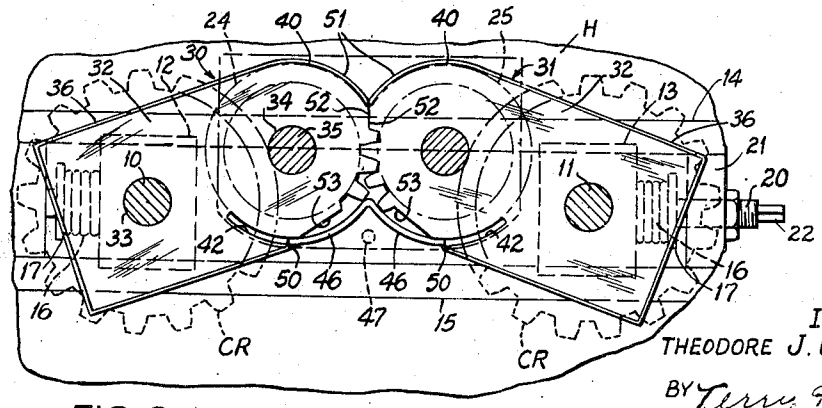


FIG. 3.

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TIMING GEAR-TRAIN ASSEMBLIES

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16 Claims. (Cl. 74—392)

This invention relates to improvements in timing gear-train assemblies, and more particularly to a gearing unit adapted for the timed operative interconnection of parallel shafts and elements rotatably carried thereby, which are subject to variable spacing, while required operatively to be kept in parallelism and in a definite phase relation at all times. For example, but without restriction, requirements for units embodying the present improvements exist in certain coal crushers, ice crushers and other rotatable material-processing equipment.

In roll type processing equipment involving the requirement of operation of a pair or more of parallel shafts which are subject to variable spacing according to the nature and load of material encountered, it is in many cases highly desirable and in some cases necessary, that special provision be made to assure a separating, translatory displacement of paired coacting rolls or rollers while maintaining their parallelism. When this requirement is complicated by the necessity of operation of the rollers in synchronism, or otherwise stated, in definite timed relation, there exists a need for a timing gear train interconnecting the rollers in such manner as to assure their relative displacement without impairment of accurate timing of the rolls. The requirements for successful realization of this result on a long term service-free basis, are further complicated by the necessity, as in the case of coal crushers for example, of assuring lubrication of the gearing at all times, and carefully excluding therefrom fine solids and the like which, if admitted to the gears, would cause rapid wear and failure of effective lubrication. It is accordingly a major and general objective of the present improvements to realize each of the purposes aforesaid, and to provide a fully enclosed, entirely shaft-supported, self-lubricated gear train which will automatically follow the movements of one or both of the shafts timed through the gear train.

A further important objective of the present improvements is realized in what may be termed a full-floating gear bracket assembly so arranged that the sections of the sectional gear box enclosing the gear train, may, when desired, be supported entirely by the shafting elements served thereby, without the requirement of added brackets, supports, guides or the like.

Yet a further object of importance is realized in a sectional gear train and gear box assembly, in which sections of the housing are articulately connected in such manner as to permit converging-diverging movements of the sections, responsively to spreading or converging movements of normally parallel shafts or rolls operatively connected through the gearing, while preserving at all times an accurately timed relation of the shafts.

An additional and highly important objective is realized in the attainment of improved lubricant sealing and retaining means in a gear and gear box assembly of jointed or articulate type, in which there is provided a positive operative interconnection between adjacent sections of the articulated assembly.

The foregoing and numerous other objects will more

clearly appear from the following detailed description of a presently preferred embodiment of the invention, particularly when the description is considered in connection with the accompanying drawing, in which:

Fig. 1 is a side elevational view, with certain parts broken away and other parts shown in dotted lines, of a coal crusher assembly to which the improved gear train assembly is applied;

Fig. 2 is a top or plan view with certain parts of the gear train assembly shown in section, of the crusher shown by Fig. 1;

Fig. 3 is a side elevational view of the gear train assembly and immediately appurtenant parts showing the parts of the gear train assembly as same would appear incident to extreme separation of the paired roll shafts served by the train, and

Fig. 4 is a perspective view of one of the gear box cover elements showing certain features for sealing of lubricant in the box, and certain features making for a positive operative connection between the major sections of the gear box.

Referring now by characters of reference to the drawing, the structure illustrated consists of a single stage coal crusher, but without limitation to any specific field of application. The crusher embodies a housing H, only portions of which are shown in dotted lines, and which is provided with a hopper or receiving throat including opposite downwardly sloped walls indicated at W serving to direct the coarse solid material into a zone between the two crusher rolls CR. In certain commercial embodiments, the crusher or sizing rolls CR are characterized by mutually interfitting projections and recesses in keeping with the subject matter of Letters Patent No. 2,578,540, issued to this applicant on December 11, 1951. In rolls of this and many other types, it is advisable and in some cases necessary, that the recesses of one roll are always presented directly opposite the coacting projections on the companion roll, thus necessitating an accurately-timed operative interconnection of the rolls.

The rolls CR are carried by a pair of normally horizontal shafts 10 and 11, journalled respectively in slidably and horizontally movable crossheads 12 and 13, the crossheads being mounted for movement in spaced horizontal guides 14 and 15 at the top and bottom respectively of each pair of crossheads.

Provision of the crosshead mounting for the rolls is necessitated by the fact that, particularly in the crushing of coal, extremely hard objects such as pieces of metal, and more often rocks or stones of a size far in excess of either the uncrushed or crushed coal, sometimes inadvertently find their way into the crushing zone. When such hard objects encounter the rolls, the rolls must spread to pass such foreign object in order to avoid breakage or other roll damage.

Provision for such spreading action consists of the crossheads 12—13 at each end of each of the roll shafts 10 and 11, the crossheads being normally positioned with the rolls in proper crushing relation, through a compression coil spring 16, one of which is shown as engaging each of the crossheads, the opposite ends of each of the springs being in abutting relation to an annular head 17 adjustably positioned through a jack screw 20 threadedly engaging a fixed portion of the frame of the crusher, such as a vertical member 21. The head of the screw is provided with a squared extension 22 through which a wrench or wheel applied thereto, may serve to adjust the individual compression springs.

Although for symmetry of showing, each of the roll shafts is shown as provided with a pair of the movable and adjustable crossheads, in many cases, particularly in a single stage crusher, one of the rolls and its shaft may

be fixed in position longitudinally of the crusher, with sole reliance on the yielding displacement of the companion shaft, to meet the requirement of relative separation of the rolls while maintaining their parallelism at all times, as well as their accurately timed rotative connection, by means later to be described. It is accordingly to be understood that despite certain description in the present specification and claims, the present improvements are equally applicable to, and equally comprehend arrangements in which both shafts, or alternately only one shaft, may be given a translatory displacement to avoid damage by objects of unusual hardness or dimension.

The exact form of enclosure or housing H, and the specific form assumed by the hopper or feed throat of the structure, will vary according to the field of usage and the relation of the crusher to conveying apparatus, for which reasons most of such structure is omitted from the drawing in the interest of clarity of illustration of the parts more particularly identified with the present improvements.

Proceeding now to the arrangement for keeping the shafts 10 and 11 in operatively timed relation under all conditions, irrespective of variation in spacing of the parallel rolls CR and their shaft elements 10—11, there is shown a gear train assembly consisting in the present example, but without limitation to exact number of gearing elements, of a first gear 23 carried by the shaft 10 and secured thereto as by a suitable key and keyway (not shown). Gear 23 is at all times operatively enmeshed with a gear 24 constituting a second gear of the train. The gear 24 likewise is at all times in mesh with the gear 25, and the latter with a final or fourth timing gear 26, gear 26 being keyed or otherwise securely attached to the shaft 11. Assuming the gears 23, 24, 25 and 26 to be of the same diameter and characterized by the same number of teeth it will be apparent that the two rolls CR will operate at identical speeds and in opposite directions, with the roll on shaft 10 moving clockwise (Fig. 1) and the roll CR on shaft 11 in a counterclockwise direction.

In the example illustrated the timing gear assembly is supported entirely by the two shafts 10 and 11 served thereby. The arrangement is such that the gear train assembly including the housing elements thereof thus constitutes a complete assembly of itself and may be considered as a package unit, susceptible of substantially complete assembly prior to application of the unit to the other elements of the crusher, and in the form shown, requiring only to be mounted over the ends of shafts 10 and 11 and keyed or otherwise attached thereto with the rolls in correct relative operating positions.

The housing structure forming a part of the gear train assembly and serving fully to enclose the timing gears, consists in effect of two gear boxes or gear box sections, one of which is generally indicated at 30, and the other of which is generally designated at 31. Since the two gear box sections are or may be substantially identical except with certain parts right and left reversed, a description of one thereof will suffice for both. Section 30 is comprised of an inner and outer side cover plate, one of which is shown by Fig. 4 and indicated at 32. Each cover plate is provided with a shaft opening 33 to accommodate one of the roll shafts, and a similar companion opening 34 to accommodate an idler or stub shaft 35, the stub shafts serving the intervening gears 24 and 25. The margins of the paired cover plates 32 of each gear box section such as 30, are enclosed by marginal strips or plates 36 attached as by screws (not shown), engaging tapped apertures 37 therefor in the plates 32. Each of the plates 32 is provided with a rounded outer margin 40 best shown by Fig. 4, a portion of which is formed to provide a series of gear teeth 41. The right and left hand arrangement of the cover plates on the two gear box sections 30 and 31 is such that corresponding plates of the two gear box sections are operatively enmeshed, as will be seen from Figs. 1 and 3. Further, each of the plates 32 is provided with an arcuate slot depthwise of the plate and indicated at 42, for a purpose later more fully appearing.

It will now have been noted that the two gear boxes or gear box sections 30 and 31 are open to each other in their adjacent end zones, in order to permit meshing engagement and operative connection between the intervening gears 24 and 25, shown in Fig. 1, with the section containing the first and second gears of the train, in a maximum converging relation with respect to the second gear box section 31, this latter serving as a housing for the gears 25 and 26.

It will now have become obvious that some means must be provided for completing the closure of the gear box sections in their otherwise open end zones. Such closure is cared for by a cover structure now to be described.

A pair of parallel plate elements, one of which is indicated at 43, are spaced apart just sufficiently to accommodate therebetween, with working clearances, the adjacent ends of the two gear box sections. The plates 43 are apertured as at 44 to receive the stub shafts 35. Bridging the upper margins of the plates 43 in the relation shown by Fig. 1, is a normally horizontal, planar member or plate 45, suitably attached to the adjacent edges of the plates 43. Thus the cover structure, consisting of the paired spaced plates 43 and the bridge plate 45, constitutes an inverted open end member of U shape in section.

Since it is highly desirable to provide for the retention of a fluid or semi-fluid lubricant, such as a suitable grease, in the articulated gear case assembly and about the train of gears therein, means are desirably provided for sealing the interfitting structure provided between the sections 30 and 31, incident to the pivotal movement of such sections relative to the cover 43—45. For this purpose there are provided a pair of divergent arcuate flanges 46 fixed in position between and bridging the opposite plates 43, each such arcuate flange 46 lying closely along the adjacent perimeter of one of the intervening gears 24 or 25. The side plates 43 are desirably slotted incompletely of their depth (not shown), to receive and position the arcuate flanges 46, and a tie bolt 47 (Fig. 3) together with the flanges 46 the plates 43—45 constitute a rigid open end cover.

Since in the assembly shown, the gear box sections 30 and 31 work inside of the cover, the plates 32 thereof are provided with the arcuate slots 42 above referred to. The width of these slots is such that they receive the flanges 46 with barely a working clearance between the parts, thus providing an effective lubricant seal between the cover and the two major gear case sections, in the slotted zones.

Further, in the zone adjacent the arcuate flanges 46, the marginal plate portions 36 along the adjacent peripheries of the major gear case sections, are provided at their extreme ends within the cover, each with an inturned lip 50 which if desired, may be characterized by a certain resilience, and engages the adjacent flange 46 in an edge-to-face relation, and in close wiping engagement, thus serving to constitute an effective grease seal in this zone.

The outside marginal walls of the sections 30 and 31 are provided with arcuate extensions 51 best appearing in Fig. 3. These curled portions are preferably made to exhibit a certain outward resilience, and so bear against the inside planar surface of the bridging plate 45 of the cover, thus providing a movable grease-sealing joint in this zone.

In Figs. 1 and 3 are shown the two major gear box sections first in a position of maximum convergence, i. e. with their major axes at a minimum angle, and in Fig. 3 in a position of maximum divergence of the sections. From a comparison of these views it will appear that each section is rotatable equally about an axis identified with the shaft 35 extending therethrough, thus provid-

ing a distinctly articulate gear box structure shown as having three jointedly connected parts, floatingly carried by the major shaft elements 10 and 11 free of engagement with the casing of the hopper.

It has been found advisable to provide limiting abutments or stops to establish a maximum permissive angularity between the sections 30 and 31. An upper pair of such abutments are shown in engagement in Fig. 3 and consist of shoulders 52, the nature of which best appears from Fig. 4. In the opposite extreme, i. e. with a maximum subtended angle between the sections 30 and 31, a pair of planar shoulders 53 (Fig. 4) abut each other to prevent any further diminution of spacing between the shafts 10 and 11, and hence between the rolls CR carried thereby.

Numerous possible refinements are omitted from the present disclosure in the interest of clarity. Among these may be mentioned the provision of grease fittings or threaded plugs (not shown) to facilitate the introduction of lubricant to the communicating gear case sections.

The various functional purposes and mode of operation of the assembly described are thought to have become fully apparent from the preceding description of parts and their individual functions, but it may be noted for completeness that, assuming power to be applied to the crusher assembly as through an extended driven shaft, shaft 10 of the present example, with a clockwise drive thereof as viewed in Figs. 1 and 3, the opposite roll on shaft 11 will be rotated counterclockwise so that the tops of the rolls approach each other toward the crushing zone. In the event of any inordinate crushing resistance resulting in separation of the parallel rolls against the loading of springs 16, whether a single pair or double pair thereof be provided, such separation of the rolls CR will result in an increase in angle between the major gear case sections 30 and 31, and of course likewise increasing the angle between the lines connecting the axes of gears 23 and 24 on the one hand, and 25 and 26 on the other.

It will be seen as possible that, unless the two components of the gear train are equally displaced, some disturbance of correct timing between the rolls CR, may take place. By reason of the compelled equal angular displacement of the two halves of the train, the rolls CR are maintained in a predetermined correctly timed relation under all conditions. But for some provision such as gear teeth 41 or an equivalent, in the event one of the sections 30 or 31 remained in a fixed position, while the angle or slope of the companion section is changed, the epicyclic movement of either of gears 24 or 25 about the other, would result in a rotation of one roll CR with respect to the other to destroy their timed relation.

In most installations, particularly as in a coal crusher, it becomes highly advisable in order to assure correct lubrication of the gears at all times, to enclose same as in the case or gear box sections described. However, in installations wherein the enclosure of the gears is not of importance, the same principles of structure may be involved, utilizing for example, only three connected gear mounting brackets which may take the form of plates, such for example as the two major elements 32 and a bridging element therebetween. Thus the gear box sections should be considered in a broad sense as gear mounting brackets, with the added advantages of enclosure under operating conditions where protection against dust and other solids, and retention of lubricant about the gears is desirable.

Although the invention has been described by particularized reference to a single preferred embodiment of the improvements, the detail recited should be understood solely in an instructive, rather than in any limiting sense, numerous variants being possible within the fair scope of the claims hereunto appended.

I claim as my invention:

1. In a machine embodying a pair of variably separable, parallel, rotatable shafts operable in mutually timed relation, gearing connecting the shafts for operation in timed relation throughout a substantial range of separation of the shafts, a bracket structure for positioning the gearing, the bracket structure including bracket sections carried by said shafts, said sections having interfitted portions, each of the bracket sections carrying an element of the shaft-interconnecting gearing, and a pair of said sections being connected for movement relative to each other in variably divergent relation.

2. In a timing gear assembly for the operative interconnection of paired, parallel, separable shafts to be kept in synchronism, a plurality of relatively movable gear supporting brackets, a train of gears supported by said brackets, and interconnecting said shafts, means providing a pivotal connection with a pair of said brackets, permitting relative movement thereof incident to relative approaching and separating movement of the shafts interconnected by the gear train, and means operatively interconnecting the said pair of brackets, and serving to prevent relative epicyclic motion of any gear with respect to a gear meshed therewith in the region of pivotal connection of the brackets with the first said means.

3. In a machine embodying a pair of parallel, variably separable rotatable shafts required to operate in mutually timed relation, a plurality of gears connecting the shafts in timed relation throughout a substantial range of separation of the parallel shafts, a three-section gear-supporting bracket, a pair of said sections being supported respectively by the parallel shafts, and having interfitted portions, and a third section constituting a pivotal connection with each of the aforesaid pair of sections, the said bracket sections being thus adapted to assume varying mutual angular relations incident to varying degrees of separation of the rotatable shafts.

4. In a machine comprising a pair of parallel coacting rolls operable in timed relation and subject to variable spacing while in parallelism, a shaft for each of said rolls, a plurality of timing gears constituting a gear train and interconnecting said rolls in timed relation at all times, a sectional articulate gear bracket serving with said shafts, to support the gear train, said bracket comprising a first section swingably carried by one of the roll shafts and constituting a journalling gear support, a second swingable section likewise serving as a journalling gear support and swingably carried by the companion roll shaft, means providing an interfitted connection between the first and second gears, and a third section pivotally connected at least to one of the sections aforesaid and coacting with each of the first and second sections to constitute the journalling support for certain of the gears of the train.

5. In a machine including a pair of parallel, variably separable coacting shafts, means for supporting said shafts in journalled relation while permitting a variable spacing between the shaft axes, a gear train interconnecting the shafts for operation in fixedly timed relation irrespective of variation in shaft spacing, a three-section bracket for the timing gear train, two of such sections being pivotally supported by the respective shafts, the two said sections having meshing portions, and a third section connected for swinging movement with each of the aforesaid sections in a manner to permit a variation in angularity between the sections incident to variation in spacing of the shafts.

6. The combination and arrangement of elements as recited by claim 5, but further characterized in that one of the said sections is supported solely by pivotal connection to the end of one of the roll shafts, a second such section solely supported by pivotal connection to the other said shaft, and an intermediate section floatingly supported by the sections aforesaid.

7. In an assembly for operatively interconnecting in timed relation, a pair of variably spaced, timed shafts, a train of timing gears including a gear mounted on each of said shafts and operatively intervening gears, a plurality of swingably connected gear-supporting bracket

sections arranged along and enclosing the gear train, the bracket sections being pivotally connected to the shafts by which the end gears of the train are carried, and lubricant-sealing means in the regions of connection of the swingable bracket sections to each other.

8. An articulated gear train assembly for connecting variably spaced, parallel shafts operating in mutually timed relation, said assembly including a gear train consisting of a plurality of gears, the final gears of which are connected to the shafts, two gear boxes each having one open end and respectively carried by the shafts, and a sealing cover structure pivotally connected to and overlying the open ends of said gear boxes, to constitute a gear casing serving the train, the parts of which are thus adapted to assume various relative angularities incident to approach and separation of the parallel shafts served thereby.

9. An enclosed gear train for interconnecting parallel, variably spaced, timed shafts, the train including a gear attached to each shaft served by the train, gears operatively intervening the shaft gears, a first gear box enclosing the gears at one end of the train, a second gear box enclosing the gears at the opposite end of the train, gear shafts bridging the walls of the gear boxes, the boxes being open to each other in a meshing zone of their respective gears, and a combined cover and sealing structure overlying said meshing zone, and coacting with the gear boxes to constitute a swing joint therebetween.

10. A gear train assembly for interconnecting parallel, variably spaced, timed shafts, the assembly including a gear attached to each shaft served by the train, gears operatively intervening the shaft gears, a first gear bracket carrying the gears at one end of the train, a second gear bracket supporting the gears at the opposite end of the train, gear shafts carried by the brackets, the brackets being interfitted to each other in a meshing zone of the gears on the respective brackets, and an operative connection between the adjacent ends of the brackets compelling a substantially equally swinging movement of the brackets and the gears thereon, incident to variation of spacing of the shafts served by the train.

11. In an enclosed gear train for interconnecting parallel, variably spaced, timed shafts, the train including a gear attached to each shaft served by the train and additional gears operatively intervening the shaft gears, a first gear box enclosing the gears at one end of the train, a second gear box enclosing the gears at the opposite end of the train, the gear boxes being open to each other in a meshing zone of their respective gears, means providing an interfitting connection between the adjacent ends of the gear boxes, and an operative connection between the said gear box ends, compelling a substantially equal and opposite swinging movement of the gear boxes and the gearing therein, incident to variation in spacing of the timed shafts.

12. The combination and arrangement of elements as recited by claim 11, but further particularized in that the connection between the gear box ends is constituted of meshing gear teeth respectively located in the end regions of the adjacent ends of the gear boxes.

13. In an enclosed gear train assembly for the operative interconnection of parallel, variably spaced, timed shafts, a train of gears including a gear attached to each shaft served by the train, additional gears operatively intervening the shaft gears, a first gear box enclosing the gears at one end of the train, a second gear box enclosing the gears at the opposite end of the train, the gear boxes being open to each other in a meshing zone of their respective gears, a cover element on each of said gear boxes, a sealing element overlying the adjacent ends of the gear boxes, an arcuate flange on one of said elements, an adjacent element being provided with an arcuate slot adapted to receive the flange to constitute a sealing connection between the elements, while permitting relative divergence and convergence of the gear boxes and gearing therein.

14. In a gear train assembly of enclosed type, for the operative and timed interconnection of a pair of parallel, variably spaced, operative shafts, a gear train constituted of meshing gears, the end gears of the train being attached to the respective shafts to be kept in timed relation by the train, said end gears consisting of a first and fourth gear of the train, a second and third gear operatively intervening said first and fourth gear, a gear box substantially enclosing and constituting a lubricant reservoir about the first and second gears, a similar gear box substantially enclosing the third and fourth gears of the train, each gear box including opposite side plates, corresponding plates of the gear boxes being provided with meshing gear teeth in the region of meshing engagement of the second and third gears of the train, each of the gear boxes having an end opening at the said meshing zone, a cover overlying the end regions of the gear boxes and portions of the second and third gears, gear shafts extending through the gear box plates and the cover, the cover including a substantially planar wall element, the inner end portions of the gear boxes having convex elements movable over said planar element to constitute a movable lubricant-sealing joint therewith, the cover in a portion opposite said plate being provided with a pair of divergent arcuate sealing elements, the gear box plates each having an arcuate slot for receiving, in working engagement, one of said arcuate flanges; each of the gear boxes having a marginal plate portion provided with an inturned margin, each margin engaging in slidable wiping relation an adjacent one of said arcuate flanges in lubricant-sealing relation, the shafts serving the second and third gears of the train constituting spaced pivots each fixed in position with respect to the cover element and about which the gear boxes are pivotally movable incident to diverging-converging movements of the gear boxes and gears therein, concurrently with changes in spacing of the paired shafts served by the train, and gear teeth on the gear boxes, acting to compel an equal swinging movement of the gear boxes and gears therein, incident to changes in spacing of the shafts served by the train.

15. In a gear train assembly of enclosed type, for the operative and timed interconnection of a pair of parallel, variably spaced, operative shafts, a gear train constituted of meshing gears, the end gears of the train being attached to the respective shafts to be kept in timed relation by the train, said end gears consisting of a first and fourth gear of the train, a second and third gear operatively intervening said first and fourth gear, a relatively rigid gear box substantially enclosing and constituting a lubricant reservoir about the first and second gears, a similar gear box substantially enclosing the third and fourth gears of the train, each gear box including opposite side plates, corresponding plates of the gear boxes being provided with meshing gear teeth in the region of meshing engagement of the second and third gears of the train, each of the gear boxes having an end opening at the said meshing zone, a cover consisting of an open-end, U shape structure overlying the end regions of the gear boxes and portions of the second and third gears, gear shafts extending through the gear box plates and the sides of the U shaped cover, and serving as supports for the second and third gears, the U shape cover including a substantially planar wall element bridging the side plates of the U shape member, the inner end portions of the gear boxes having arcuate convex elements movable over said planar element to constitute a movable lubricant-sealing joint therewith, the U shaped cover in a portion opposite said plate being provided with a pair of divergent arcuate sealing flanges, the gear box plates each having an arcuate slot for receiving, in working engagement, one of said arcuate flanges; each of the gear boxes having a marginal plate portion provided with an inturned margin, each margin engaging

in slidable wiping relation an adjacent one of said arcuate flanges in lubricant-sealing relation, the shafts serving the second and third gears of the train constituting spaced pivots each fixed in position with respect to the U shape cover element and about which the gear boxes are pivotally movable incident to diverging-converging movements of the gear boxes and gears therein, concurrently with changes in spacing of the paired shafts served by the train, and gear teeth on the gear boxes, acting to compel an equal swinging movement of the gear boxes and gears therein, incident to changes in spacing of the shafts served by the train.

16. In a machine including a pair of variably separable coacting shafts required to operate in mutually timed relation, gearing interconnecting said shafts, a bracket structure for supporting said gearing, the bracket structure including a bracket section pivotally carried by each

shaft, each of the said bracket sections carrying a gear element of the gearing, means interconnecting said sections for movement relative to each other in variably divergent relation, and means providing an interfitting connection between said sections to prevent relative epicyclic motion of the gear element carried by one bracket section with respect to the gear element meshed therewith and carried by the other bracket section.

References Cited in the file of this patent

UNITED STATES PATENTS

2,141,101	Webster	Dec. 20, 1938
2,640,371	Rosenleaf	June 2, 1953

FOREIGN PATENTS

563,684	France	Oct. 3, 1923