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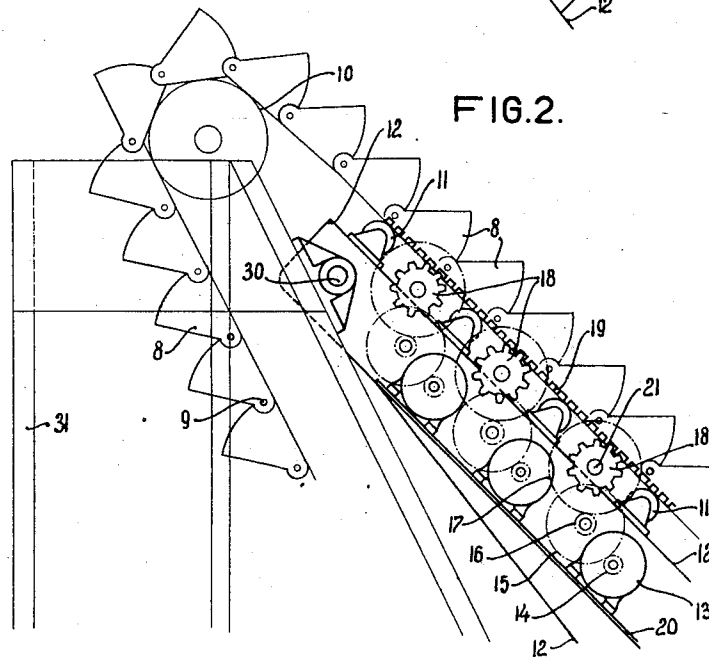
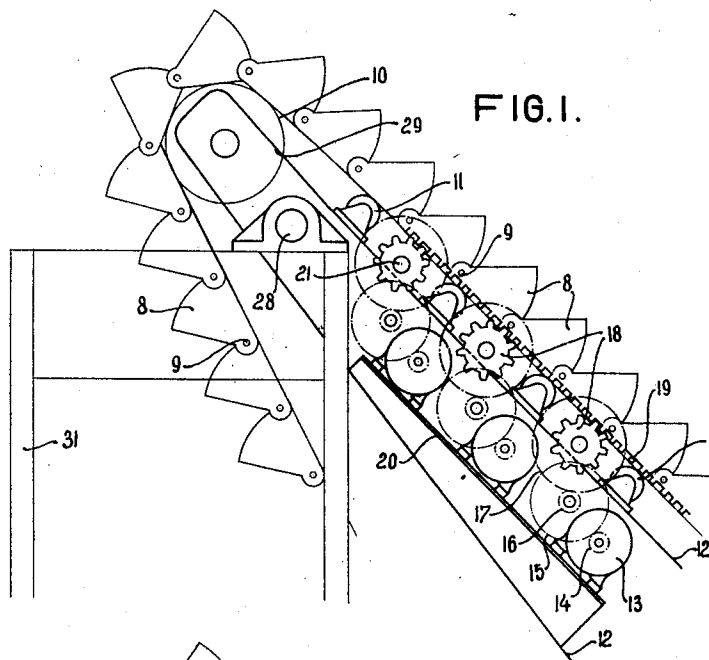
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H. A. J. DE B. NACHENIUS

DRIVING GEAR FOR THE BUCKET CHAINS OF DREDGERS

Filed Aug. 5, 1926

2 Sheets-Sheet 1



INVENTOR
H. A. J. DE BULL NACHENIUS

BY *Jno. J. J. J.*
ATTY.

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H. A. J. DE B. NACHENIUS

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FIG.3.

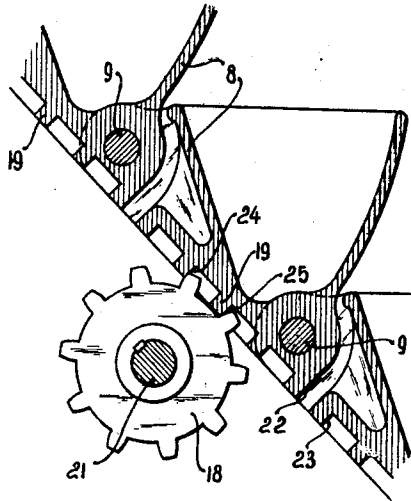


FIG.5.

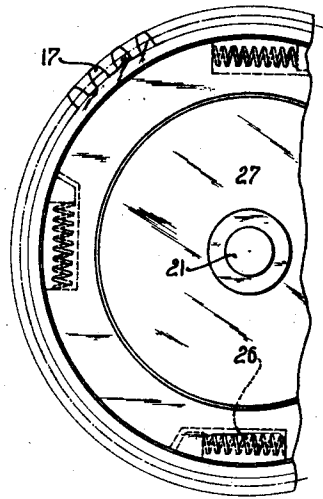
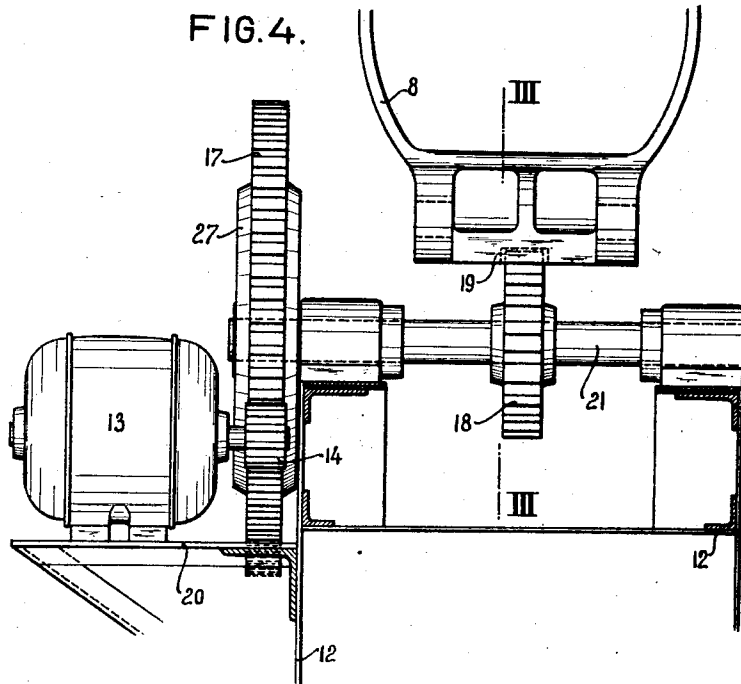


FIG.4.



INVENTOR
H. A. J. DE BULL NACHENIUS

BY *John L. Marie*
ATTY.

UNITED STATES PATENT OFFICE.

HENRI ARNOLD JOHANNES DE BIJLL NACHENIUS, OF HAARLEM, NETHERLANDS.

DRIVING GEAR FOR THE BUCKET CHAINS OF DREDGERS.

Application filed August 5, 1926, Serial No. 127,387, and in the Netherlands June 30, 1926.

The ordinary driving gear for the bucket chain of a dredger comprises a four, five or six sided drum, the so-called top tumbler, over which the chain runs, and a gear wheel mechanism for driving the tumbler shaft. Dredgers, which have to do heavy work, suffer from the rapid wear and tear of the tumbler and of the bucket chain, owing to the ordinary pulling forces and also the accelerating forces being so considerable, that the material used in the construction is overloaded. Moreover, the wear and tear of the pins tends to increase the pitch of the chain, whereby the parts are shifted relatively to one another and the wear is still further accelerated.

The object of the invention is to meet these disadvantages by the use of a construction other than the normal construction with a tumbler. In addition to attaining this object, the invention realizes still other constructional advantages, which will be explained after some embodiments of the invention have been described.

Figures 1 and 2 of the accompanying drawing illustrate more or less diagrammatically two embodiments of a driving gear in accordance with the invention.

Figure 3 is a section of a detail, on an enlarged scale.

Figure 4 shows a driving aggregate.

Figure 5 is a detail of the driving gear as per Figure 4.

Figures 1 and 2 illustrate the upper portion of a bucket chain, of which each link carries a bucket. In other dredgers there are fewer buckets, but the invention can be applied thereto as well. The bucket chain is composed of buckets 8, which are pivotally interconnected by pins 9. It runs over a top tumbler in the form of a roller 10, in the manner in which it is known to pass a bucket-chain over a roller at the lower end of the ladder, and it is further supported in the usual manner by guide rollers 11, the brackets of which are mounted on the ladder 12.

The bucket-chain is driven by three equal driving aggregates, which are independent of one another. Each driving aggregate comprises, as shown in Figures 1 and 2, an electric motor 13, a motor pinion 14, a transmission gear 15, a transmission pinion 16, a driving gear 17 and a driving pinion 18.

The latter cooperates with teeth 19, formed in the bucket backs. Consequently, the series of teeth 19 forms an endless rack. The motors and transmission gearings are mounted in a bracket, which is secured to the ladder 12 at the outside thereof. The driving shafts 21 are rotatable in bearing blocks also mounted to the ladder.

Also with this driving mechanism the pitch of the bucket chain will increase in the long run, owing to wear of the pins. To prevent the teeth 19 of the chain from running, as a consequence of the said fact, on the teeth of the driving pinions, the pitch between the tooth flanks 22 and 23 (Figure 3) may on purpose be made smaller than the normal pitch of the teeth of the chain, such as exists, for instance, between the tooth flanks 24 and 25. According as the pitch of the links increases owing to wear and tear, the magnitude of this intentionally made error diminishes. Therefore, although at the passing of the pitch 22—23 over the pinion the flank 23 will not at once catch a tooth of the pinion 18, this does not involve a serious disadvantage, since it is here a matter of an interval of $\frac{1}{8}$ second at the most. In this connection it may be observed that the driving aggregates are so spaced, that the discontinuities in the driving force do not occur simultaneously. There is an excess of driving force available, so that the momentary disengagement of a driving pinion does not matter. Provision may even be made of such a great number of small aggregates, that some of them may be thrown out. Assuming a motor to be out of order, so that the driving gear of its aggregate would have to be dragged, the chain may bump on the tooth heads of the pinion 18 concerned, and be lifted, whereas the remaining aggregates remain in normal operation.

In order that the bucket chain may not be lifted off the driving pinions 18 under the influence of the tooth pressure, the flanks of the teeth 19 are disposed at right angles, or approximately at right angles, to the pitch line.

It is essential that the flank 23 of each link be overtaken at a suitable speed by the coacting tooth of the pinion 18, but it is also desirable to prevent the pinion from suddenly racing when disengaging a flank 22.

Such racing would have a destructive influence on the edges of the teeth. For this reason the driving gear 17 is provided with a loose gear rim (Figure 5), which through springs 26 transmits the driving force of the pinion 14 (Figure 4) or 16 (Figures 1 and 2) to a disk 27 acting as a flywheel and secured to the shaft 21. The inertia of this disk prevents the pinion 18 from suddenly racing when disengaging the flank 22, but thereafter the disk and the pinion are nevertheless accelerated a little under the influence of the springs, so that the flank 23 is soon overtaken. The spring tension and the mass of the flywheel should be so chosen, that a smooth running and a low average tooth pressure are obtained. As the differences in dimensions, which in devices of this character are unavoidable in the long run, are distributed, as far as their effect is concerned, over a plurality of driving gears, irregularities are much less serious than with dredgers provided with a driven tumbler.

In accordance with Figure 1, the ladder 12 is rotatable about the ladder suspension shaft 28 and is provided with an upwardly projecting portion 29 supporting the shaft of the top roller 10. The upper part of the chain will therefore always have the same form, irrespective of whether the ladder is in its lowermost position as shown, or is hoisted. The portion of the bucket-chain between the top roller 10 and the uppermost driving aggregate is always kept suitably taut by the gravity pull of the lower part. According to Figure 2, the ladder is suspended from a ladder suspension shaft 30, whereas the top roller 10 is mounted with its bearing blocks on the main frame 31. With this construction the uppermost guide roller 11 is so located, that also in a higher position of the ladder a sufficient part of the weight of the chain will counteract forces that might tend to move the chain away from the guide rollers and the driving pinions. The chain teeth wear down relatively slowly, because their number is great with respect to the number of teeth of the pinions.

Abstracting from accidental details of the illustrated embodiments, it will be seen that the invention is broadly embodied in a bucket-chain, the stretched part (or a portion, the radius of curvature of which exceeds that of the bight over the top roller or tumbler) of which is acted upon by a driving gear, or, preferably, by a plurality of (i. e. at least two) independent driving aggregates which preferably are mounted on the ladder. The principle of the invention does not depend upon the employment of long links, or, for instance, upon the provision of one central series of teeth in the chain, or upon the form of the chain links and their connection with the buckets. The chain could very well be guided to form a slight curve,

whereby the force, which counteracts the tendency to lift the chain, is increased. The use of a plurality of driving aggregates, which act upon the more or less stretched part of the bucket-chain, has the advantage that the tumbler can be entirely dispensed with, at least as a driving element, so that the motion of the chain is much more uniform and the tensional stresses are reduced to a minimum where the curvature is maximum. But also the super-structure of the dredger may be much simplified. The main frame can be made lighter and less complicated, owing to the absence of the heavy driving mechanism and of the erection auxiliaries. The smaller aggregates substituted therefor can easily be mounted on one side or on both sides of the ladder. Repairs of these small aggregates can easily be carried out, because said aggregates are to a certain extent independent of the bucket-chain. Quite a number of simple constructions exist for quickly bringing the driving aggregates out of engagement with the chain, for instance, when a driving pinion is to be renewed. The system is especially suitable for electric drive, but it will be understood that belt drive could be used as well.

A ladder projecting above the ladder suspension shaft and provided at that projecting end with a tumbler or a roller, can be suitably used only in connection with the driving gear in accordance with the invention, because at the top there need be no driving gear at all. Consequently, this construction represents a further development of the invention.

The embodiment, in which the links are formed as racks, so that the pitch between two successive links is shorter than normal, is a sub-invention.

What I claim is:—

1. An endless bucket chain including links formed as racks, the pitch between the final tooth of one bucket rack and the initial tooth of the next bucket rack being normally less than the pitch of the remaining teeth of a bucket rack.

2. An endless bucket chain including links formed as racks, the pitch between the final tooth of one bucket rack and the initial tooth of the next bucket rack being normally less than the pitch of the remaining teeth of a bucket rack, and a plurality of independent driving aggregates cooperating with the teeth of the rack.

3. An endless bucket chain including links formed as racks, the pitch between the final tooth of one bucket rack and the initial tooth of the next bucket being normally less than the pitch of the remaining teeth of a bucket rack, a plurality of independent driving aggregates cooperating with the teeth of the rack, and means cooperating with the

driving aggregates to compensate for the reduced pitch of the adjacent teeth of the bucket racks.

5 4. An endless bucket chain including links formed as racks, the pitch between the final tooth of one bucket rack and the initial tooth of the next bucket rack being normally less than the pitch of the remaining teeth

of the bucket rack, a plurality of independent driving aggregates cooperating with the teeth of the racks, and a cooperating fly wheel including spring accelerating means to compensate for the shorter pitch. 10

In testimony whereof I affix my signature.

HENRI ARNOLD JOHANNES de BIJLL NACHENIUS.