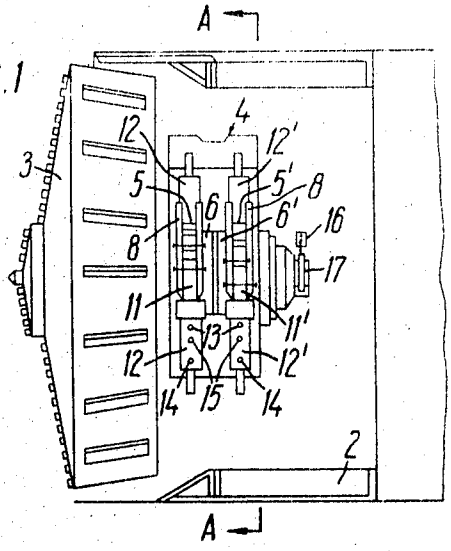
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DEVICE FOR DRIVING A WORKING MEMBER OF ROTARY TYPE IN A MECHANIZED DRIFTING SHIELD

Filed March 1, 1967

FIG. 1



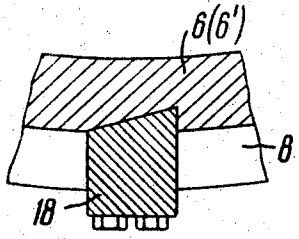


FIG. 3

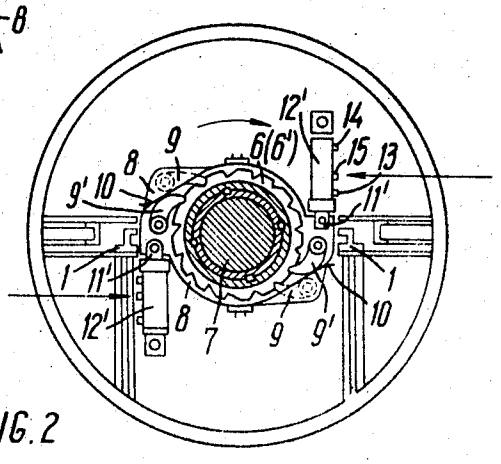


FIG. 2

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DEVICE FOR DRIVING A WORKING MEMBER OF ROTARY TYPE IN A MECHANIZED DRIFTING SHIELD

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ABSTRACT OF THE DISCLOSURE

A device for driving a working member of a rotary type therein comprising two pairs of double-action hydraulic cylinders and two ratchet-and-pawl mechanisms whose working or ratchet wheels are fixed on the shaft of the working member, each moving element of said mechanism comprisingly pawls pivotally attached to a pair of said cylinders which create a couple of forces transmitted through the ratchet and pawl mechanisms to the shaft of the working member.

The present invention relates to devices used in mechanized drifting shields for driving rotary type working members.

The working member of known drifting shields is imparted a rotary motion from an electric motor or a plurality of hydraulic motors through a reducing gear meshing with a toothed or pin wheel connected to said working member. It is known that the efficient mining of ground requires a substantial torque at the shaft of the working member which involves the application of high power motors.

These motors in conjunction with reducing gears have large dimensions. Therefore it is difficult to dispose them inside a drifting shield especially those employed for mining granular grounds, such as sand or sandy loam where it is necessary to apply high torques with low speeds of rotation of the working member.

The present invention provides for an improved construtcion of a device of small dimensions for driving the working member, permitting the obtention of substantial torque on the shaft of the working member.

According to the present invention, this is achieved by employing at least two pairs of double-action hydraulic cylinders and two ratchet-and-pawl mechanisms whose working or ratchet wheels are fixed on the shaft of the working member, each moving element of said mechanisms comprising pawls being pivotally attached to a pair of said cylinders which create a couple of forces transmitted through said ratchet-and-pawl mechanisms to the shaft of the working member. In order to obtain a continuous rotation of the working member, the pawls of each mechanism are displaced relative to each other in the direction of rotation of the ratchet wheels, for example, by a value of a tooth of the ratchet wheel, whereas each of said cylinders is provided with an additional hole in the middle part thereof for letting out the working liquid in order to create a difference of stroke speeds for said pairs of cylinders.

For reversing the working member of the device, it is provided with removable inserts put into tooth spaces of the ratchet wheels.

The present invention may be made more fully apparent from a consideration of the following description

of an exemplary embodiment, taken in conjunction with the appended drawings, in which:

FIG. 1 is a fragmentary side view of the mechanized drifting shield complete with a device for rotating the working member;

FIG. 2 is a section on the line A—A of FIG. 1;

FIG. 3 represents a scaled up fragmentary view of the working or ratchet wheel complete with a removable insert set into a tooth space thereof and designed for reversing the working member.

The rotary device 4 for rotating the working member 3 and two-ratchet-and-pawl mechanism 5 and 5′ (FIGS. 1 and 2) whose ratchet wheels 6 and 6′ are rigidly secured on the shaft 7 of said working member 3. Loosely mounted on each wheel 6 and 6′ are two cheeks 8 with pawls 9 and 9′ pivotally attached thereto, that are essentially moving elements of said ratchet-and-pawl mechanisms 5 and 5′. The pawls 9 and 9′ are pressed to the ratchet wheels 6 and 6′ by springs 10, said pawls 9 and 9′ of separate ratchet-and-pawl mechanisms 5 and 5′ being displaced relative to each other in the direction of rotation of the ratchet wheels 6 and 6′ (shown with an arrow in FIG. 2), for example, within a tooth of the ratchet wheel.

Pivotally attached to the cheeks 8 of each ratchet-and-pawl mechanism 5 and 5′ with their moving elements 11 and 11′ are two pairs of double-action cylinders 12 and 12′ operated turning and creating a couple of forces. The availability of at least two pairs of hydraulic cylinders 12 and 12′ is accounted for by the necessity of ensuring the continuous rotation of the working member 3.

Each hydraulic cylinder of said pairs of cylinders 12 and 12′, apart from the holes 13 and 14 for effecting idle and working strokes, has an additional hole 15 disposed in the middle part thereof (FIGS. 1 and 2) for letting out the working liquid passed, for example, through a throttle (not shown in FIG. 2). Thanks to the presence of the additional hole 15, it is possible to obtain a difference of stroke speeds for said two pairs of cylinders 12 and 12′ complete with moving elements 11 and 11′, which ensures the interception of a tooth by the pawls 9 and 9′ of the ratchet-and-pawl mechanisms 5 and 5′. This is accomplished in the following manner.

At a time when one of the two pairs of cylinders 12 and 12′ terminates its working stroke, another pair disengages and begins an idle stroke. During the operation of the first pair of cylinders, say the pair of cylinders 12, the second pair of cylinders 12′, having completed an idle stroke, comes into its initial position for the beginning of motion and rests therein unmovable until the tooth spaces of the ratchet wheel 6′ arrive in conjunction therewith and the pawls 9′ of the ratchet-and-pawl mechanism 5′ engage them. Then the second idle pair of cylinders 12 starts the forward stroke. In such a way both pairs of cylinders 12 and 12′ operate together for some period of time.

At that time the pistons of the first operating pair of cylinders 12 pass the additional holes 15 through which a portion of the working liquid is removed resulting in a deceleration of the stroke speed of the moving elements 11 of the pair of cylinders 12 and providing thereby the difference of stroke speeds for both pairs of cylinders 12 and 12′.

The pawls 9′ of the ratchet-and-pawl mechanism 5′ catch up with the teeth of their ratchet-wheel 6′, and for a certain period of time the second pair of cylinders 12′ operates together with the first pair of cylinders 12 imparting the rotation to the shaft 7 of the working member 3 through the ratchet-and-pawl mechanism 5 and 5′. From then on the first pair of cylinders 12 is switched over for an idle stroke, and the pawls 9 disengage teeth of the ratchet wheel 6, whereas the second pair of cylin-

ders 12' makes the working stroke, thus continuing to rotate the shaft 7 of the working member 3. The cycle is repeated thereupon resulting in the continuous rotation of the working member 3.

The proposed gearing diagram of rotation of the working member 3 permits the interception of teeth of the ratchet wheels 6 and 6' through an acceleration at the beginning of the motion of one pair of cylinders relative to another pair of cylinders whose speed at the given moment remains constant.

The operation of the pairs of cylinders 12 and 12' is controlled through a slide-valve switchgear 16 (FIG. 1) actuated by means of shaped cams 17, for example, mounted on the shaft 7 of the working member 3.

Reversal of the working member 3 is accomplished by the aid of removable inserts 18, for example (FIG. 3), put into tooth spaces of one or two ratchet wheels 6 and 6' and secured to cheeks 8 of the ratchet-and-pawl mechanisms. In this case, the moving elements 11 and 11' of the pairs of cylinders 12 and 12' should be placed into the extreme exposed position thereof, and the rotation of the working member 3 be accomplished due to the reversing stroke of the cylinder 12 and 12'. The working member 3 may be also reversed by the aid of additional pawls (not shown) arranged between the cheeks 8 and directed backwards with respect to the pawls 9 and 9'.

In conformity with the present invention, the above described construction ensures the reliable operation of the working member in grounds ranging from those of a medium hardness to granulated ones, providing thereby sufficient torque at preset speeds of rotation of the working member.

What is claimed is:

1. In a mechanized drifting shield, a device for rotating the working element of a rotary type, which comprises: a shaft on which said working element is secured, two

ratchet-and-pawl mechanisms, each of which is provided with a working wheel rigidly secured on the shaft of said working element, and a movable part interacting with said working wheel, ratchet pawls of said ratchet mechanisms taken individually pivotally attached to the moving parts of said mechanisms, the ratchet pawls of one ratchet mechanism being mutually displaced relative to the pawls of the other mechanism in the rotation direction of said working wheels, at least two pairs of double action hydraulic cylinders, the moving elements of each being jointly connected with said movable part of said ratchet-and-pawl mechanisms in such a way, that in their forward motion they create a couple, said hydraulic cylinders being provided with holes for delivery and draining of working fluid, and an additional hole in the middle part for letting out the working fluid in order to create a difference of stroke speeds for the said pairs of the cylinders to ensure the continuous rotation of the working element.

2. A device for driving a rotary-type working member as claimed in claim 1, which is provided with removable inserts secured on the movable portions of said ratchet-and-pawl mechanisms and entering the recesses of the working wheels thereof to reverse the working member.

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U.S. Cl. X.R.

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