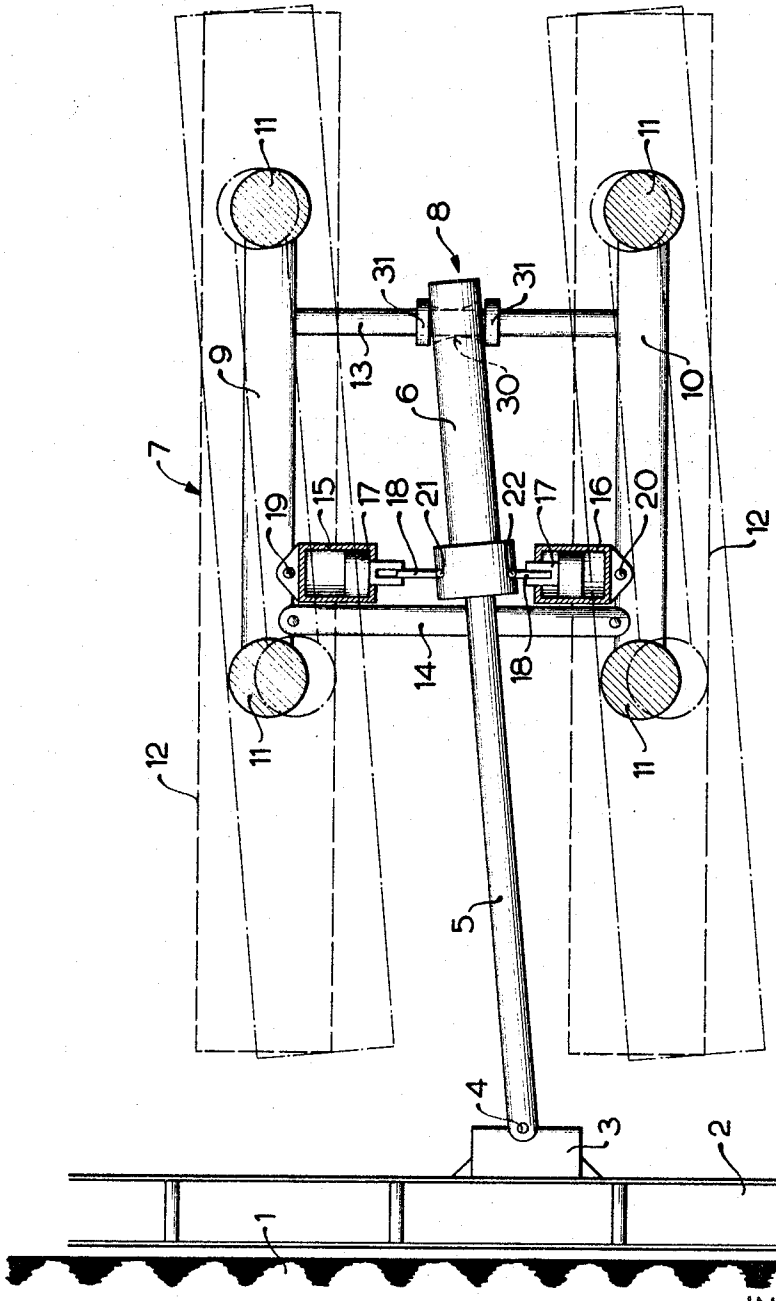
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HYDRAULIC CASING UNITS FOR MINE WORKINGS

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HYDRAULIC CASING UNITS FOR MINE WORKINGS

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ABSTRACT OF THE DISCLOSURE

This invention relates to a hydraulic casing unit for mine workings, in particular to a hydraulic casing jack system, with a stepping jack, including a feed cylinder, and a joint, operative at least in the horizontal attitude of the unit, linking the casing unit to a strongpoint for the feed mechanism, hydraulic side thrust jacks being provided between the casing unit and the feed cylinder, and is characterised by the provision of telescopic devices between the side thrust jacks and the stepping jack to avoid application of lateral forces on the casing unit during its advancing steps. The strongpoint for the feed mechanism can, in particular, be constituted by a conveyor disposed transversely of the direction of advance of the unit in front of the working face, which conveyor is advanced by its own stepping jacks or by the feed mechanism of the casing unit.

Background of the invention

Attachment of the feed mechanism to the casing unit must be effected in such a manner that should the strongpoint or the casing unit shift laterally, the feed mechanism cannot be damaged by the resultant bending moments. On the other hand, the casing should also be able to follow the path taken by its point of connection to the strongpoint.

Prior art

In this context, it is known to attach the casing to the conveyor through a block and tackle arrangement, and to connect two casing frames, which together form a truss, through respective pivotal joints, whose axes are vertical, to a slide in which the stepping cylinder is housed. This kind of arrangement cannot be used for casing jack systems. Also, the requisite block and tackle arrangements are relatively expensive and give rise to technical problems.

It is also known to connect the casing unit to the strongpoint through an elastic bar instead of a cable, the bar co-operating with the lateral thrust cylinders to exert a couple on the frame, when the latter is in the unloaded condition. This procedure gives rise to difficulties in practice, arising out of risks of permanent sets developing in the bar, and cannot be directly applied to simpler structures such as casing jack systems.

Finally, it is known to employ the arrangement described initially. Then, it is true, the stepping jack is protected against the adverse effects of bending forces, throughout the range of effectiveness of the joints, but on the other hand, at the beginning of the feed movement and with the stepping jack pivoted, the force exerted by the latter jack is directed transversely of the casing unit and this unit only becomes parallel with the feed cylinder again when the feed movement is completed. This means that during the feed movement, transverse forces are exerted upon the casing unit, and this is undesirable for a number of reasons.

Object of the invention

It is an object of the present invention, considering a casing unit of the kind referred to hereinbefore, so to align the casing at the commencement of the feed operation, that the direction of feed is parallel to the direction in which the stepping jack is disposed.

Brief description of the invention

This object is achieved, in accordance with the invention, by virtue of the fact that the feed cylinder of the stepping jack has the end of its piston rod attached to the strongpoint through the said joint referred to, and has its cylinder end connected through a joint, preferably a universal joint, to the casing unit, that beyond the last mentioned joint the lateral thrust cylinders are disposed in opposed relationship with the ends of their piston rods articulated to the stepping jack through the medium of telescopic devices, and that the said telescopic devices of the two opposed lateral thrust cylinders are in the retracted condition when the piston rods, of said cylinders are extended.

With this arrangement, the stepping cylinder can, when the casing unit is fixed, pivot freely to accord with the movements of its points of attachment to the strongpoint, since the pistons of the lateral thrust cylinders, and the telescopic elements, can also move freely in this condition, With the casing unit unloaded and the lateral thrust cylinders under pressure, both the piston rods move into their terminal positions, although, because of the provision of the telescopic elements, only one lateral thrust cylinder actually applies any pivoting force, this until both telescopic elements are retracted, i.e. the axis of the feed cylinder is again in line with the advance direction.

Conveniently, and in accordance with a further feature of the invention, the arrangement is so arranged that the ends of the piston rods of the two lateral thrust cylinders, located at opposite sides of the casing, are articulated to the feed cylinder in a common cross-sectional plane of the latter. In this condition, the full piston areas of the lateral thrust cylinders can be exploited for the application of the pivoting forces, and the lateral thrust jacks themselves can be identical.

In order to achieve the best lever ratio, the ends of the piston rods will conveniently be articulated to one end of the feed cylinder, and the universal joint will be arranged at the other end thereof.

The said joint, referred to as a universal joint, basically need only pivot about a vertical axis. However, in order for the casing unit to be able to follow irregularities in the sill of the working, it is convenient to make this a universal joint. Universal design is particularly simple in the case of the last embodiment, in which the joint is located at the end of the feed cylinder.

A preferred construction of the universal joint consists of a transverse bore in the end of the feed cylinder, said bore enlarging at both ends, and a rod passing through said bore, upon which are fitted stops which limit the axial position of the feed cylinder on the rod.

Description of drawing

Further features of the invention will be apparent from the following detailed description referring to the accompanying drawing, which shows an embodiment of casing jack system in accordance with the invention.

In accordance with the drawing, there is set up, along a coal seam **1**, a conveyor **2** which serves as the strongpoint for a plurality of casing jack systems, the said systems being identical to one another so that it will suffice to describe one of said systems only.

The conveyor has a schematically illustrated attachment device **3**, the essential constituent of which is a joint

4 which in the example shown, is operative in the horizontal attitude only. A stepping jack comprising piston rod 5 and a feed cylinder 6 is connected to the attachment device 3 through this joint 4.

If the cylinder 6 is double-acting, then when the casing jack system 7 is in the fitted condition, it can be used to advance the conveyor 2 and, with the casing jack system 7 in the unloaded condition, can be employed to feed the casing forward.

The feed cylinder is provided at its rear end with a joint 8, which in the example in question is a universal joint being connected to the casing jack system 7 through this joint.

The casing jack system of the present example comprises two frames 9 and 10 for simultaneous advance, each embodying two hydraulic pit props 11. The pit props are also equipped with casing heads 12. In the jack system selected as an example here, the two frames 9 and 10 are connected together through a rear link 13 and a front link 14.

In order to apply pivoting forces, two horizontal lateral thrust cylinders 15, 16 of identical design are provided, these operating when the pit props 11 are unloaded and the casing unit itself is therefore not in the fitted condition; in the following, we will confine ourselves to a description of one of these lateral thrust cylinders only.

Each lateral thrust cylinder has a piston rod 17 which, in the example in question, simultaneously makes up part of a telescopic device whose other component is marked 18.

The cylinders 15 and 16 are articulated at the points 19 and 20 respectively to one side 9 and the other 10 of the casing jack system 7, whilst the piston rods, in particular the components 18 of the telescopic devices are articulated at the points 21 and 22 to respective sides of the feed cylinder 6.

The points of articulation 21 and 22 are thus, in the example, in a common cross-sectional plane of the feed cylinder 6.

The arrangement is also such that the points of articulation of the piston rod components 18 to the feed cylinder 6 are located at one end of the latter, whilst the universal joint 8 is located at the other or rearward end of the feed cylinder.

This universal joint consists of a transverse bore 30 in the feed cylinder, which bore flares at both ends, and of the link 13, on which stops 31 are fixed in order axially to locate the feed cylinder.

The drawing illustrates the condition which arises when the conveyor 2 moves downward (in the drawing) along the coalface 1 while the casing unit 7 is fixed in position. As will be apparent, the longitudinal axis of the feed cylinder 6 is then no longer in line with the direction of advance. Also, in this condition, the piston rod 17 of the lateral thrust cylinder 15 is in the extended position and the telescopic device 17, 18 of this cylinder is extended. On the other hand, the telescopic device 17, 18 of the lateral thrust cylinder 16 is retracted, and likewise the piston rod 17.

For an advance or stepping operation, the pit props 11 are unloaded and at the same time the spaces, formed above the pistons in the cylinders 15 and 16, are pressurised. In the condition shown in the drawing, this means that the piston rod 7 of the feed cylinder 6 extends, the feed cylinder 6 shifting the casing unit 7 into the broken-line position by the application of appropriate couples, until the piston rod 7 reaches its terminal position.

During this operation, the lateral thrust cylinder 15 is ineffective, since it is simply its telescopic device 17, 18 which is retracted throughout the period of movement of its piston up to the fully extended position.

Since, with the telescopic devices fully retracted, both piston rods 17 of the lateral thrust cylinders 15, 16 are extended, and the longitudinal axis of the feed cylinder 6 is in line with the advance direction, the direction of advance produced when the piston rod side of the piston in the cylinder 6 is pressurised, corresponds with the direction in which the feed force is operative.

The advantages arising out of this consist in the fact that with a casing design of this sort the pivoting forces react on the feed cylinder 6 as soon as the casing is unloaded. With the casing unit 7 in the loaded condition, however, the feed cylinder 6 can pivot freely. Thus, in all phases of operation the action of disturbing forces on the feed or stepping cylinder is excluded. In addition, should the lateral thrust cylinders 15, 16 be pressurised simultaneously with the feed cylinder 6, the casing unit 7 is in all cases aligned before feed takes place, and this too inhibits any action of transverse forces on the casing unit and upon the stepping cylinder.

Both the lateral thrust cylinders and the feed cylinder may have a common control, thus giving rise to a very simple circuit.

The points of articulation of the lateral thrust cylinders are generally forced with sufficient play to allow the cylinders to move to the requisite extent in any plane.

I claim:

1. In a hydraulic casing system for mine workings comprising a hydraulic casing unit having a stepping jack, means linking said casing unit to a strongpoint support, and hydraulic side thrust jacks provided between the casing unit frame and the feed cylinder of the stepping jacks, the improvement consisting in the combination of a joint connecting the piston rod of the stepping jack feed cylinder to the strongpoint support, a joint connecting the said feed cylinder to the casing unit frame; means mounting the side thrust jacks in opposed relationship; telescopic devices carried by the piston rods of the side thrust jacks; and articulated connections between the telescopic devices and the stepping jack, the mounting means for the side thrust jacks being such that the telescopic devices are both in the retracted condition when the side thrust jacks are both in the extended condition.

2. A hydraulic casing unit as claimed in claim 1, wherein the points or articulation of the ends of the piston rods of two mutually opposite lateral thrust cylinders to the feed cylinder are located in a common radial cross-sectional plane of said feed cylinder.

3. A hydraulic casing unit as claimed in claim 1, wherein the joint between the feed cylinder and the casing unit is a universal joint, and consists of a transverse bore in the end of the feed cylinder, said bore flaring at both ends, and a rod extending through said bore, said rod carrying stops which axially locate the feed cylinder.

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