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Satbayev University

ХАБАРЛАРЫ

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НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
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Kassenov A.Zh.[1], Abishev K.K.[1*], Absadykov B.N.[2], Yessaulkov V.S.[1], Bolatova A.B.[3]

[1]Toraighyrov university, Pavlodar, Kazakhstan;
[2]A.B. Bekturov Institute of Chemical Sciences, Almaty, Kazakhstan;
[3]S. Seifullin Kazakh AgroTechnical University, Nur-Sultan, Kazakhstan.
E-mail: a.kairatolla@mail.ru

ANALYSIS AND JUSTIFICATION OF THE LAYOUT OF A MULTIPURPOSE MACHINE FOR THE DEVELOPMENT OF MINERAL DEPOSITS

Abstract. Mining machines of various types and designs with different technical characteristics have been created for the efficient geological explorations. The fleet of mining and transport vehicles used in the mining industry is constantly growing. In order to accelerate the pace and reduce the cost of geological explorations, it is necessary to ensure the widespread introduction of new technologies that will increase the productivity for all types of exploration.

This article presents the results of a research work carried out by a team of authors to create a multipurpose machine for the field development of mineral deposits.

The modern stage in development of traction and transport vehicles is distinguished by an increase in power, traction and coupling qualities, cross-country ability, reliability, and other properties. These trends in the development of vehicles can be endorsed by creating new models of vehicles or modernizing existing designs of individual units and assemblies of machines. The modernization of tracked vehicles is related mostly to increased energy saturation of propulsions which leads to an increase in the mass of the mining machine without significant improvements in the design of running systems.

Based on the analysis of academic and technical sources, the team of authors proposed a replaceable wheel-tracked mover. Machines with interchangeable wheel-tracked movers have two moving units, but only one of them is used depending on the working conditions.

The paper presents a comparative analysis of the existing options for replaceable wheel-tracked movers. The advantages and disadvantages of each layout are also described. Based on the analysis, the design of a multipurpose machine for the development of mineral deposits is proposed.

The layout of the multipurpose vehicle is made in a non-conventional scheme. Both axles of the car are driving ones and all wheels have the same size. The cab of the machine is placed in the front as this solution allows one to place a cargo platform behind it.

The tracked mover contains two sprung caterpillar bogies containing a caterpillar chain made of solid steel links connected by pins, track rollers and a guide wheel with a back-off mechanism fixed on the caterpillar bogie, as well as fasteners connecting the caterpillar bogie with the vehicle frame.

This traction and transport vehicle with all driving wheels of the same size can work in quarries, in the public utilities system, at remote pastures and geological exploration sites as a light tractor or a special machine.

Key words: multipurpose machine, mineral deposits, geological exploration works, undercarriage system, wheel-tracked propulsion, replaceable mover.

Introduction. The Republic of Kazakhstan has a huge reserve of minerals located throughout the country. In order to search, discover and prepare for the industrial development of mineral deposits, geological explorations take place. Traction and transport machines of various types and designs with different technical properties have been developed for the effective geological exploration and mining operations in various conditions [1, 3].

The task of expanding the mineral resource base in the most important sectors of the country's economy can

be solved by accelerating the pace and reducing the cost of geological exploration, which is achieved through widespread introduction of new technologies that will increase the productivity for all types of exploration.

In 2020, a joint team of different departments of technical universities began research work to develop the design of a traction and transport vehicle for the development of mineral deposits [4].

Materials and research methods. The modern development of traction and transport vehicles is distinguished by an increase in power, traction and coupling qualities, cross-country ability, reliability, and other properties. These trends in vehicles development can be endorsed by creating new models of vehicles or modernizing existing designs of individual units and assemblies of machines The modernization of tracked vehicles is related mostly to increased energy saturation of propulsions which leads to an increase in the mass of the mining machine without significant improvements in the design of the running system.

Comparative analysis and comparison of wheeled and tracked vehicles during their operation in heavy road, and especially off-road conditions, shows the advantage of the tracked vehicles by important indicators such as cross-country ability, productivity, maneuverability, traction and coupling properties, convenience and reliability of work [5, 7].

Based on the analysis of academic and technical sources [8, 10], the team of authors proposed the use of a replaceable wheel-tracked mover in order to increase the productivity and passing ability of wheeled vehicles.

Vehicles with interchangeable wheel-tracked movers have two movers, but only one of them is used, depending on the working conditions. The use of a replaceable running system will expand the functionality of the vehicle and increase its annual load.

All existing variants of interchangeable wheel-tracked movers can be described with four main schemes.

In [11], a vehicle design with a replaceable mover is proposed, the wheeled version of which is a machine of a traditional layout, and its track mover has a triangular shape.

A distinctive feature of the triangular track outline are the drive wheels located above the supporting surface of the machine (Figure 1). This allows one to increase the supporting surface, lifting capacity and stability of the machine. In addition, the drive wheel is removed from the abrasive wear zone, the transmission units are not subject to vertical shock loads caused by the contact of the drive wheel with the ground.

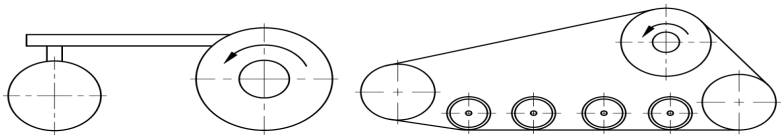

Figure 1 – Scheme of a wheel-track mover with a triangular outline

Despite a number of advantages, this scheme has some significant drawbacks, such as the need to provide a sufficient wrap angle of the drive wheel by the track, increased loading of the rear track roller with tangential traction force, the difficulty of rear track roller suspension, increased friction losses in the track joints in the areas around the rear track roller as well as around the drive wheel.

In [12], a design of a vehicle with a replaceable mover is proposed. Its peculiarity is the diameter of the driving wheel that is larger than the diameter of the guide wheel (figure 2).

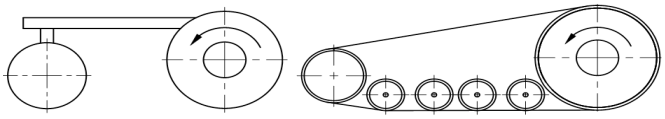

Figure 2 – Scheme of a wheel-track mover with an enlarged drive wheel

The increased drive wheel in comparison with the idler wheel provides a reduction in track tension and better ground contour following. The disadvantage of this design is the uneven distribution of the specific pressure along the length of the support surface and the difficulty of suspension of the drive wheel.

The designs of aforementioned track movers are for wheeled vehicles of a traditional (conventional) layout. Next, we delve into the design of wheel-tracked movers with the wheels of the same size.

Figure 3 shows a tracked mover with the drive and idler wheels raised above the supporting surface. The disadvantage of this scheme gets revealed during operations with rear attachments, when a small longitudinal base corresponds to a large lever for lifting attachments. One of the options for this scheme is the lowered guide wheel, which makes it possible to increase the bearing surface of the machine without changing length of the track outline, but nevertheless there would be a problem with suspension of the guide wheel [13].

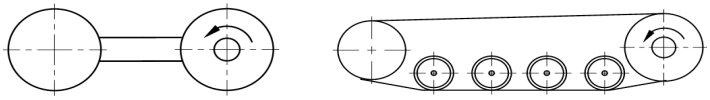

Figure 3 – Scheme of a wheel-track mover with wheels of the same size

The described schemes of track outlines are used on traction and transport vehicles, the wheeled mover of which has wheels of the same size. This layout combines useful features of a row-crop tractor and a car.

The tracked mover made according to the scheme shown in Figure 3, cannot be installed on vehicles of a separate-assembly layout. Wheeled vehicles of this layout have a front engine, the cab is located behind the engine, the front and rear wheels are of the same size and load capacity. Turning is carried through an articulated frame.

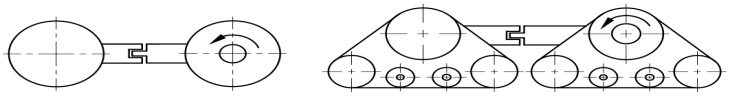

Figure 4 – Scheme of a wheel-tracked mover with a four-track running system

The tracked version of the vehicle with a separate-assembly layout is a four-track running system (Figure 4). Each of the tracks replaces wheels and is made in a triangular outline with the drive wheel on top. The advantages of this design are an efficient location of the center of gravity and a large hanging capacity [14].

Results and discussion. Based on the analysis of the existing designs of traction and transport vehicles with a replaceable wheel-tracked mover, a team of authors proposed the layout of a multipurpose machine for the development of mineral deposits. The layout of the multipurpose vehicle shown in Figure 5 is made in a non-conventional scheme. Both axles of the car are driving ones and all wheels have the same size. [15].

The chosen layout of the wheeled version of the vehicle has the front location of the cab and four driving wheels of the same size which allows one to supply the carrier system of the machine with two spars between the axles and the spatial truss under the cab. This design of the structural layout allows many rigging devices and implements to be mounted on the vehicle without a significant change in the methods of attachment. Moreover, the principle of front attachment makes possible the creation of new promising designs of lifting and other equipment for auxiliary work in construction, industry and transport.

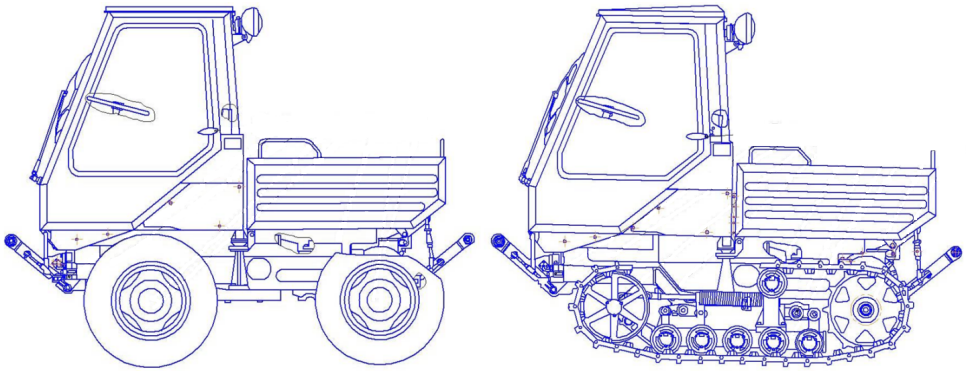

Figure 5 – Multipurpose vehicle layout

The cab of the machine is put forward. This design makes it possible to place a cargo platform of 1 cubic meter and a load capacity of 1.5 metric tons behind it. For the transportation of goods of a low specific weight, there are devices for mounting up the side walls in operating conditions.

As a light tractor or a special vehicle, this traction and transport vehicle with all driving wheels of the same size can work in quarries, public utilities systems, at remote pastures and geological exploration sites.

The tracked mover contains two sprung caterpillar bogies, each containing a caterpillar chain made of solid steel links connected by pins, track rollers and a guide wheel with a back-off mechanism fixed on the caterpillar bogie, as well as fasteners connecting the caterpillar bogie with the vehicle frame.

Conclusions. As part of the study, a team of authors proposed the use of a replaceable wheel-tracked mover in order to increase the productivity and passing ability of wheeled vehicles. The advantage of the chosen design direction is an opportunity to expand the functionality of the traction machine, to supply it with new functions, especially transport ones, thus significantly increase the operating time of the machine during

the year and ensure the implementation of a complex of geological exploration and transportation works with lower capital costs.

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Касенов А.Ж.[1], Абишев К.К.[1*], Абсадыков Б.Н.[2], Есаулков В.С.[1], Болатова А.Б.[3]

[1]Торайғыров университеті, Павлодар, Қазақстан;
[2]Ә.Б. Бектұров атындағы химия ғылымдары институты, Алматы, Қазақстан;
[3]С. Сейфуллин атындағы Қазақ агротехникалық университеті, Нұр-Сұлтан, Қазақстан.
E-mail: a.kairatolla@mail.ru

ПАЙДАЛЫ ҚАЗБАЛАР КЕН ОРЫНДАРЫН ИГЕРУГЕ АРНАЛҒАН КӨПСАЛАЛЫ МАШИНА ҚҰРЫЛЫМЫН ТАЛДАУ ЖӘНЕ НЕГІЗДЕУ

Аннотация. Геологиялық барлау жұмыстарын тиімді жүргізу үшін әртүрлі техникалық сипаттамалары бар түрлі типтегі және құрылымдағы геологиялық барлау және тау-кен машиналары жасалды.Тау-кен өндірісі саласында жұмыс істейтін тау-кен және көлік машиналары паркі үздіксіз дамып келеді. Геологиялық барлау жұмыстарының қарқынын жеделдету және құнын төмендету мақсатында геологиялық барлау жұмыстарының барлық түрлерінің өнімділігін арттыруды қамтамасыз ететін жаңа техниканы кеңінен енгізуді қамтамасыз ету қажет.

Бұл мақалада авторлар ұжымы жүргізген пайдалы қазбалар кен орындарын игеруге арналған көпсалалы машина жасау бойынша ғылыми-зерттеу жұмыстарының нәтижелерін келтірген.

Тарқыш-көлік машиналарының қазіргі заманғы дамуы олардың қуаттылығының, тарту-ұстасу қасиеттерінің, өткіштігінің, сенімділігінің артуымен және басқаларымен сипатталады. Машиналардың дамуының көрсетілген тенденцияларын машиналардың жаңа үлгілерін жасау немесе машиналардың жеке түйіндері мен агрегаттарының қолданыстағы құрылыстарын жаңарту арқылы шешуге болады. Шынжыр табанды машиналарды жаңғырту, негізінен, қозғалтқыштардың энергиямен қанықтылығының артуымен байланысты, бұл жүріс жүйелерінің конструкциясында елеулі жақсартуларсыз тау-кен машиналары массасының ұлғаюына әкеледі.

Авторлар ғылыми-техникалық әдебиеттерді талдау негізінде ауыспалы доңғалақты-шынжыр табанды қозғалтқышты пайдалануды ұсынды. Ауыспалы доңғалақты-шынжыр табанды қозғалтқышы бар машиналардың екі қозғалтқышы болады, бірақ олардың тек біреуі жұмыс жағдайына байланысты пайдаланылады.

Жұмыста ауыспалы доңғалақты-шынжыр табанды қозғалтқыштардың қолданыстағы нұсқаларына салыстырмалы талдау жасалды. Әр схеманың артықшылықтары мен кемшіліктері сипатталған. Талдау негізінде пайдалы қазбалар кен орындарын игеруге арналған көпсалалы машинаның құрылысы ұсынылды.

Көпсалалы көлік құралының құрылымы әдеттегіден өзгеше ықшамсызба негізінде жасалған. Машинаның екі белдігі жетекші, барлық дөңғалақтары бір өлшемді. Машинаның кабинасы алға қарай жылжытылған, бұл оның артында жүк платформасын орналастыруға мүмкіндік береді.

Жеңіл тартқыш немесе арнайы машина ретінде бірдей өлшемдегі барлық жетекші дөңғалақтары бар бұл тарту-көлік құралын карьерлерде, коммуналдық шаруашылық жүйесінде, шалғайдағы жайылымдарда, геологиялық барлауда қолдануға болады.

Түйінді сөздер: көпсалалы машина, пайдалы қазбалар кен орындары, геологиялық барлау жұмыстары, жүріс жүйесі, доңғалақты-шынжыр табанды қозғалтқыш, ауыспалы қозғалтқыш.

Касенов А.Ж.[1], Абишев К.К.[1*], Абсадыков Б.Н.[2], Есаулков В.С.[1], Болатова А.Б.[3]

[1]Торайгыров университет, Павлодар, Казахстан;
[2]Институт химических наук имени А.Б. Бектурова, Алматы, Казахстан;
[3]Казахский агротехнический университет имени С. Сейфуллина, Нур-Султан, Казахстан.
E-mail: a.kairatolla@mail.ru

АНАЛИЗ И ОБОСНОВАНИЕ КОМПОНОВКИ МНОГОЦЕЛЕВОЙ МАШИНЫ ДЛЯ РАЗРАБОТКИ МЕСТОРОЖДЕНИЙ ПОЛЕЗНЫХ ИСКОПАЕМЫХ

Аннотация. Для эффективного проведения геологоразведочных работ созданы геологоразведочные и горные машины разных типов и конструкций с различными техническими характеристиками. Парк горных и транспортных машин, занятых в сфере горного производства, постоянно растет. С целью ускорения темпов и снижения стоимости геологоразведочных работ, необходимо обеспечить широкое внедрение новой техники, обеспечивающей повышения производительности всех видов геологоразведочных работ.

В данной статье приведены результаты, проведенной коллективом авторов научно-исследовательской работы по созданию многоцелевой машины для разработки месторождений полезных ископаемых.

Современное развитие тягово-транспортных машин характеризуется повышением их мощности, тягово-сцепных качеств, проходимости, повышением надежности и другими. Указанные тенденции развития машин могут быть решены путем создания новых образцов машин или модернизации существующих конструкций отдельных узлов и агрегатов машин. Модернизация гусеничных машин идет за счет увеличения энергонасыщенности силовой установки, что приводит к увеличению массы горной машины, без существенных усовершенствований конструкции ходовой системы.

Авторами, на основе проведенного анализа научно-технической литературы предложено использование сменного колесно-гусеничного движителя. Машины со сменным колесно-гусеничным движителем имеют два движителя, но используется только один из них в зависимости от условий работы.

В работе проведен сравнительный анализ существующих вариантов сменных колесно-гусеничных движителей. Описаны преимущества и недостатки каждой схемы. На основе проведенного анализа предложена конструкция многоцелевой машины для разработки месторождений полезных ископаемых.

Компоновка многоцелевого транспортного средства выполнена по схеме, отличной от классической. Оба моста машины ведущие, все колеса одинакового размера. Кабина машины вынесена вперед, что позволяет разместить за ней грузовую платформу.

Как легкий тягач или специальная машина данное тягово-транспортное средство со всеми ведущими колесами одинакового размера может работать в карьерах, в системе коммунального хозяйства, на отгонных пастбищах, в геологоразведке.

Ключевыеслова: многоцелевая машина, месторождения полезных ископаемых, геологоразведочные работы, ходовая система, колесно-гусеничный движитель, сменный движитель.

Information about authors:

Kassenov Assylbek Zhumabekovich – Candidate of Technical Sciences, ass. Professor, Toraighyrov university, *asylbek_kasenov@mail.ru*, ORCID: 0000-0001-9552-1439;

Abishev Kairatolla Kairollinovich – Candidate of Technical Sciences, ass. Professor, Toraighyrov university, *a.kairatolla@mail.ru*, ORCID: 0000-0003-2001-0428;

Absadykov Bakhyt Narikbayevich – Doctor of Technical Sciences, Professor, the Corresponding member of National Academy of Sciences of the Republic of Kazakhstan, A.B. Bekturov Institute of Chemical Sciences, *b_absadykov@mail.ru*, ORCID: 0000-0001-7829-0958;

Yessaulkov Valeriy Sergeevich – doctoral student, Toraighyrov university, *cooh.hooc@yandex.kz*, ORCID: 0000-0002-0153-8051;

Bolatova Ainash Bolatovna – Candidate of Technical Sciences, Senior lecturer, S.Seifullin Kazakh Agro Technical University, *bolatova_ainash@mail.ru*, ORCID: 0000-0001-8488-8155.

REFERENCES

[1] Horeshok A.A., Tsekhin A.M., Buyalich G.D., Meshkov A.A., Maslennikov N.R. (2019) Mining machines and equipment for underground mining operations. Moscow. Russia. ISBN 978-5-905450-98-3.

[2] Sklyarov V.I., Miroshnikova L.K. (2017) Technology and technique of geological exploration in the development of solid mineral deposits: textbook. Norilsk. Russia. ISBN 978-5-89009-674-6.

[3] Kozbagarov R.A., Taran M.V., Zhussupov K.A., Kanazhanov A.E., Kamzanov N.C., Kochetkov A.V. (2021) Increasing the efficiency of motor graders work on the basis of working elements perfection // News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences. Vol. 1, No. 445, pp. 98-105. *https://doi.org/10.32014/2020.2518-170X.97* (in Eng.).

[4] Abishev K.K., Kassenov A.Zh., Mukanov R.B., Sembaev N.S., Suleimenov A.D. (2021) Research of the operational qualities of a mining machine for the development of mineral deposits // News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences. Vol. 6, 450, pp. 30-36. *https://doi.org/10.32014/2021.2518-170X.116* (in Eng.).

[5] Pzebnev V.P., Polivaev O.I., Vorokhobin A.V. (2018) Tractors and cars. Theory and operational properties: study guide. Moscow. Russia. ISBN 978-5-406-06240-1.

[6] Sherov A.K., Alikulov D.E., Smirnov Y.M., Sherov K.T., Mussayev M.M., Mazdubay, A.V. (2021) Research of the internal leakage process of a liquid in the design of a gear pump with a two-axial connection // News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences. Vol. 2, No. 446, pp. 198-204. *https://doi.org/10.32014/2021.2518-170X.53* (in Eng.).

[7] Kutkov G.M. (2018) Tractors and cars: theory and technological properties: textbook. Moscow. Russia. ISBN 978-5-16-006053-8.

[8] Komkin A.S., Kurbanov R.F. (2014) Aspects of the use of replaceable crawler propellers on wheeled tractors. Prospects for the development of technical service in the agro-industrial complex, Cheboksary: Chuvash State Agricultural Academy, pp. 80-83.

[9] Donenbayev B., Sherov K., Mazdubay A., Taskarina A., Tussupova S. (2021) Investigation of the method of processing holes with a rotary cup cutter with surfacing // Journal of Applied Engineering Science. Vol. 19, No. 4, pp. 862-867. *https://doi.org/10.5937/JAES0-27504* (in Eng.).

[10] Loparev A.A., Komkin A.S. (2018) Trends in the development and prospects for the use of replaceable caterpillar movers on wheeled agricultural tractors. Mobile energy in agriculture: state and prospects of development, Cheboksary: Chuvash State Agricultural Academy, pp. 462-466.

[11] Promzalev Yu.S., Shevtsov V.G. (1991) Vehicle with replaceable propulsion [Transportnoe sredstvo so smenny`m dvizhitelem]. Invention of the USSR [Izobretenie SSSR].

[12] Bekenov T.N. and others. (2007) Vehicle with replaceable propulsion [Transportnoe sredstvo so smenny`m dvizhitelem]. Preliminary Patent of the Republic of Kazakhstan [Predvaritelnyi patent Respubliki Kazakhstan].

[13] Tractors T15, T15K. Technical description and operating instructions. (1992). Pavlodar: "Pavlodartractor" Concern.

[14] Polivaev O.I., Vedrinsky O.S. (2009) Improving the traction properties of wheeled tractors through the use of interchangeable crawler thrusters with a triangular outline. Innovative technologies of mechanization of agricultural production, Voronezh: Voronezh State Agrarian University named after Emperor Peter I, pp. 90-94.

[15] Kartashevich A.N., Pontalev O.V., Gordeenko A.V., Belousov V.A. (2020) The device of tractors: textbook. Minsk. Belarus. ISBN 978-985-7234-45-5.

[16] Buss D., Abishev K., Baltabekova A. (2019) Driver`s reliability and its effect on road traffic safety. In: ICTE 2018, Procedia Computer Science. No. 149, pp. 463–466. *https://doi.org/10.1016/j.procs.2019.01.163* (in Eng.).

[17] Abishev K.K., Kassenov A.Zh., Assylova K.B. (2021) Design Justification of Half-Track Propulsor of Traction and Transport Vehicle. In: Lecture Notes in Mechanical Engineering. pp. 434-440. *https://doi.org/10.1007/978-3-030-85230-6_50* (in Eng.).

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