



Vojnotehnicki glasnik/Military Technical
Courier

ISSN: 0042-8469

vojnotehnicki.glasnik@mod.gov.rs

University of Defence
Serbia

Žegarac, Nikola P.

Device for dismantling and assembling hard-to-separate mechanical assemblies on
mechanical plants

Vojnotehnicki glasnik/Military Technical Courier, vol. 65, núm. 1, 2017, pp. 20-29

University of Defence

Available in: <https://www.redalyc.org/articulo.oa?id=661770077010>

- How to cite
- Complete issue
- More information about this article
- Journal's homepage in redalyc.org

redalyc.org

Scientific Information System

Network of Scientific Journals from Latin America, the Caribbean, Spain and Portugal

Non-profit academic project, developed under the open access initiative

DEVICE FOR DISMANTLING AND ASSEMBLING HARD-TO-SEPARATE MECHANICAL ASSEMBLIES ON MECHANICAL PLANTS

Nikola P. Žegarac

Serbian Academy of Inventors and Scientists, Belgrade,
Republic of Serbia

e-mail: zegaracnikola@vektor.net,

ORCID iD:  <http://orcid.org/0000-0002-1766-8184>

DOI: 10.5937/vojtehg65-10025

FIELD: Mechanical Engineering, Energetics

ARTICLE TYPE: Original Scientific Paper

ARTICLE LANGUAGE: English

Summary:

The paper presents a new technical solution, a device for dismantling and assembling parts of mechanical plant components which are not easily separable. The device design allows wide possibilities of application in maintenance and repair of hydro power plants, thermal power plants, and diesel electric generators, in motor industry, shipbuilding industry and navy, aircraft industry, and turbines in process industry. The device for dismantling and assembling is universal and easy to use. Its small weight makes it easy to transport to locations with machine facilities.

Keywords: device for mounting and dismantling, hard-to-separate assemblies, mechanical installations, unit design, possibility of universal application of the device.

Introduction

During the years of maintenance and overhaul of mechanical plants, there has been a need to invent and design a device for assembling and dismantling hard-to-separate mechanical assemblies on mechanical plants. The device was supposed to have a wide range of applications: hydro power plants, thermal power plants, turbine systems in process industry, ships, reciprocating compressors, gas turbines, internal combustion engines, machine tools and other plants. This means that potential users are companies engaged in the production and maintenance of systems in: hydropower plants, motor industry, shipbuilding industry and

the navy, aviation industry, turbine plants in process industry, manufacturers of gears, sliding and rolling bearings and other machine elements. The main part of the work shows the structure and the possibilities of the device application (Tehnička dokumentacija za Mini hidroelektrane Elektroprivrede Crne Gore, 1964).

Description of the construction of the device for mounting and dismantling hard-to-separate mechanical assemblies

Figure 1 shows a device for mounting and dismantling hard-to-separate mechanical assemblies (Žegarac, 2004).

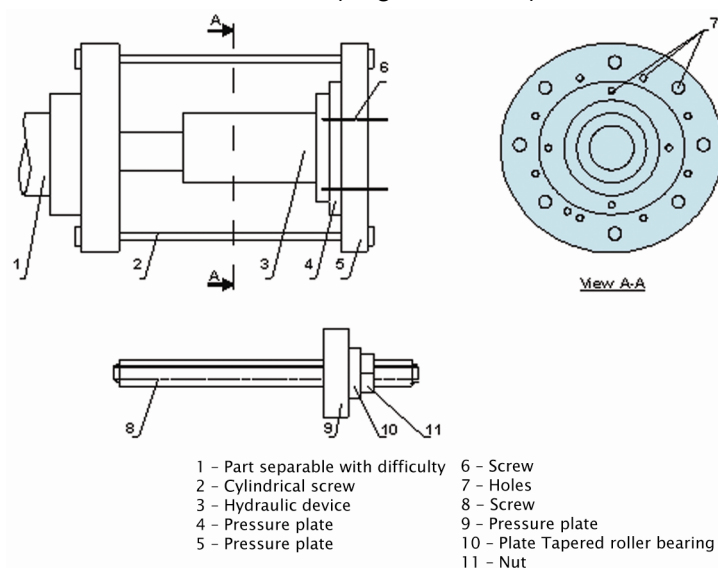


Figure 1 – Device for mounting and removing hard-to-separate components of mechanical constructions in mechanical systems

Рис. 1 – Монтажно-демонтажное устройство для сложно разбираемых деталей машиностроительного оборудования

Слика 1 – Уређај за демонтажу и монтажу тешко растављивих склопова на машинским постројењима

Position (1) in Fig.1 is a hard-to-separate mechanical part that is to be removed for replacement of other parts. Positions (2-5) are the parts of the device for removal. Position (2) indicates the anchor bolts, position (3) denotes the hydraulic device, positions (4) and (5) are pressure plates with different diameters, and position (6) represents the screws for joining pressure plates. Holes for anchor bolts are drilled at different diameters on the pressure plates thus enabling the device to be adapted to different dimensions of parts to be dismantled. The design and calculations of machine elements of the device were carried out under the design standard

(Ognjanović, 2008), (Standardi za materijale mašinskih elemenata, JUS M.B1.050, DIN 601, JUS M.B1.051, 1980).

Manual hydraulic devices of different capacities (10-50 tons) were used (Fig. 2) (Tehnička dokumentacija za hidraulične ručne dizalice Lincos, 2001), (Tehnička dokumentacija za hidraulične ručne dizalice Sloga, 2002).

In the process of dismantling the parts, an autogenous welding set was used to heat the parts to be dismantled.

Positions (8-11) in Fig.1 indicate the parts to be dismantled. Position (8) denotes a threaded spindle which turns into the threaded hole at the head of the shaft or axle onto which the part is mounted. Position (9) is a pressure plate which pushes the part to be mounted into a specific position. Position (10) indicates a tapered roller bearing that reduces friction between the contact surfaces during assembly, and position (11) denotes a nut which pushes the conical bearing and the pressure plate on the threaded spindle, thus moving the part to be mounted. These operations require a considerable experience.



Figure 2 – Manual hydraulic cranes
Рис. 2 – Ручной гидравлический домкрат
Слика 2 – Ручне хидрауличне дизалице

Application of the device for dismantling and mounting hard-to-separate mechanical assemblies

The device for dismantling and assembling difficult-to-detach parts has found its first application in the Electro Industry Montenegro and in some companies in the Republic of Serbia. In the Electro Industry Montenegro, it is used in maintenance and overhaul of mini hydro power plants. The operations of overhaul of hydro electric power plants have been significantly improved. This universal device is used in all 18 mini hydro electric power plants.

One of these mini hydro power plants is shown in Fig. 3 (Žegarac, Zuber, 2004), (Žegarac, 2008).

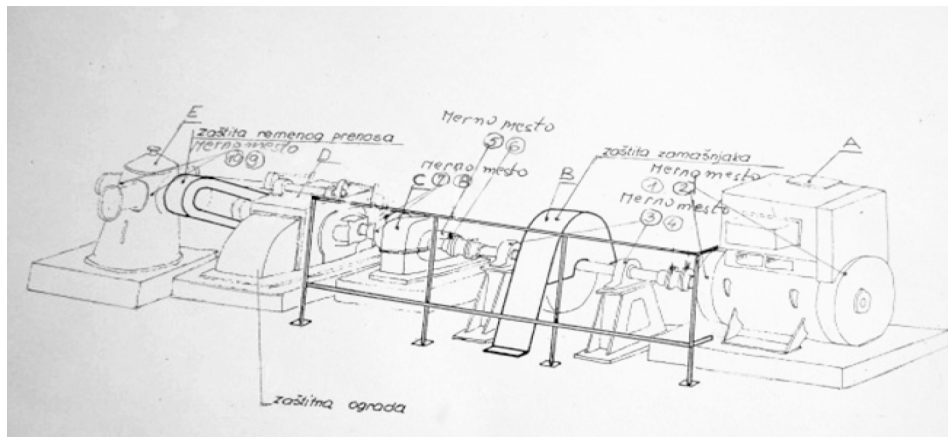


Figure 3 – Schematic representation of a mini hydro power plant
 Рис. 3 – Схематическое изображение сооружения мини-ГЭС
 Слика 3 – Шематски приказ постројења мини-хидроелектране

In Fig.3, hard-to-separate assemblies are labelled: the position (A) indicates the generator assemblies, the position (B) marks the flywheel assemblies, bearings, and the flexible couplings of the ARPEX type-German manufacturer Flender, the position (C) is the multiplier with a flexible coupling type N-EUPEX A 480, German manufacturer Flender, the position (D) is the turbine part, and the position (E) denotes the turbine regulator. Fig. 4 presents the mounting of the metal parts of the flexible couplings N-EUPEX, onto one side of the multiplier set, and Fig. 5 presents the completed mounting of the ARPEX coupling onto the other side of the multiplier of the mini hydropower plant (Žegarac, 2009).



Figure 4 – Mounting of the metal parts of the elastic coupling N-EUPEX onto the multiplier assembly

Рис. 4 – Монтаж стальных деталей упругой муфты к корпусу мультипликатора
Слика 4 – Монтажа металних делова еластичне спојнице N-EUPEX на склоп мултипликатора



Figure 5 – Display of the assembled ARPEX couplings on the multiplier of the hydro power plant

Рис. 5 – Изображение завершено монтажа муфты Arrex на мультипликаторе ГЭС
Слика 5 – Приказ завршене монтаже Arrex спојница на мултипликатор хидроелектране

Fig.6 presents several characteristic hard-to-separate assemblies in mini hydro power plants (Tehnička dokumentacija Flender, 1979), (Tehnička dokumentacija Stromag, 1980).

...wenn Sie elastische oder hochelastische, drehstarre oder gelenkige, schaltbare oder nichtschaltbare Wellenkupplungen für Drehmomente von 20 Nm bis 10.000.000 Nm aus Stahl oder Gußeisen einsetzen.

ist Ihr Ansprechpartner...

FLENDER

A. FRIEDR. FLENDER GMBH
Kupplungswerk Mussum
Industriepark Bocholt
Schlavenhorst 100, DE-46395 Bocholt
Tel.: (0 28 71) 92 - 28 68; Fax: (0 28 71) 92 - 25 79
E-mail: anja.blits@flender.com
Internet: <http://www.flender.com>


VERTRIEBSZENTRUM HANNOVER
DE- 30639 Langerhagen
Markplatz 3, DE- 30653 Langerhagen
Tel.: (05 11) 7 71 89 - 0
Fax: (05 11) 7 71 89 - 89
E-mail: vz.hannover@flender.com

VERTRIEBSZENTRUM MÜNCHEN
DE- 85750 Karlsfeld
Leibnizstrasse 14, DE- 85757 Karlsfeld
Tel.: (0 81 31) 90 03 - 0
Fax: (0 81 31) 90 03 - 33
E-mail: vz.muenchen@flender.com

VERTRIEBSZENTRUM HERNE
DE- 44607 Herne
Westring 303, DE- 44629 Herne
Tel.: (0 23 23) 4 97 - 0
Fax: (0 23 23) 4 97 - 2 50
E-mail: vz.herne@flender.com

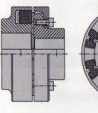
VERTRIEBSZENTRUM BERLIN
Schlossallee 8, DE- 13156 Berlin
Tel.: (0 30) 91 42 50 58
Fax: (0 30) 47 48 79 30
E-mail: vz.berlin@flender.com

VERTRIEBSZENTRUM STUTTGART
DE- 70472 Stuttgart
Friedrichstrasse 3, DE- 70469 Stuttgart
Tel.: (07 11) 7 80 54 - 51
Fax: (07 11) 7 80 54 - 50
E-mail: vz.stuttgart@flender.com




N-EUPEX
Elastische Nockenkupplung
Katalog K 420


- universell einsetzbare Nockenkupplung zum Ausgleich von Wellenverlagerungen
- größtmögliche Betriebssicherheit da "durchschlagssicher"
- geeignet für Steckmontage und vereinfachte Montage bei dreiteiliger Ausführung
- Drehmomentenbereich von 19 Nm bis 62.000 Nm bei 23 Größen und 10 verschiedenen Bauarten
- geeignet für den Einsatz in Ex-Schutz Bereichen. Zertifiziert gemäß ATEX (ATEX 100a)



N-EUPEX-Kupplungen bestehen aus hochwertigem Gußeisen GG-25. Die elastischen Elemente aus synthetischem Gummi (Perbunan) sind gegen viele Medien beständig. Metallhaken und elastische Elemente sind so aufeinander abgestimmt, daß bei zulässiger Verlagerung kein Verschleiß auftritt.

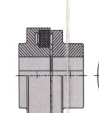


Einsatzgebiete:
Weil verlorener Einsatz im gesamten Maschinenbau sowohl motorseitig als auch schaltseitig (z.B. Pumpenantriebe oder Stromerzeugungsaggregate) als auch bei hohen Drehmomenten zur Verbindung von Getriebe und Arbeitsmaschine (z.B. Mühle).




N-EUPEX-DS
ohne Durchschlagsicherung
Katalog K 420


- trennen von An- und Abtrieb bei Ausfall der elastischen Elemente (ohne Durchschlagsicherung)
- universell einsetzbar, da mit allen Teilen des N-EUPEX-Programms kombinierbar
- Drehmomentenbereich von 60 Nm bis 21.200 Nm bei 19 Größen und gleichen Nennmomenten wie bisher
- geeignet für den Einsatz in Ex-Schutz Bereichen. Zertifiziert gemäß ATEX (ATEX 100a)
- wartungsfrei auch bei Einsatz in explosionsfähiger Umgebung



Metallteile aus Gußeisen GG-25. Die elastischen Elemente sind aus Polyurethan oder Perbunan.




Einsatzgebiete:
N-EUPEX-DS-Kupplungen werden als universelle Kupplungen im gesamten Maschinenbau eingesetzt. Man bevorzugt sie besonders dort, wo bei Ausfall der elastischen Elemente An- und Abtrieb getrennt werden müssen, bzw. die Kupplung wartungsfrei sein soll.



BIPEX

- elastische, durchschlagssichere Konstruktion
- sehr kompakte Konstruktion
- bestens geeignet für Steckmontage
- in 13 Größen ab Vorrat
- Bereich von 13,5 Nm bis 3,7 Nm
- Bauart BWT mit Tiger-Buchse und Bohrungsanpassung



BIPEX-Kupplungen bestehen aus zwei gleich großen GG-25. Die elastischen Nockenringe aus Metallhaken sind in ihrer Geometrie so geformt, daß bei zulässiger Auslenkung kein Verschleiß auftritt. BIPEX-Kupplungen besitzen drehpaar und können mit Nocken- oder elastischen Elementen gewendet werden.



Einsatzgebiete:
Allgemeiner Maschinenbau bis hin zu schnelllaufenden Pumpenantrieben und Bohnen.

Figure 6 – Review of other typical hard-to-detach components of mini hydro power plants
Рис. 6 – Изображение прочих сложно разбираемых деталей мини-ГЭС
Слика 6 – Приказ осталих карактеристичних тешко растављивих склопова на мини-хидроелектранама

Fig.7 presents a mini hydro power plant in operation following the general overhaul (Žegarac, 2008).



Figure 7 – A mini-hydro power plant in operation
 Рис. 7 – Изображение мини-ГЭС в процессе эксплуатации
 Слика 7 – Приказ мини-хидроелектране у оперативном раду

Conclusion

The device for dismantling and assembling the parts of hard-to-separate mechanical assemblies on mechanical plants is an original and new technical solution (invention) in the maintenance and overhaul of mechanical systems, especially in off-road conditions where there are no other conditions for dismantling and mounting assemblies, such as specialized machine shops, overhaul institutes and others.

This device is portable, universal and very easy to use. It allows an easy, fast and efficient dismantling and assembling hard-to-separate parts large in size. Flanges or various types of metal hubs can have an external diameter up to 800 mm, inner diameters may be up to 250 mm, the size of the overlap (dosed components) to the axle or shaft may be up to 0.025 mm, and the length of engagement work on the axle can be up to 300 mm. This means that these parts are very complicated to disassemble and re-

assemble. The device design is such that it prevents damage to parts during disassembling and reassembling.

The device has a wide range of applications. In the Electro Industry Montenegro, it is used to maintain mini hydroelectric power plants. In the Republic of Serbia, it is often used in repair of diesel electric generators for electric power supply backup. The users of diesel generating sets are many firms: Air Traffic Control, Airport Belgrade, Air Serbia, the Serbian Army and many other companies.

The application of this device has improved the technology of maintenance of mechanical installations.

References

Ognjanović, M., 2008, Mašinski elementi, knjiga I, II Mašinski fakultet Beograd.

Standardi za materijale mašinskih elemenata (JUS M.B1.050, DIN 601, JUS M.B1.051), 1980.

Tehnička dokumentacija za hidraulične ručne dizalice Lincos, 2001. Beograd.

Tehnička dokumentacija za hidraulične ručne dizalice Sloga, 2002. Nova Varoš.

Tehnička dokumentacija za Mini hidroelektrane Elektroprivrede Crne Gore, 1964.

Tehnička dokumentacija Flender, 1979, Bocholt.

Tehnička dokumentacija Stromag, 1980, Dortmund.

Žegarac, N., 2004, Uređaj za demontažu i montažu delova teško rastavljivih sklopovima na mašinskim postrojenjima.

Žegarac, N., 2008, Izveštaj o merenju vibracija nakon generalnog remonta u MHE Rijeka Crnojevića.

Žegarac, N., 2009, Izveštaj o merenju i analizi vibracija nakon generalnog remonta MHE Podgor.

Žegarac, N., Zuber, N. 2004, Merenje i analiza vibracija nakon generalnog remonta u MHE Podgor.

МОНТАЖНО-ДЕМОНТАЖНОЕ УСТРОЙСТВО ДЛЯ СЛОЖНО
РАЗБИРАЕМЫХ ДЕТАЛЕЙ МАШИНОСТРОИТЕЛЬНОГО
ОБОРУДОВАНИЯ

Никола П. Жегарац
Сербская академия изобретателей и ученых, Белград,
Республика Сербия

ОБЛАСТЬ: машиностроение, энергетика
 ВИД СТАТЬИ: оригинальная научная статья
 ЯЗЫК СТАТЬИ: английский

Резюме:

В данной работе описаны новое технологическое решение, монтажно-демонтажное устройство для сложно разбираемых деталей. Благодаря своей конструкции, данное устройство имеет широкие возможности применения в области содержания и ремонта инженерных сооружений, таких как: ГЭС, ТЭС, дизельных электростанций, моторной промышленности, турбинных сооружений, а также в процессном производстве. Монтажно-демонтажное устройство отличается универсальностью, простотой в применении, легкостью веса, которая в свою очередь, способствует мобильности и легкому переносу на объекты.

Ключевые слова: *монтажно-демонтажное устройство, сложно разбираемое оборудование, инженерные сооружения, конструкция устройства, универсальность применения устройства.*

УРЕЂАЈ ЗА ДЕМОНТАЖУ И МОНТАЖУ ДЕЛОВА ТЕШКО РАСТАВЉИВИХ МАШИНСКИХ СКЛОПОВА НА МАШИНСКИМ ПОСТРОЈЕЊИМА

Никола П. Жегарац

Српска академија изумитеља и научника, Београд, Република Србија

ОБЛАСТ: машинство, енергетика

ВРСТА ЧЛАНКА: оригинални научни чланак

ЈЕЗИК ЧЛАНКА: енглески

Сажетак:

У раду је приказано ново техничко решење – уређај за демонтажу и монтажу делова тешко растављивих склопова на машинским постројењима. Његова конструкција омогућава широке могућности примене у одржавању и ремонту хидроелектрана, термоелектрана и дизел електроагрегата. Такође, може се применити у моторној и бродограђевинској индустрији, као и морнарици, авио-индустрији и код турбинских постројења у процесној индустрији. Уређај за демонтажу и монтажу је универзалан и лако се користи. Захваљујући својој малој тежини лако се преноси до локација где се налазе машинска постројења.

Кључне речи: *уређај за демонтажу и монтажу, тешко растављиви склопови, машинска постројења, конструкција уређаја, универзална могућност примене уређаја.*

Paper received on / Дата получения работы / Датум пријема чланка: 19. 01. 2016.
Manuscript corrections submitted on / Дата получения исправленной версии работы /
Датум достављања исправки рукописа: 27. 03. 2016.
Paper accepted for publishing on / Дата окончательного согласования работы / Датум
коначног прихватања чланка за објављивање: 01. 04. 2016.

© 2017 The Author. Published by Vojnotehnički glasnik / Military Technical Courier
(www.vtg.mod.gov.rs, втг.мо.упр.срб). This article is an open access article distributed under the
terms and conditions of the Creative Commons Attribution license
(<http://creativecommons.org/licenses/by/3.0/rs/>).

© 2017 Автор. Опубликовано в «Военно-технический вестник / Vojnotehnički glasnik / Military
Technical Courier» (www.vtg.mod.gov.rs, втг.мо.упр.срб). Данная статья в открытом доступе и
распространяется в соответствии с лицензией «Creative Commons»
(<http://creativecommons.org/licenses/by/3.0/rs/>).

© 2017 Аутор. Објавио Војнотехнички гласник / Vojnotehnički glasnik / Military Technical Courier
(www.vtg.mod.gov.rs, втг.мо.упр.срб). Ово је чланак отвореног приступа и дистрибуира се у
складу са Creative Commons licencom (<http://creativecommons.org/licenses/by/3.0/rs/>).

