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MULTI-STATIONS SHORT PITCH PRECISION ROLLER CHAIN BREAKER AND MOUNTING TOOLS

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Abstract: *This paper presents two new design solutions for short pitch roller chain breaker tool and for attachment mounting tool respectively. These two devices are designed as multi-stations tools which permit the disassembly and the assembly of four sizes of roller chains. Utilizing these designs conduct to a high productivity without damaging the press fit joints between the chain links and the chain pins. The research of this paper is patent-pending.* ***Key words:*** *Multi-station chain breaker/mounting tools, roller chain, conveyor chain.*

1. INTRODUCTION

Roller chains are used all over the world for transmission of mechanical power on many kinds of domestic, industrial and agricultural machinery. They really keep things moving and without them a lot of important equipment will be powerless.

In industry there are known many situations where it is necessary to customize a standardized roller chain (Fig. 1, Table 1) by replacing the actual links (i.e. the standardized ones) with different types of attachments (see Fig. 5) which fit certain movable subassembly. Changing a standardized chain involves two basic operations:

- Breaking apart (i.e. disassembling) the roller chain;
- Replacing the standardized links with various types of attachments (A-1, WA-1, SA-1 and WSA-1 see for example Fig. 5 and Table 2) resulting a custom roller chain.

The chains manufacturers have special devices and automatic assembly chains lines, and their technology is effective for achieving standardized chains in large series production.

The large requirements of modified chains correspond directly on each industrial application. In this case the type of the link is defined and selected accordingly with the demands of the application. The manufacturing process of custom chain has a unique production character or in the most favorable cases a small series production character. For this reason the chain manufacturers are not willing to make these changes (for obtaining custom chains). The customization of the chains is made by those who want to do that specific application, using different approaches and with special tools i.e. chain breaker tools (for disassembling different type of roller chain, see for example Fig 1 and Fig. 2).

Table 1

Dimensions of short pitch precision roller chains (series B)

DIN / ISO Chain No.	P [mm]	d_1 [mm]	b_1 [mm]	d_2 [mm]	L [mm]	L_c [mm]	h_2 [mm]	t/T [mm]
08B–1	12.7	8.51	7.75	4.45	16.7	18.2	11.8	1.6
10B–1	15.875	10.16	9.65	5.08	19.5	20.9	14.7	1.7
12B–1	19.05	12.07	11.68	5.72	22.5	24.2	16	1.85
16B–1	25.4	15.88	17.02	8.28	36.1	37.4	21.00	4.15/3.1

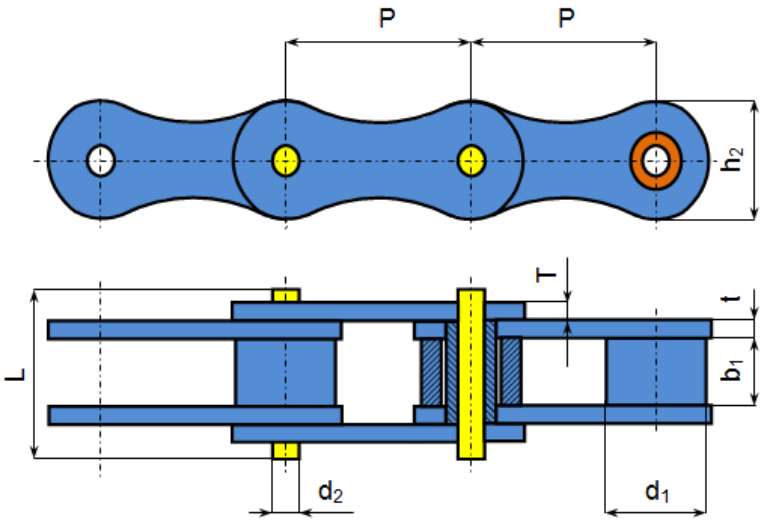


Fig. 1 Short precision roller chain (series B) [4]

An interesting tool for obtaining chains of a specific length (depending upon the customer demands) is shown in Fig. 2. This multi-station [3] is used to break short pitch precision roller chain (series B) [4]. The specific dimensions of these chains are shown in Table 1 [4].

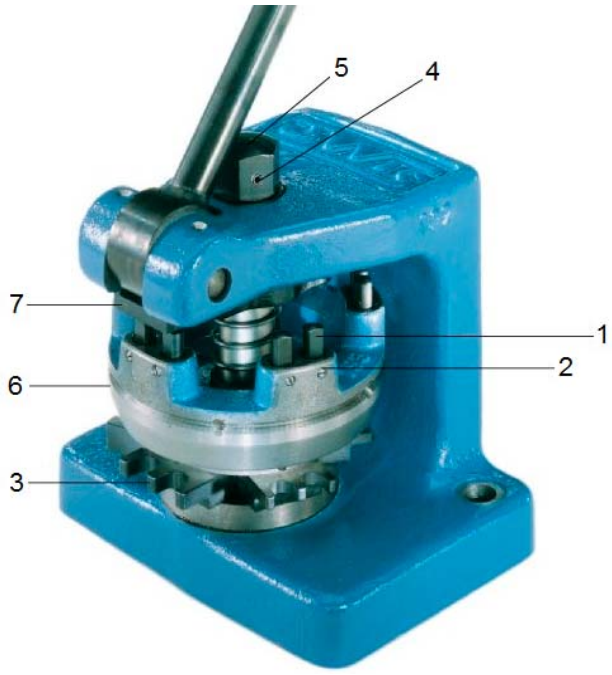


Fig. 2 *IWIS*® [3] multi-station chain breaker
1 - pressure pin; **2** - grub screws; **3** - support forks; **4** - top nut; **5** - bolt; **6** – rotating head; **7** - pressure plate

This multi-station tool (Fig. 2) can be clamped in a vice or screwed onto a workbench [3]. The rotating head (6) holds five sets of ejector tools, each of which is marked with the respective size (Table 1) of roller chain.

In this paper the authors proposed **a modular multi-station chain breaker tool** for disassembling (i.e. breaking) four sizes of roller chains with parallel pins (presented in Table 1). Also the authors developed a **brand-new multi-station tool** for replacing the standard links with different attachments (see for example the Fig. 5 and Table 2) in order to obtain custom roller chains. In Section 2 we describe the design solutions. Then in the following Section are described the working principles of those multi-stations tools. Eventually, some suggestions regarding the possible extensions of the results of this study are presented.

2. THE DESIGN SOLUTIONS

In this Section are presented the design solutions developed by the authors for disassembling and replacing the standard links a roller chain (Fig. 1).

2.1 Multi-station roller chain breaker

The design solution of the multi-station roller chain breaker tool proposed by the authors of this paper is presented in Fig. 3.

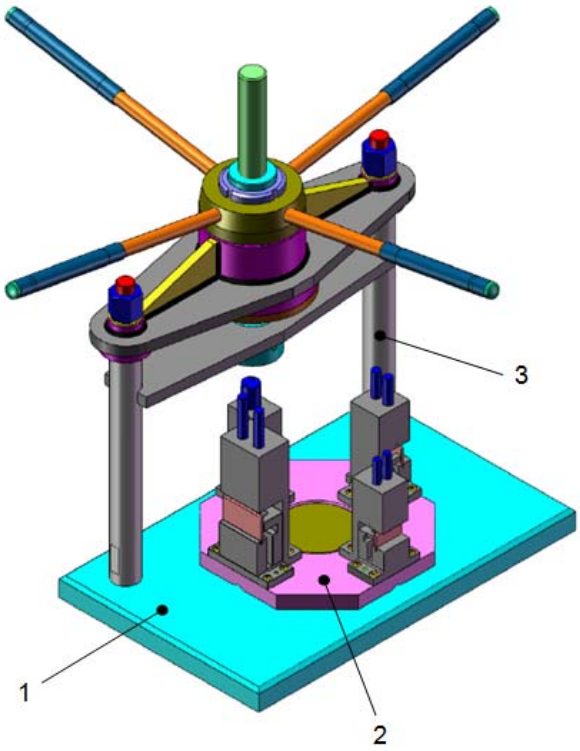
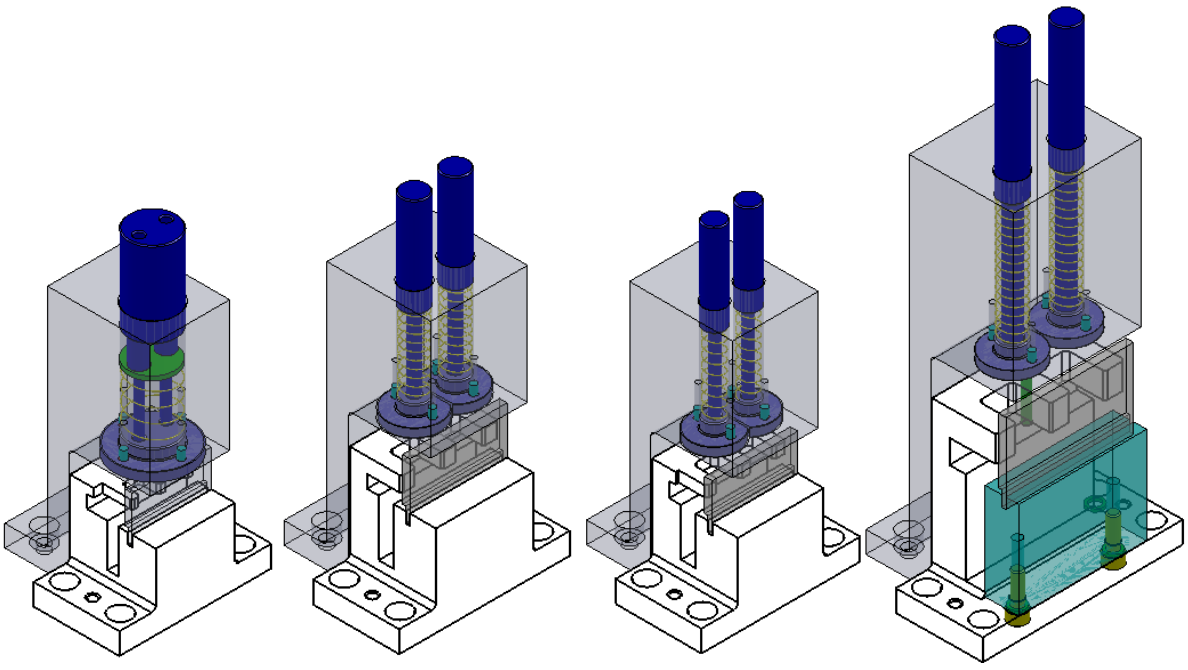


Fig. 3 Multi-station roller chain breaker
1 – base plate, **2** - indexing base plate, **3** - power-screw press



a) **b)** **c)** **d)**

Fig. 4 The four workstations corresponding to the four sizes (Table 1) of short pitch precision roller chains
a) Workstation no. 1 (roller chain **08B–1**); **b)** workstation no. 2 (roller chain **12B–1**); **c)** workstation no. 3 (roller chain **10B–1**); **d)** workstation no. 4 (roller chain **16B–1**)

On the indexing base plate (2) are mounted four workstations (Fig. 4) corresponding each other to a single roller chain size (Table 1). The working principle of this multi-station consists

in the following phases: (-*a*-) selecting the right workstation (Fig. 4–depending on the roller chain size – see Table 1); (-*b*-) positioning the roller chain into the workstation; (-*c*-) manual drive of the power-screw press's handle–resulting the pressing off of the roller chain's bolts.

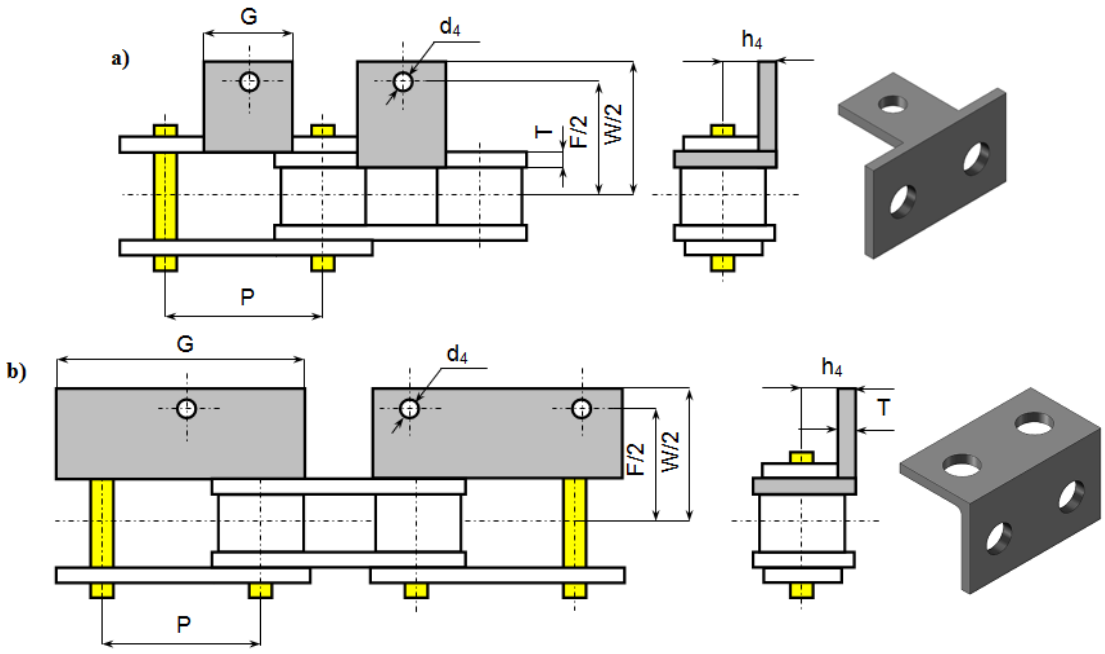
2.2 Multi-station for mounting short pitch conveyor chains attachments (A-1, WA-1, SA-1 and WSA-1)

This multi-station for mounting four different types of attachments (Fig. 5 and Table 2) is presented in Fig. 6.

Table 2

Dimensions of short pitch conveyor chain attachments (A-1, WA-1, SA-1, WSA-1) [4]

DIN / ISO Chain No.	P [mm]	G [mm]	C [mm]	L [mm]	F [mm]	W [mm]	T [mm]	h_4 [mm]	d_4 [mm]
08B–1	12.7	9.5	–	–	25.4	36.4	1.6	8.9	4.5
10B–1	15.875	14.3	–	–	31.75	44.6	1.7	10.31	5.3
12B–1	19.05	16	–	–	38.1	52.4	1.85	13.46	6.4
16B–1	25.4	19.1	–	–	50.8	72.6	3.1	15.88	6.4
08B–1	12.7	24	–	12.7	25.4	36.4	1.6	8.9	4.3
10B–1	15.875	29.58	–	15.875	31.8	44.6	1.7	10.31	5.3
12B–1	19.05	34.05	–	19.05	38.1	52.4	1.85	13.46	6.4
16B–1	25.4	46.4	–	25.4	50.8	72.6	3.1	15.88	6.4
08B–1	12.7	9.5	13.35	–	18.9	–	1.6	–	4.3
10B–1	15.875	14.3	16.5	–	22.95	–	1.7	–	5.3
12B–1	19.05	16	21.45	–	28.6	–	1.85	–	6.4
16B–1	25.4	19.1	23.15	–	34	–	3.1	–	6.4
08B–1	12.7	23.3	13.35	12.7	18.9	–	1.6	–	4.3
10B–1	15.875	29.58	16.5	15.875	22.95	–	1.7	–	5.3
12B–1	19.05	34.05	21.45	19.05	28.6	–	1.85	–	6.4
16B–1	25.4	46.4	23.15	25.4	34	–	3.1	–	6.4



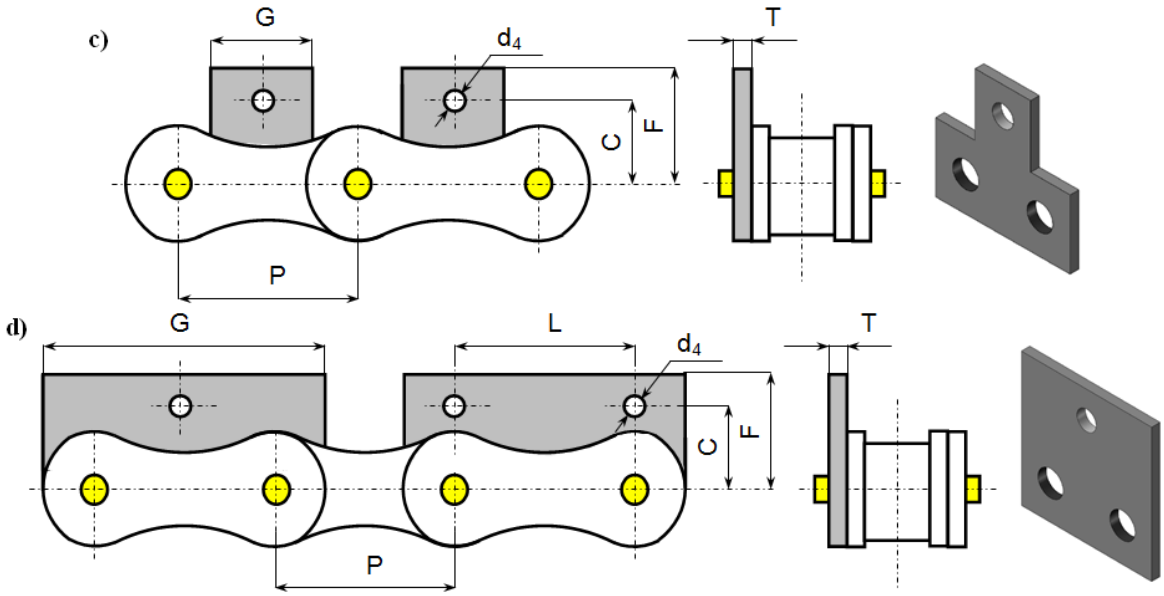


Fig. 5 Short pitch conveyor chain attachments
a) A-1 attachment, **b) WA-1** attachment, **c) SA-1** attachment, **d) WSA-1** attachment

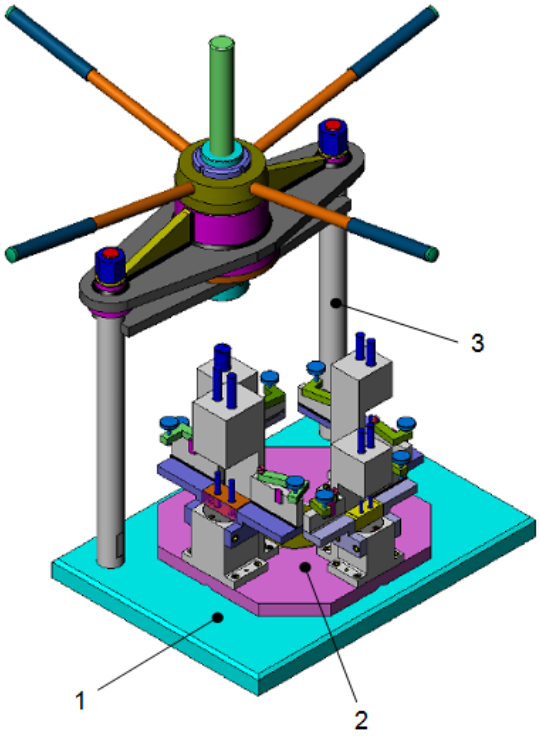
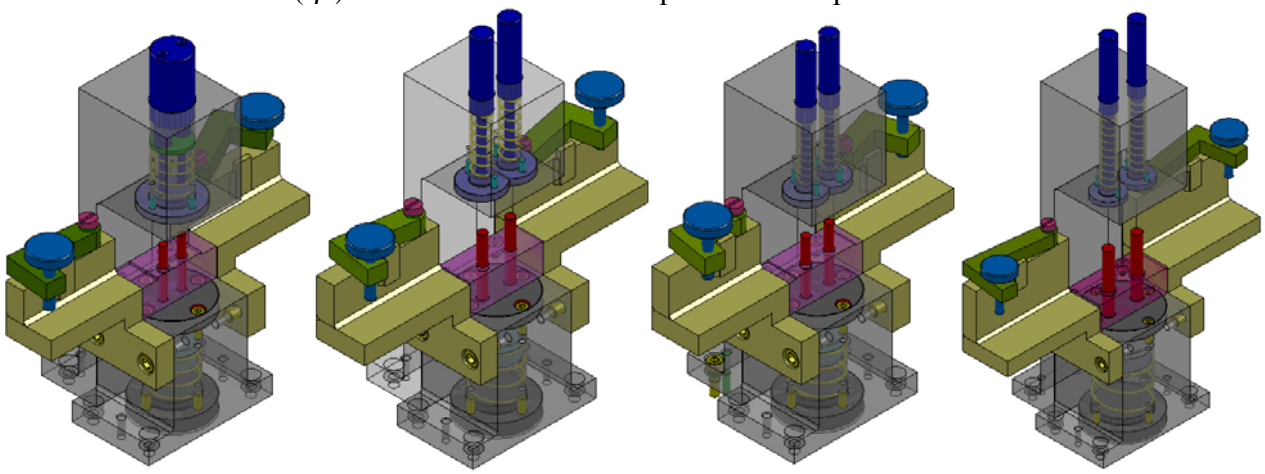


Fig. 6 Multi-station for mounting short pitch conveyor chain attachments
1 - base plate, **2** - indexing base plate, **3** - power-screw press

The method for mounting the short pitch conveyor chain attachments using the multi-station tool (Fig. 6) designed by the authors of this paper consists in the following steps: (-*a*-) selecting the appropriate workstation (Fig. 7) accordingly with the chain size (Table 1), (-*b*-) placing the chain attachment on the inferior rods, (-*c*-) introducing the two ends of the chain (which will be assembled) on the inferior rods and over the previously introduced attachment, (-*d*-) preliminary pressing of the chain pin into the second attachment for a length of 50%-80% from the link thickness, (-*e*-) positioning the

second attachment and (*-f-*) manual drive of the power-screw press's handle.



a) **b)** **c)** **d)**

Fig. 7 The workstations for mounting the short pitch precision roller chains attachments
a) Workstation no. 1 (roller chain **08B–1**); **b)** workstation no. 2 (roller chain **12B–1**); **c)** workstation no. 3 (roller chain **10B–1**); **d)** workstation no. 4 (roller chain **16B–1**

3. CONCLUSIONS

This paper presents a new design solution of a multi-station chain breaker tool and of a multi-station for mounting the attachments of a short pitch precision roller chain. These two solutions are very ingenious designed permitting a rapid and easy disassembling and mounting of the roller chain components. Also the utilization of these two multi-stations ensures high productivity without damaging the press fit joints between the links and the roller chain pins. These multi-stations tools are patent-pending in this moment.

4. REFERENCES

[1] Budynas R. and Nisbett K., *Shigley's mechanical engineering design*, McGraw-Hill Science; 2006.
[2] Grote, K.H., Antonsson, E.K., *Springer Handbook of Mechanical* Engineering, Springer, Berlin, 2009.
[3] *http://www.iwis.de/en/drive-systems/brands-products/accessories/tools*
[4] *http://www.tvchain.cn*

Dispozitive pentru depresarea şi montarea ecliselor lanţurilor cu role

Rezumat: Lucrarea prezintă două dispozitive, unul pentru depresarea bolţurilor lanţurilor cu role, iar celălalt pentru montarea unor eclise modificate. Aceste dispozitive au fost concepute într-o construcţie modular, care permite depresarea şi montarea a patru mărimi de lanţuri cu role. Utilizarea acestor dispozitive a condus la creşterea productivităţii fără deteriorarea îmbinărilor dintre eclise şi bolţuri. Cercetările din cadrul acestei lucrări fac obiectul a două brevete de inventive, în curs de apariţie.

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