

THE SPRING RESEARCH ASSOCIATION

A Pneumatic Five Ton Press and Feeding System

Report No. 180

by

J. Oldham

October 1970

THE SPRING RESEARCH ASSOCIATION

Report No: 180

A PNEUMATIC FIVE TON PRESS AND FEEDING SYSTEM

SUMMARY

This report describes how a small press can be made using a pneumatic impact cylinder and demonstrates how pneumatics can be used to provide a feeding system which is used to crop strip material into lengths to close tolerances.

The machine was designed to demonstrate the use of impact cylinders, and subsequent work has shown that a strip up to 1.5 in wide and 0.064 in thick may be cut to lengths accurate to ± 0.002 in. With the feed cylinder employed the strip feed was infinitely variable between 0 and 6 in but this could be increased to 2 ft if necessary.

Production rates may be varied up to approximately 3000 cycles per hour depending on the lengths of strip required.

ALL RIGHTS RESERVED

The information contained in this report is confidential and must not be published, circulated or referred to outside the Association without prior permission.

(October 1970)

CONTENTS

	<u>Page No</u>
1. Introduction	1
2. Equipment and Materials	1
2.1 General Description	1
2.2 The Five Ton Impact Press	1
2.3 The Feed Unit	2
2.4 Pneumatic Circuit	2
3. Discussion	2
4. Conclusions	3
5. Figures	
1. Prototype Machine	
2. Feeding Unit	
3. Cropping Unit	
4. Pneumatic Circuit	

A PNEUMATIC FIVE TON PRESS AND FEEDING SYSTEM

by

J. OLDHAM

1. INTRODUCTION

The Spring Research Association has designed several low cost automation devices with the aim of improving production and reducing operator fatigue. This report describes a prototype machine which uses a five ton impact cylinder and other pneumatic components to form a strip feeding and cropping system.

The original intention was to demonstrate how an impact cylinder could be used to make a small press; it was also shown that accurate strip cropping could be achieved even with a relatively simple feed system. This further demonstrates the scope of pneumatics in automating many of the operations that are at present carried out either by hand or semi-automatically.

2. EQUIPMENT AND MATERIALS

2.1 General Description

The machine consisted of two units, a small press frame with the strip feed mechanism mounted on a channel sectioned base and a pneumatic impact cylinder, as illustrated in Figures 1 - 3 (shown without safety guards).

2.2 The Five Ton Impact Press

A five ton impact press was made by using a Martonair cylinder No. 3030 which was mounted vertically in a rigid frame. A die set was used to fix the cropping tools.

2.3 The Feed Unit

The feed unit mechanism employed three cylinders to clamp the strip and feed it into the cropping tools. The clamping cylinders were mounted vertically and the feed cylinder horizontally, these being coupled to a sliding feed unit, which was pushed forward to a solid stop where the second clamp was activated to hold the strip during cropping and the return stroke of the feed unit. As the strip was clamped the impact cylinder was operated and the strip cropped.

2.4 Pneumatic Circuit

The pneumatic circuit used on the machine is given in Figure 4. Diaphragm valves were used to control the cycling of the machine and restrictors and reservoirs employed to give a variable time delay on forward and return strokes of the feed cylinder. This ensured that the clamps were operated before the feed cylinder was activated.

If necessary the rate of feed or strip advancement could be varied by using variable restrictors on the appropriate exhaust port.

The impact cylinder was triggered by a roller trip valve at the end of the feed unit's stroke.

The air consumption of the machine was approximately 25 ft³/min.

3. DISCUSSION OF APPLICATIONS

Whilst the pneumatic impact cylinder was used only to crop metal strip there are numerous applications where it could be usefully employed, since these cylinders cover a range of 2 to 50 tonf impact force. Any operation which could be carried out on a fly press could be performed with less operator fatigue using the pneumatic impact cylinder.

The cylinders may be used separately as presses or attached to existing machinery for additional operations. Operations such as punching, riveting, piercing, cropping, coining and marking are typical examples of work which could be performed with the appropriate

impact cylinder and control valves.

The feed system also has many uses. Steel strip, wire or sectioned materials could all be fed either singly or in multiples depending on the width of the tools. The feed system could also be used on 'Multiple Tool' presswork where the work is in strip form.

By using an uncoiling machine and straightening rolls, the feed system allows the machine automatically to crop straightened lengths of strip from coiled stock.

Providing the feed and clamp cylinders are large enough to produce the gripping and pushing forces required there should be no limitation to the size of material which could be fed, and since positive stops were used on both forward and return strokes of the feed cylinder this should ensure that the length of strip is accurate to fine limits. The ability to cut long lengths of strip is an important advantage over the conventional type of press.

4. CONCLUSIONS

1. The impact cylinder is potentially a most useful tool for the spring industry due to its high force capabilities and reliability. (Cylinders ranging from 2 to 50 tonf are available commercially.)

2. The application of pneumatics, even in the simple form used in the feeding unit, can reduce unnecessary material handling and increase productivity.

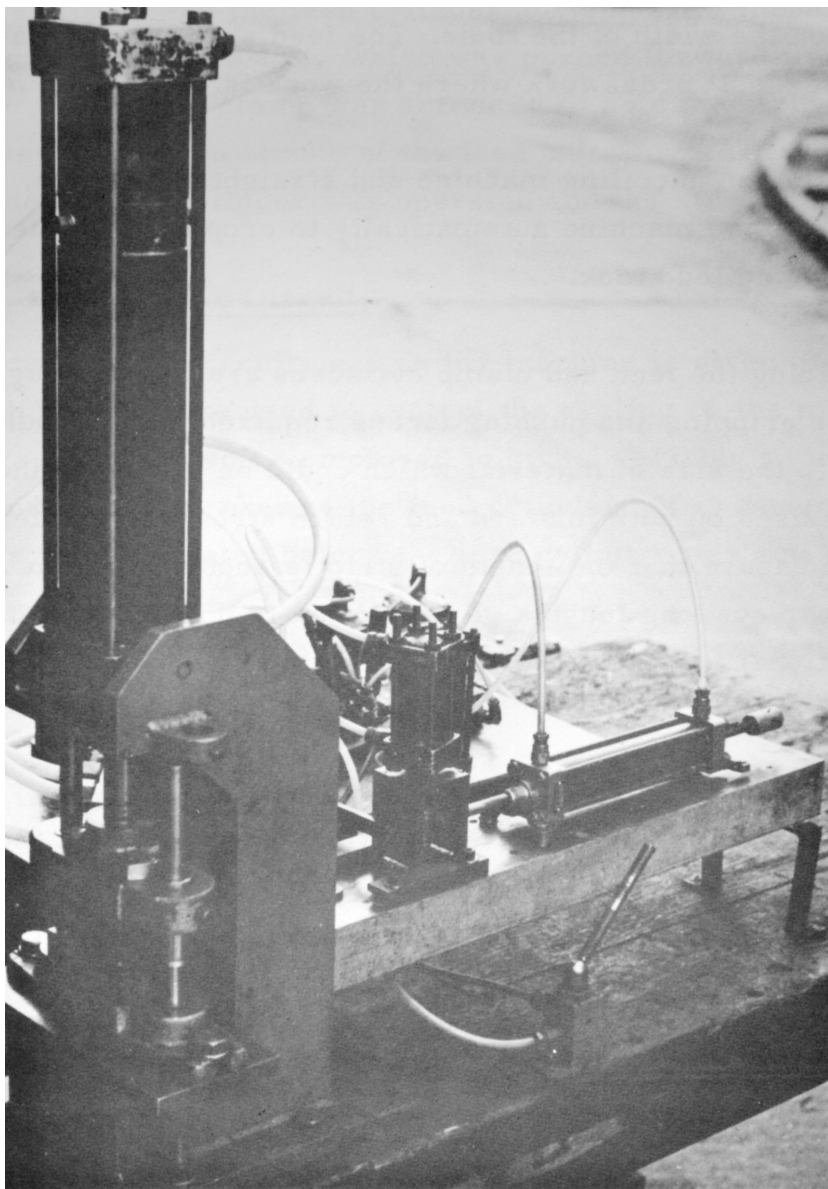


Fig. 1 PROTOTYPE MACHINE

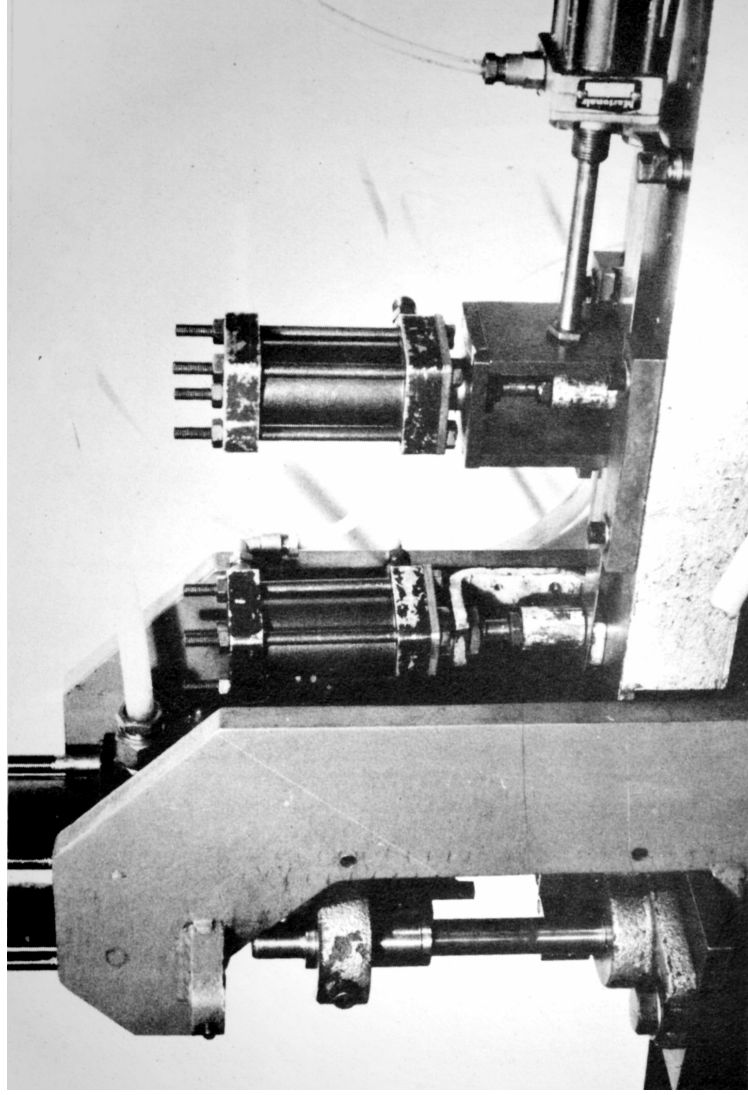


Fig. 2 FEEDING UNIT

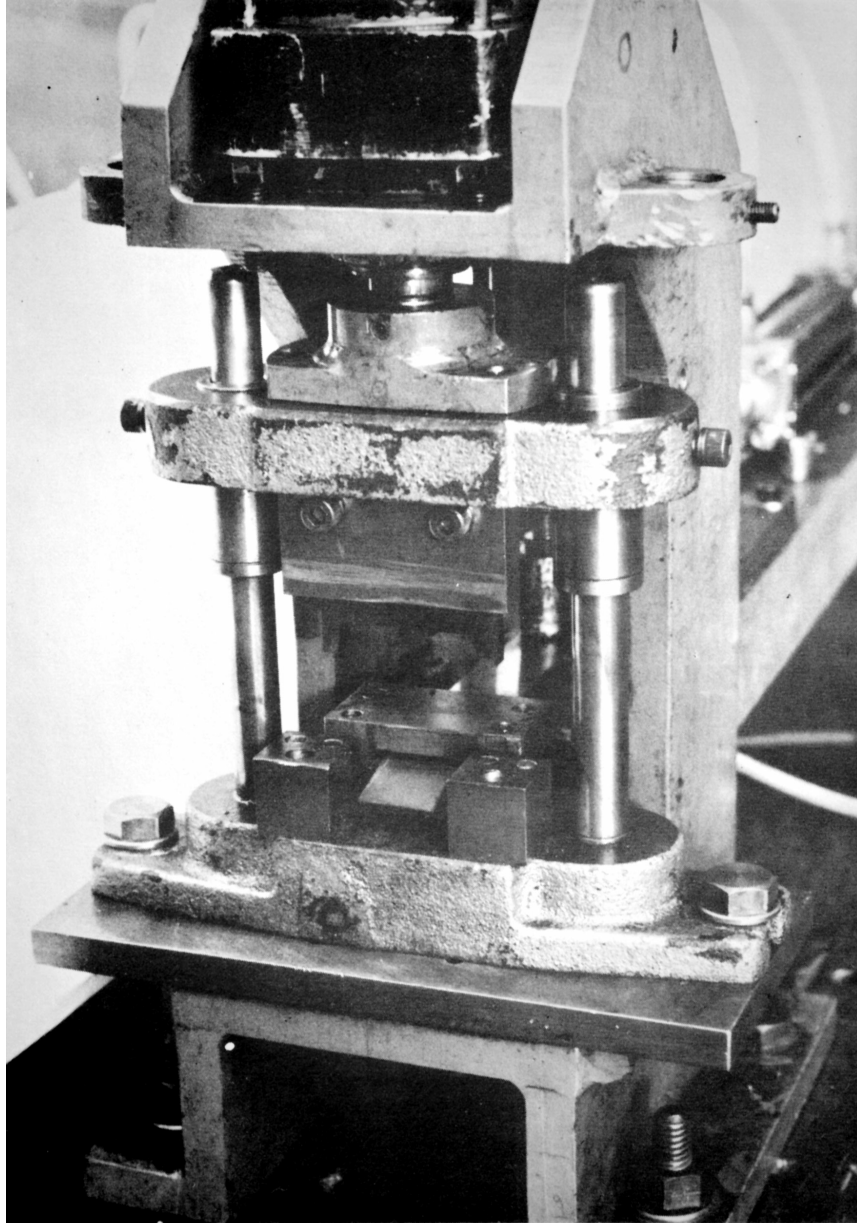


Fig. 3 CROPPING TOOLS

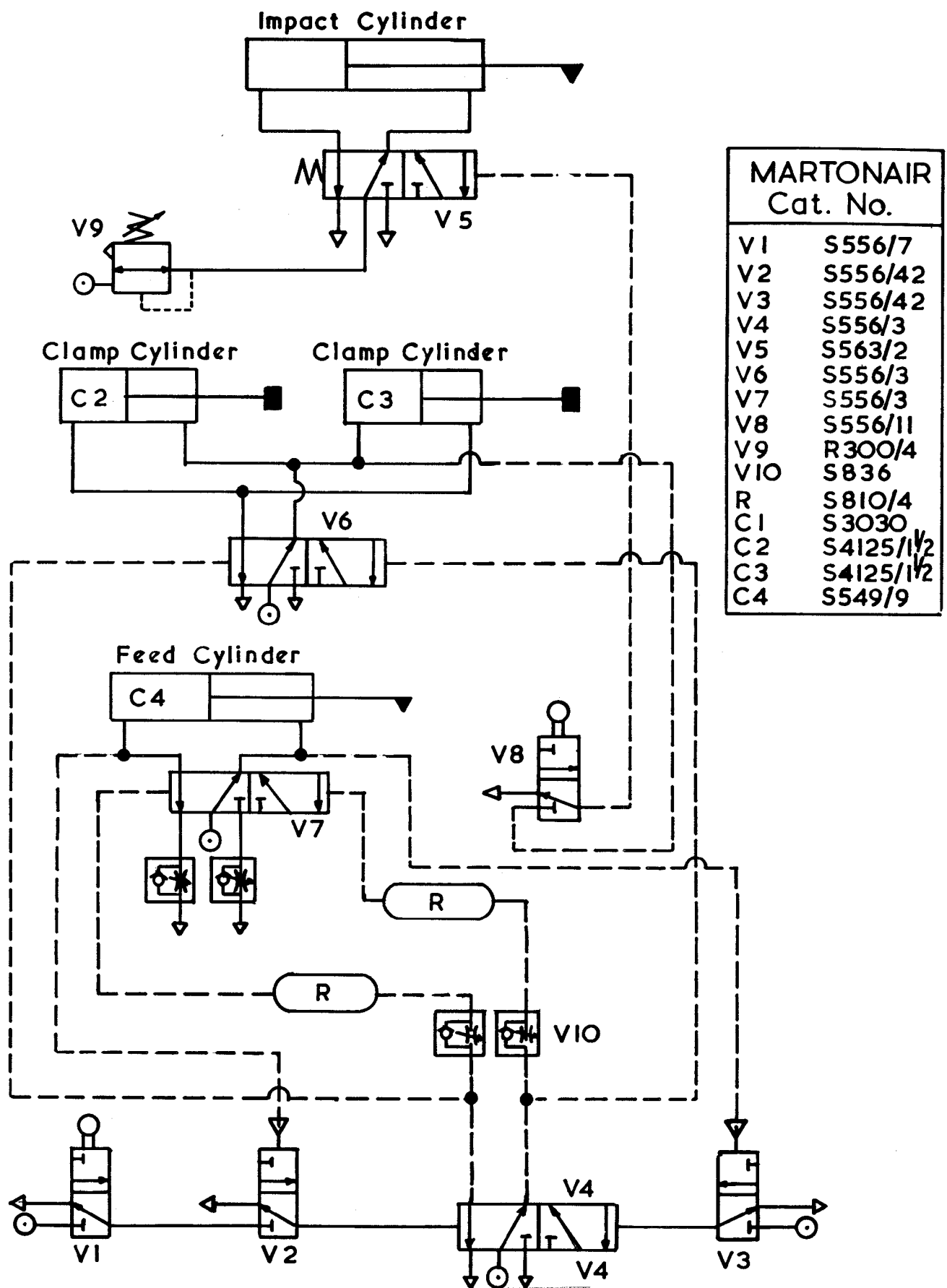


Fig. 4 PNEUMATIC CIRCUIT