THE SPRING RESEARH ASSOCIATION

A PROTOTYPE DOUBLE TORSION SPRING COILING MACHINE

by
A.H. Wilkinson, B.Sc.

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SUMMARY

The initial stages of development of a double torsion spring coiling machine have been completed and a prototype machine has been produced. The machine forms double torsion springs of the 'inside leg' type from 'u' shaped wires which are fed in by hand. It is designed to fill the gap between fully automatic machines and hand operated jigs by using relatively simple principles which facilitate quick setting up procedure.

The machine uses a $\frac{1}{4}$ hp 3 phase electric motor and requires an air supply of 0.2 cu ft/min at 60 lbf/in^2.

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1. INTRODUCTION

For some time now it has been part of SRA policy to investigate requirements in the Spring Industry for low cost semi-automatic devices which assist spring handling and manufacture. There are many good machines available commercially which perform such functions, but they are, in general, quite expensive and only really justified by large scale production of a single item.

Thus there is a need for versatile semi-automatic machines to undertake work which is presently being done manually with the aid of jigs. It is expected that such devices would give rise to a more consistent product, improved rate of production and less operator fatigue.

One such device which has recently been produced by SRA is a prototype machine for coiling double torsion springs. The principles of operation of this machine are described in this report.

2. EQUIPMENT AND MATERIALS

2.1 General Description

A general view of the machine is shown in Fig. 1. The machine is electro-pneumatic and forms double torsion springs of the type shown in Fig. 2. Springs are coiled from 'u' shaped wires which are pre-formed before coiling. The designs of spring which can be coiled by this machine are limited, as development work was terminated as soon as

it was clear that the principles of operation were sound. For the same reason the speed of operation is fairly slow. However, by manufacturing a number of interchangeable components, a large variety of spring designs could be coiled utilising wire diameters up to about 0.080 in.

The machine is driven by a $\frac{1}{4}$ hp 3 phase electric motor, the air consumption of the pneumatic components is 0.2 cu ft/min at 60 lbf/in^2.

2.2 Coiling Mechanism

A description of a forming operation is as follows:-

The legs of a 'u' shaped wire are fed onto the two coiling mandrels on each side of the central bush and under the driving pegs as shown in Fig. 3. The 'start' button is pressed and the mandrels rotate driving the central bush and coiling the spring. When the correct number of coils have been formed, the coiling system is reversed and the mandrels retract allowing the spring to be removed. The coiling system then returns to the start position, the mandrels close and engage the central bush and the machine stops ready to coil the next spring.

2.3 Control System

The coiling mandrels, which are driven by the electric motor, are also geared to a lead screw. A carriage moving along the lead screw operates microswitches which control the direction of the motor and the opening and closing of the mandrels. This mechanism can be seen at the right hand side of the machine in Fig. 1. The mandrels are operated by pneumatic cylinders which are controlled electrically by the microswitches via a solenoid valve. A complete circuit diagram is shown in Fig. 4.

3. DISCUSSION

In its present state the machine successfully forms double torsion springs from pre-formed wires with reasonable accuracy. Further development should produce a useful and versatile manually operated machine which is more robust and has improved appearance and ease of setting up. It is not anticipated that this will involve any major modifications and it is thus considered to be sufficiently developed to interest some companies who specialise in the development, engineering and marketing of such equipment from the prototype stage.

The machine has been designed to wind double torsion springs of the 'inside leg' type, but it is possible, with suitable modifications, to wind springs of the 'outside leg' type also. This would involve having an interchangeable coiling mechanism which could be used in place of the existing one.

4. CONCLUSIONS

A prototype double torsion spring coiling machine has been produced which is sufficiently developed to show that this type of spring can be coiled with reasonable accuracy using relatively simple mechanical principles.

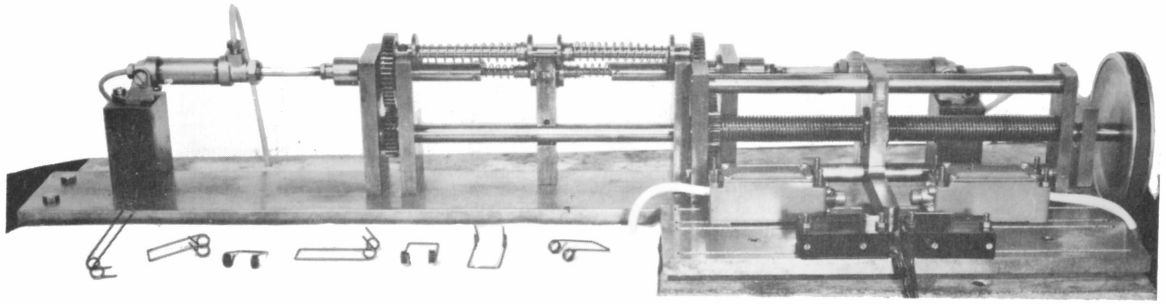


FIG. 1 THE PROTOTYPE MACHINE

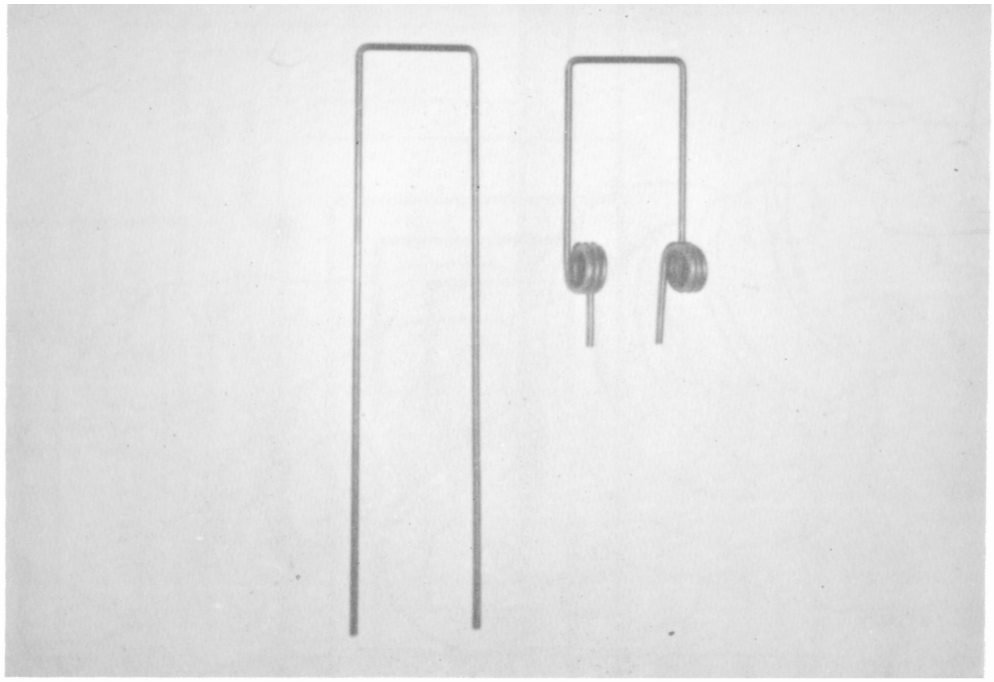


FIG 2

A PREFORMED WIRE AND DOUBLE TORSION SPRING

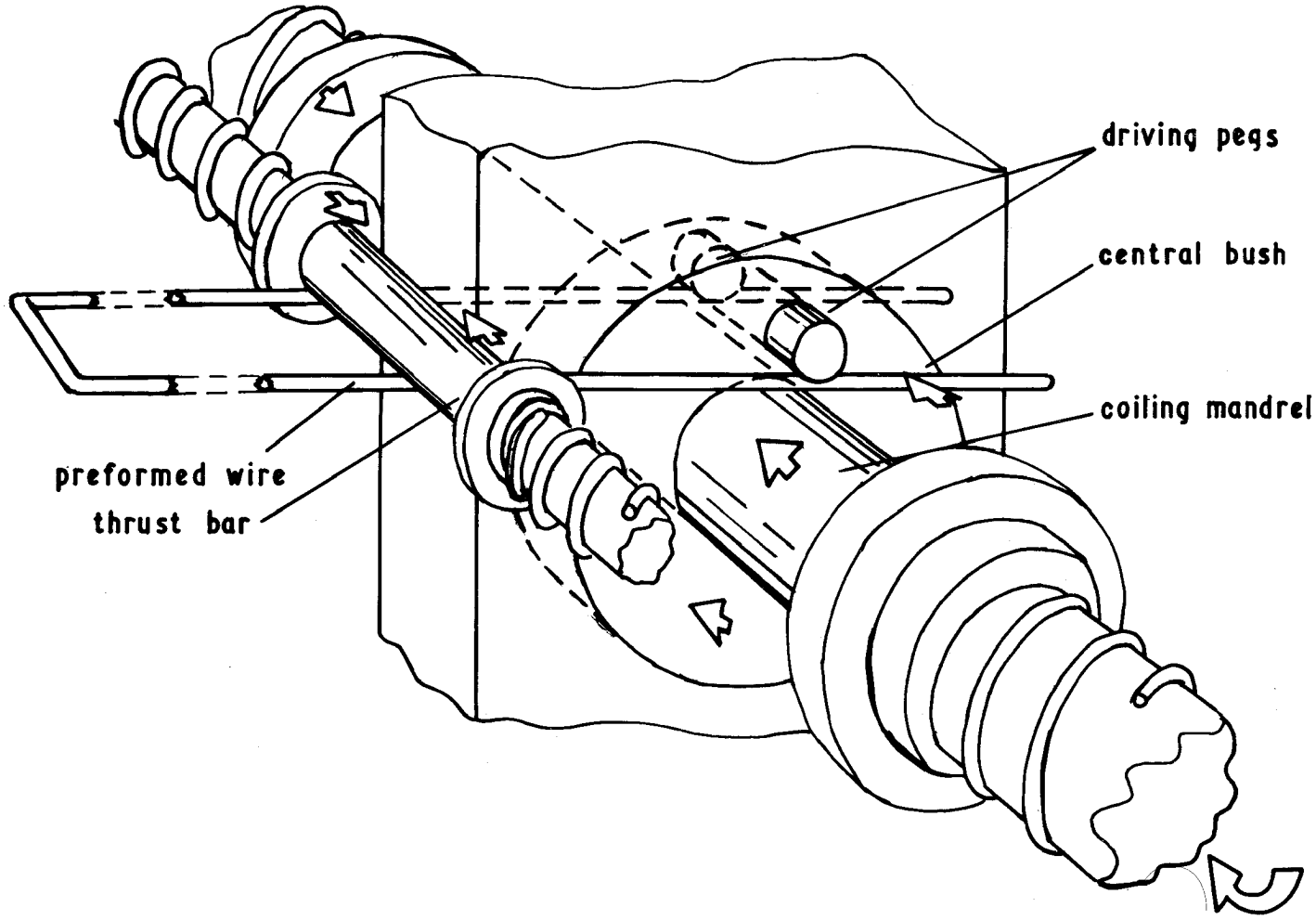
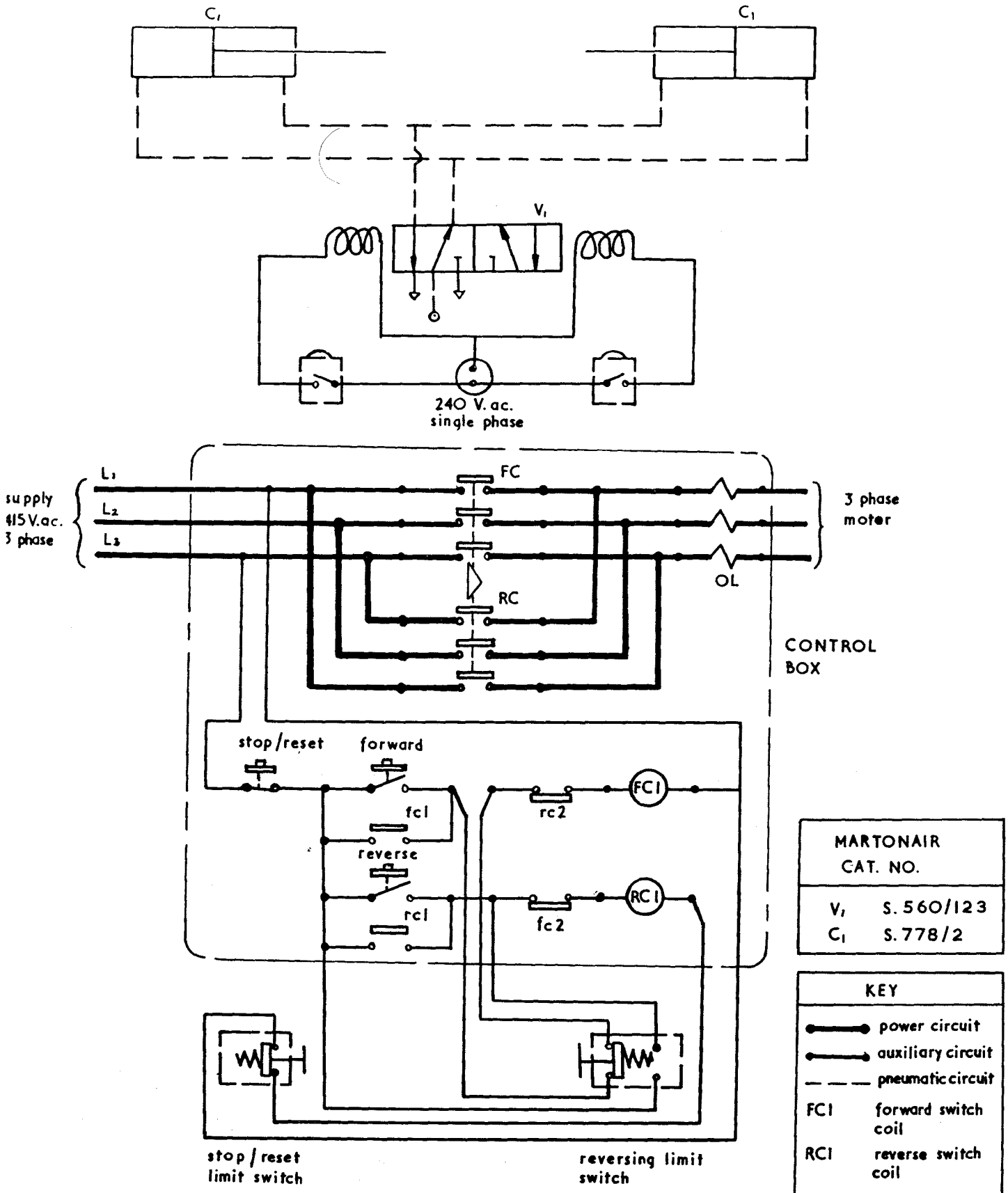


FIG. 3. COILING MECHANISM



MARTONAIR CAT. NO.	
V_1	S. 560/123
C_1	S. 778/2

KEY	
	power circuit
	auxiliary circuit
	pneumatic circuit
FC1	forward switch coil
RC1	reverse switch coil
OL	overload
FC	forward switch
RC	reverse switch
fc	auxiliary switch
rc	" "

FIG. 4. CIRCUIT DIAGRAM