

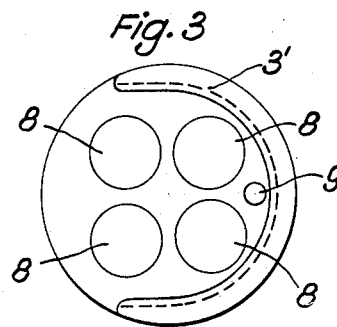
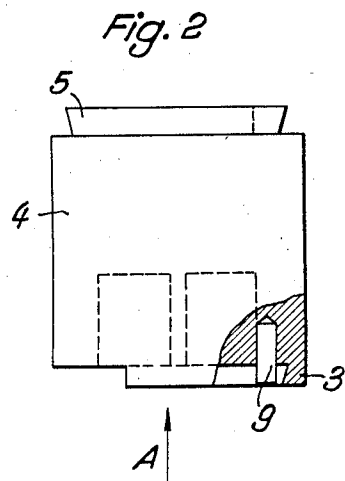
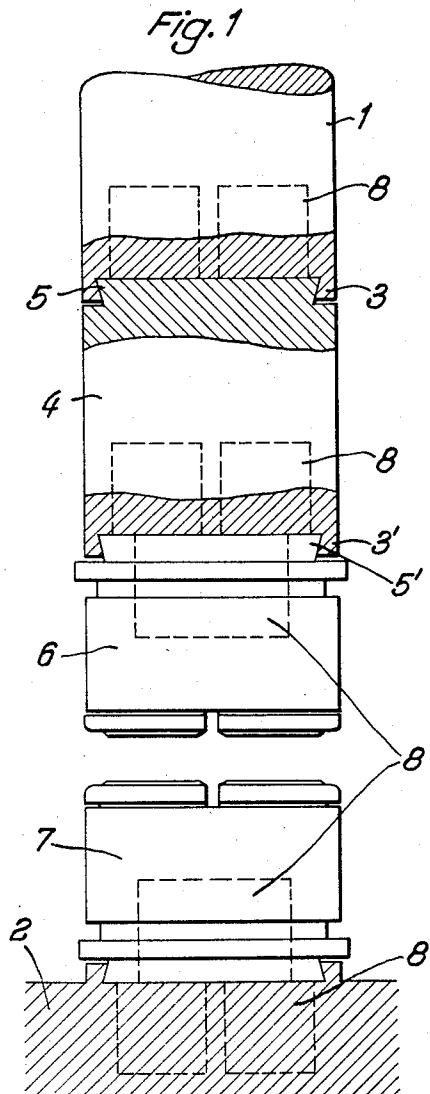
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W. ECKOLD  
TOOL CLAMPS

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 4

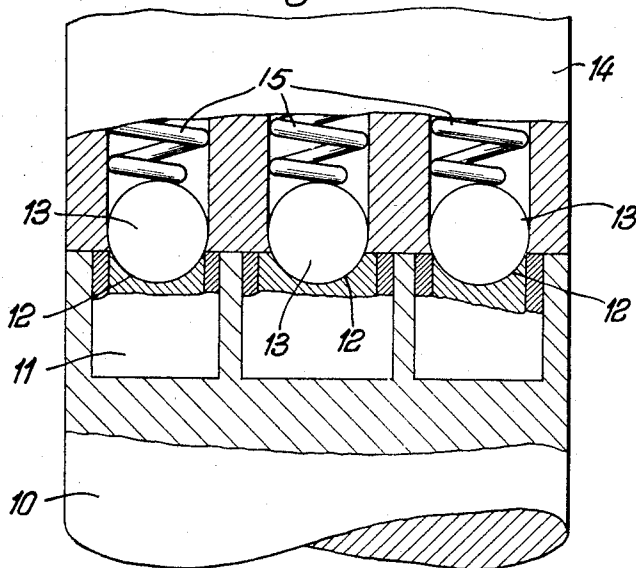
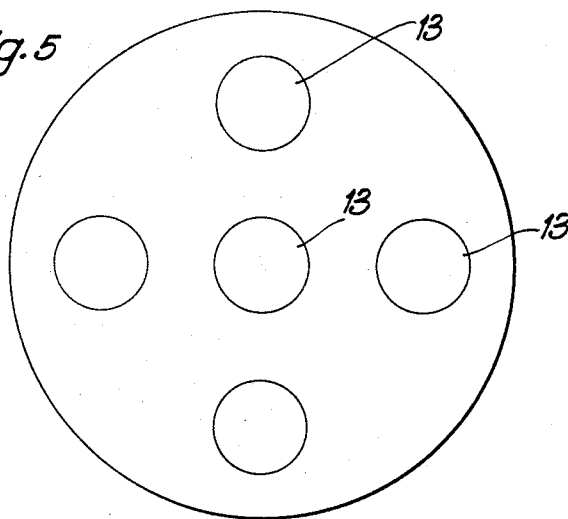


Fig. 5



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2,912,249

## TOOL CLAMPS

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4 Claims. (Cl. 279—1)

The invention relates to a clamping appliance for exchangeable tools, in particular for high-speed machines for cold-forming sheet and strip.

Such machines are employed in manufacturing processes in many different ways, so that a great number of special tools is required for use with them and which often have to be brought into operation one after another in rapid succession. The machines, which operate rapidly and have several different working speeds, can only be utilized over their whole performance range in an economical manner, if the repeated exchanges of tools, which are required in order to perform the various stages in the forming of a component, can be carried out quickly and reliably.

The complicated nature of the fastenings hitherto proposed has made it necessary up to now, to spend a considerable amount of working time in fitting and removing these tools, which greatly reduced the efficiency and the economical utilization of the machines in question. In order to remedy this state of affairs, the invention proposes now to provide the tools and their clamps or attachments with contact faces such that the tools or their attachments can be pulled away in a direction at right angles to the working stroke of the tools, at least one of the two faces in contact having magnetic properties.

It is preferred that the magnetic properties shall be given to the contact faces of the tool attachments and/or of the tools or tool clamps by means of built-in permanent magnets, so that these parts, especially the tools, can only be pulled off by overcoming the attractive forces due to the magnetic flux.

As an example of the invention embodiments suitable for cold forming metal sheet and strip thereof will now be explained in greater detail with reference to the accompanying drawings of which:

Fig. 1 is a side view partly in section of an arrangement of tools according to the invention, as used in a machine for cold forming sheet and strip;

Fig. 2 is a view of the adapter in side view;

Fig. 3 is an end view seen in the direction of the arrow "A" of Fig. 2;

Fig. 4 shows a section through part of another embodiment of the invention; and

Fig. 5 shows the plan view of Fig. 4.

In the tool set-up as shown in Figs. 1, 2 and 3, the tool attachment consists of a top plate 1 and a bolster plate 2. The top plate 1 is provided with an undercut bead 3. In the example illustrated, an adaptor 4, having a dovetailed projection 5, can be inserted into this bead from the side. This is made possible by having the dovetailed guide bead, which in Figs. 2 and 3 is shown for the under side of the adaptor, approximately U-shaped in plan, i.e. open on one side.

The adaptor 4 has on its under side an identically shaped dovetailed guide bead 3', which locates a dovetailed projection 5' of a punch 6. The guide bead 3'

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is U-shaped in plan, and thus permits the punch 6 to be withdrawn to the side.

The tool attachments 1 and 2, the adaptor 4 which has to be provided if required, and also if necessary the tools 6 and 7 are provided with permanent magnets 8, which are inserted into these parts and whose object it is to ensure the attractive force required for the assembly of these parts. Their magnetic attraction permits the tools to be withdrawn sideways, if a certain force is applied, but keeps them securely in position as required for the safe operation of the machine.

Referring to Fig. 1 the direction of force application is such as to force punch 6 toward the stationary punch 7. Thus the element 6 is the force-applying means having a work-contacting surface at right angles to the direction of force of the punch 6.

In order to assist in the correct location of the tools, dowel pins are provided at 9 which register into corresponding recesses in the mating parts. These dowel pins prevent at the same time the parts from rotating relative to each other.

Figs. 4 and 5 show an embodiment of the invention suitable for tool attachments having comparatively larger dimensions. In such a case, when it might be required that a number of tools are working together in a combined set-up, the tools can again be arranged suitably for rapid exchange, whilst at the same time ensuring absolutely secure attachment to the supporting plates, or if necessary to an adaptor. In this embodiment permanent magnets 11 embedded in a fixed plate 10, have spherical recesses 12. The base of the tools or of the recesses is provided with a number of symmetrically arranged cylindrical holes, which contain steel balls 13 whose diameters correspond with those of the spherical recesses in the plates. The steel balls can be pushed in deep enough against spring pressure by means of springs 15 so as to be flush with the plane base of the tools. They are prevented from falling out of their holes by slightly caulking the exits of the latter.

As the tool 14 is inserted from the side, the steel balls disappear inside their cylindrical holes. Only after the tool has been pushed in fully so as to take up its final working position will the permanent magnet or magnets pull the steel balls down into their respective spherical holes, so that the tool will be located in that position.

If more than two or more tools are working together in a combination tool arrangement, it is equally possible to locate them accurately in this manner and to secure them in position.

The dimensions of the spherical recess 12 in the permanent magnets 11 must be such that the tool can be withdrawn, at right angles to the direction of the working stroke, if a suitable force is applied. During that withdrawal action the steel ball slides back into its hole. Use can here be made of the fact that, because of the increased surface of the spherical recess, the effective surface of the permanent magnets is increased.

Location of the tools by steel balls which register into spherical recesses in the permanent magnets, has the additional advantage that the tools cannot be dislodged even if the operating force of the punch acts in a direction other than normal to the working face of the tools.

The total number of spherical recesses and of steel balls in the contact surfaces can be increased, by arranging more of them in the spaces in between the permanent magnets, and pitched on the same diameter as the latter. In this manner any desired angular position of the tools can be obtained. If such an arrangement is used, the balls are best loaded by springs placed inside their holes. This will ensure the correct engagement of the balls in all spherical recesses, including those having no magnetic properties.

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It will be obvious that the clamping arrangement according to the invention will result in an exceptionally simple and rapid method of exchanging the tools and, where required, the adaptors, since all that is necessary to exchange the tools is to pull them out sideways. It is here important that either the punch or the die can be inserted and dismantled without interfering with the other parts of the machine and without altering the height of the tup.

What I claim is:

1. Apparatus for clamping rapidly exchangeable tools on a support and particularly for use in the cold treatment and working of sheet and strip metal, comprising a punch having a work contacting surface at substantially right angles to the force applying direction on the punch and having a U-shaped dove-tailed projection on an opposite surface, an adaptor having a U-shaped, dove-tailed guide bead to cooperate with the projection on the surface of the punch and which permits rapid lateral movement and separation of the punch relative to the

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adaptor, and magnetic means mounted in the punch and the adaptor to maintain the punch and adaptor securely in position relative to each other during the working of the apparatus.

2. Apparatus according to claim 1, in which the magnetic means is a permanent magnet built into the punch.

3. Apparatus according to claim 1, in which the magnetic means is a permanent magnet built into the adaptor.

4. Apparatus according to claim 1, in which a dowel pin is provided secured in the adaptor and projecting into the punch to prevent unintentional rotation of the punch.

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