

Dec. 24, 1968

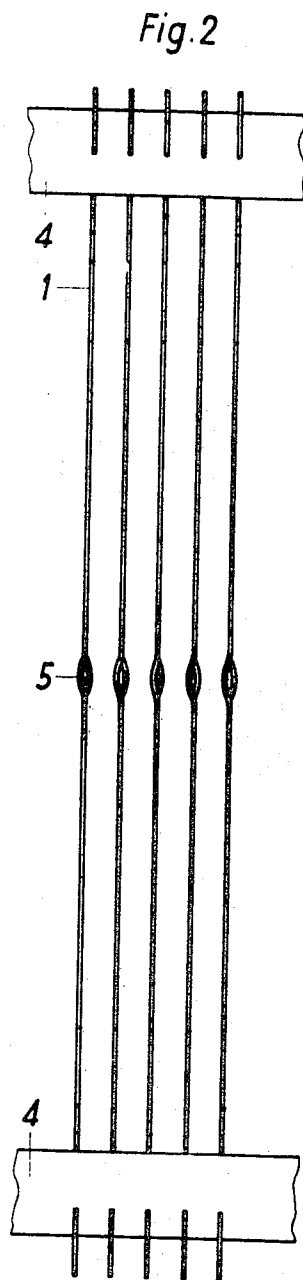
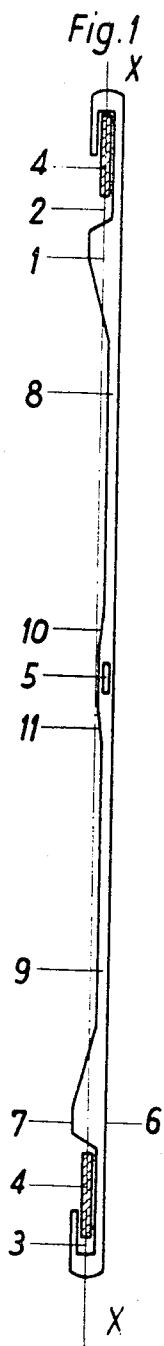
M. GRAF

3,417,789

HEDDLE

Filed Jan. 17, 1967

2 Sheets-Sheet 1



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M. GRAF  
HEDDLE

3,417,789

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Fig. 3

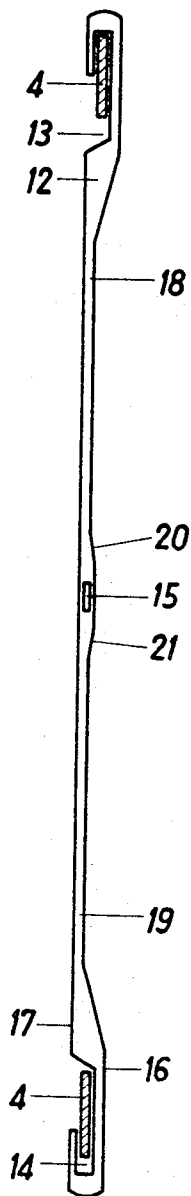


Fig. 4

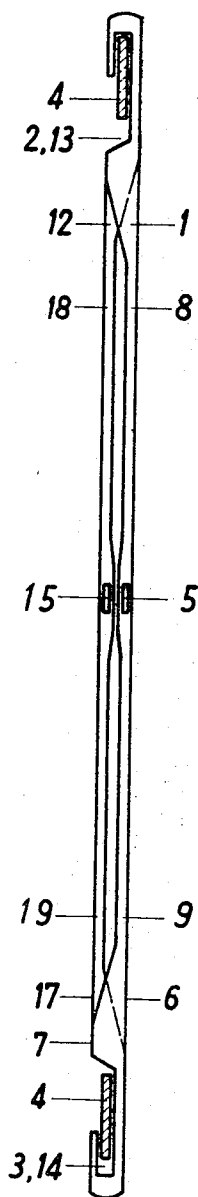
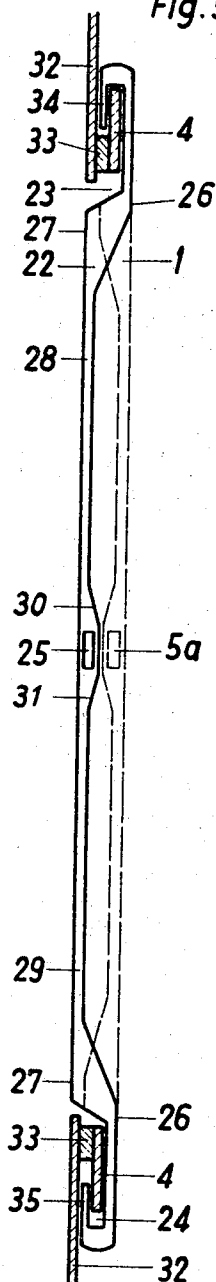


Fig. 5



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3,417,789  
HEDDLE

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4 Claims. (Cl. 139—96)

## ABSTRACT OF THE DISCLOSURE

A heddle is made from strip material (e.g. steel) and is punched out so that there is a straight edge along one side at least in the zone of the warp shed. Consequently, the heddle only needs to be polished on the other edge.

The eye is offset to one side of the line joining the centers of the carrying rods and is also displaced laterally in regard to the center line of the adjoining heddle shaft portion, and if two sets of heddles are provided with eyes offset on opposite sides, a Duplex arrangement of heddles can be assembled.

This invention relates to heddles for use in weaving looms and more particularly to heddles which are made by punching from steel strip. One of the problems with this type of heddle is that of warp threads catching on the edges of heddles other than that through which they are threaded. This is particularly the case with very fine warp threads and as a result, it becomes necessary to polish all the punched-out edges of the heddles which will be in the zone of the warp shed when in use. It is an object of the invention to reduce the amount of polishing which is necessary.

Another object of the invention is to reduce the weight of the heddles for any particular application.

According to this invention a heddle made from strip material is bounded along one of its longitudinal sides by a straight edge at least in the zone which works in the warp shed and the heddle eye is so disposed in relation to the adjoining portions of the heddle shaft itself that it is displaced laterally from the centre line passing through the middle of the adjacent portions of the heddle shaft. With this arrangement, the heddle can be pressed out of strip material with cut-outs only at one side (opposite to the straight edge) so that only this cut-out side needs to be polished in the zone of the warp shed.

A heddle in accordance with the invention can be made quite narrow through the major portion of its length, and it is preferred that the heddle eye shall be offset laterally relatively to the longitudinal centre line of this narrow part away from the straight edge. It may then be necessary to widen the heddle in the immediate vicinity of the eye, the widening being accomplished at the opposite side of the heddle to the straight edge.

It is possible to produce two sets of heddles in accordance with the invention, but with the straight edges of one set on one side of the heddles and the straight edges of the other set on the opposite side of the heddles. When these heddles are assembled on a heddle frame they produce a so called Duplex set of eyes (i.e. a heddle frame with two rows of eyes, the eyes of one row alternating with those of the other row). Thus it is possible to provide a Duplex arrangement without it being necessary to bend edgewise the metal strips from which the heddles are made.

Heddles constructed in accordance with the invention will now be particularly described, by way of examples only, with reference to the accompanying drawings, in which:

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FIG. 1 is a side view of a heddle,

FIG. 2 is a front view of a series of heddles similar to that shown in FIG. 1,

FIG. 3 is a view similar to FIG. 1, but showing a complementary heddle in which the heddle eye is displaced on the opposite side to that shown in FIG. 1,

FIG. 4 is a side view of two heddles, one in accordance with each of FIGS. 1 and 3 assembled on a heddle frame, and

FIG. 5 is a view similar to FIG. 4 but showing an alternative construction.

Referring to FIG. 1, a heddle 1 made of strip metal is formed at its ends in the conventional manner with upper and lower loops 2 and 3 open on one side. In this particular example the end loops are J-shaped, but it will be understood that the end loops could be C-shaped, claw shaped or shaped in any other convenient manner. Top and bottom heddle carrying rods 4 extend through the upper and lower end loops 2 and 3. A heddle eye 5 is formed in the heddle, and usually this is positioned midway between the top and bottom heddle carrying rods 4. In this construction, the heddle eye 5 is displaced laterally with respect to the longitudinal axis X—X passing through the centre of the thicknesses of the heddle carrying rods 4. The heddle eye is also positioned as close as possible to the right hand edge 6 of the heddle.

During the process of manufacture, material is removed from the left hand side of the heddle to produce the shaped edge 7. This metal is removed so as to reduce the weight of the heddle assembly. Because of the lateral displacement of the heddle eye 5, material can be removed from the steel strip not only in the upper heddle section 8 and the lower heddle section 9, but also in the region of the eye itself.

Various advantages are derived from this construction. In particular the right hand edge 6, being straight, does not require cutting and this produces a considerable saving, because, apart from the fact that no material has to be removed from the right hand side, it is unnecessary to polish the narrow edge 6. Polishing the edges of the heddle is normally required after a punching operation in order to avoid sharp edges which could damage the warp threads which rub on the flanks of the heddle during the weaving process.

On the other hand more material can be removed from the left hand side than in the conventional construction and because this is also possible in the region of the heddle eye 5, the weight of the heddle can be reduced still further. Shoulders 10 and 11 produced by the heddle eye only appear on one side of the heddle eye and as will be observed by reference to FIG. 1 are only slightly raised. Thereby it becomes possible to polish the severed narrow edge 7 of the heddle throughout the major portion of its length without impairing the accuracy which would result if there were considerable widening on both sides of a heddle eye in the middle of the heddle.

In FIG. 3 there is shown another example in which a heddle 12 is provided with end loops 13 and 14 and mounted on heddle carrying rods 4. A heddle eye 15 is formed in the middle of the length of the heddle and is displaced as far as possible from the longitudinal axis X—X laterally towards the left hand edge 17. In this construction however, material has been removed from the right hand side, leaving a shaped narrow edge 16 at that side. As in the first construction, there are narrow upper and lower sections 18 and 19 above and below the eye. At the junctions of the upper and lower sections 18 and 19 with the heddle eye section, there are shoulders 20 and 21, but since the heddle eye is narrower than the width of the steel strip and material can be taken from the right hand side of the steel strip even in the zone

of the eye itself, these shoulders are only slightly inclined. This facilitates the polishing of the edge 16.

FIG. 4 illustrates a further advantage of heddles in accordance with the invention. On a heddle frame having top and bottom heddle carrying rods 4, are mounted two heddles, one in accordance with FIG. 1 and the other in accordance with FIG. 3. In practice there are two sets of heddles arranged alternately along the heddle frame. Since the heddle eye 5 of the heddle 1 is displaced to the right of the longitudinal axis X—X whereas the heddle eye 5 of the heddle 12 is displaced to the left of the said axis, there is produced a double row of heddle eyes. The same is true of the upper and lower sections 8 and 9 of the heddle 1 and the upper and lower sections 18 and 19 of the heddle 12. This arrangement produces a double row, or so called Duplex arrangement of the heddle eyes without the two sets of heddles occupying more width than the steel strip of which they were made. It is because there are no projections towards the outside in the region of the heddle eyes that it becomes possible to maintain the overall width of the heddle assembly equal to that of the steel strip material from which the heddles are produced. Moreover, it is possible to use these heddles for narrow harness divisions of, for example, 10 and 12 millimetres. Nor is it necessary to bend the steel strip edgewise and this is an advantage because the steel strip is usually hardened and consequently the bending process is not easy and frequently results in the formation of cracks.

FIG. 5 shows a further arrangement in accordance with the invention. In this arrangement, it is supposed that on account of the yarns to be used or of the drawing-in hook, the heddles themselves have to be of greater width than in previously described constructions, and thereby the space between two heddles would become too small with a double row set of eyes. A heddle 22 has end loops 23 and 24 engaging on the heddle carrying rods 4. A heddle eye 25 wider than that used in the previous examples is provided in the middle of the length of the heddle 22. This heddle eye is also displaced laterally with respect to the longitudinal axis X—X and in relation to the adjacent heddle sections 28 and 29. In the zone of the warp shed (i.e. between the end loops 23 and 24) the narrow edge 27 remains straight and the reduction in width from the overall width of the steel strip takes place in the upper and lower sections 28 and 29 on the right hand side thus producing a shaped edge 26. As a result of the formation of the wider heddle eye 25, the two shoulders 30 and 31 on the edge 26 become rather more pronounced.

In this arrangement, the heddle carrying rods 4 are carried by heddle carrying rod holders 32 connected to the top and bottom staves (not shown) of the heddle frames. Spacers 33 are provided between the rods 4 and the holders 32 to accommodate hooks 34 and 35 formed in the end loops of the heddle. It is clear from FIG. 5 that the smallest possible harness division is determined by the distance of the narrow edge 26 of the heddle 22 from the opposite side of the heddle carrying rod holder 32. This dimension determines the greatest width of steel strip from which the heddle 22 can be made without the harness division being influenced or widened. The use of a wider steel strip or the full use of the space required by the heddle carrying rod holder 32 means that the hook 34 or 35 also has a punched narrow edge. This however, is of secondary importance because no warp thread can

come into contact with the hook 34 or 35 in the formation of the warp shed.

Behind the heddle 22, a heddle 1 is shown in broken lines with a large heddle eye 5a. The possible double row arrangement of heddles 1 and 22 is made clear by this diagram.

By virtue of the lateral displacement of the heddle eye away from the longitudinal axis as well as out of the adjacent sections of the heddle, a considerable reduction in manufacturing costs is achieved because only one narrow edge needs to be polished after punching to such an extent that it cannot damage the finest warp threads. It is possible to work with heddles according to FIG. 1 with a single row of eyes, and later to bring in heddles according to FIG. 3 or 5 alternately. Thus it is possible at any time to change over to a double row set of eyes without having to accept trouble in operation with a single row of eyes or to provide a more expensive heddle.

What I claim is:

1. A single layer heddle made from a strip of material provided at its ends with loops open at one side for mounting the heddle on the carrying rods in a heddle frame, one longitudinal edge of said heddle forming a straight continuous line from one end to the other end of the same, a heddle eye being provided between the ends of said strip, said heddle eye being laterally displaced with respect to the longitudinal axis passing through the center of the thickness of the heddle carrying rods, said strip being cut away above and below said heddle eye along the other longitudinal edge a distance extending from adjacent said eye to a point short before said open loops at the ends of said strip, said cut away portions forming edges which are disposed parallel to said straight continuous line of the first mentioned longitudinal edge.

2. A heddle according to claim 1, in which said straight continuous edge and the two other edges formed by said cut away portions above and below said heddle eye are all disposed to one side of said longitudinal axis passing through the center of the thickness of said heddle carrying rods.

3. A heddle according to claim 1, in which the cut away portions above and below said heddle eye leave enlargements in said strip adjacent said two open loops, said enlargements being directed away from the straight continuous edge of said strip and having an inclined edge merging into the open loop at the ends of said strip, said enlargements also extending beyond said longitudinal axis passing through the center of the thickness of said heddle carrying rods.

4. A heddle according to claim 1, in which that portion of said strip of material which is provided with said heddle eye is narrower in width than the ends of said strip provided with said open loops.

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JAMES KEE CHI, *Primary Examiner*.

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,417,789

December 24, 1968

Martin Graf

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading to the printed specification, line 6, for "Dec. 16, 1966" read -- Jan. 17, 1966 --.

Signed and sealed this 22nd day of July 1969.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents