United States Patent [19]

Deproux

[11] **3,890,895**

[45] **June 24, 1975**

[54] **ENDLESS TYPE-CARRYING TAPE FOR PRINTING MACHINE**

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[22] Filed: **Nov. 12, 1973**

[21] Appl. No.: **414,998**

[52] **U.S. Cl.** **101/111**; 101/93.14

[51] **Int. Cl.** **B41i 1/20**

[58] **Field of Search** ..... 101/111, 93 C

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Primary Examiner—Edgar S. Burr
Assistant Examiner—Edward M. Coven
Attorney, Agent, or Firm—Fred Jacob

[57] **ABSTRACT**

An endless tape for an impact printer is provided with separate groups of flexible fingers which project laterally from and along one side edge of the tape. The fingers of each groups are formed integrally with a common base and the base is removably attached in face-to-face relation to the tape. The "grain" of the material of the tape extends longitudinally of the tape in order most effectively to resist tape breakage due to the flexing of the tape as it is travelled along its endless path, whereas the grain of the material of the groups of fingers extends longitudinally of the fingers likewise to maximize their lives incidental to the flexing of these fingers caused by the striking hammers.

9 Claims, 29 Drawing Figures

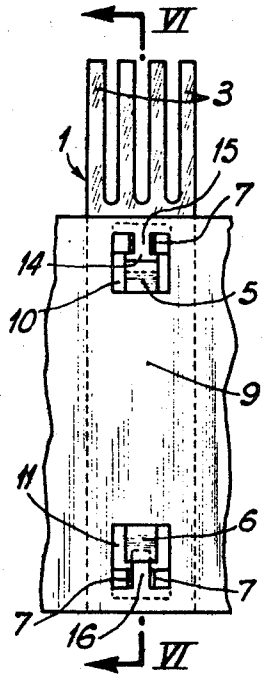


Fig.1

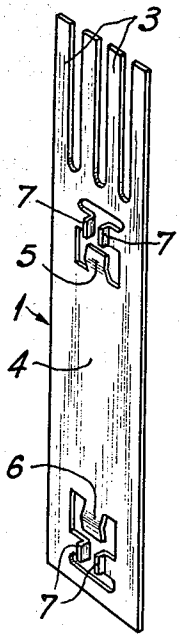


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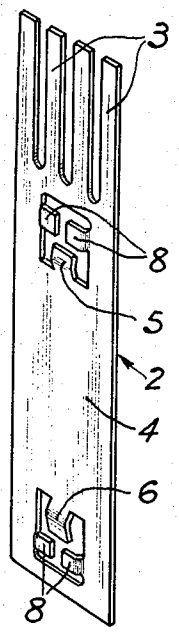


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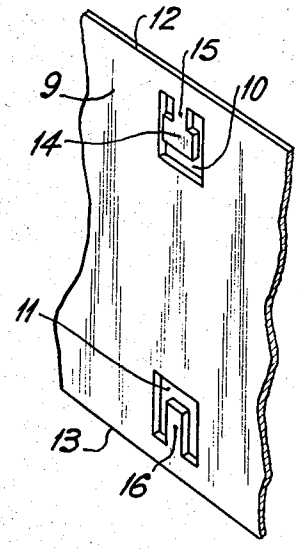


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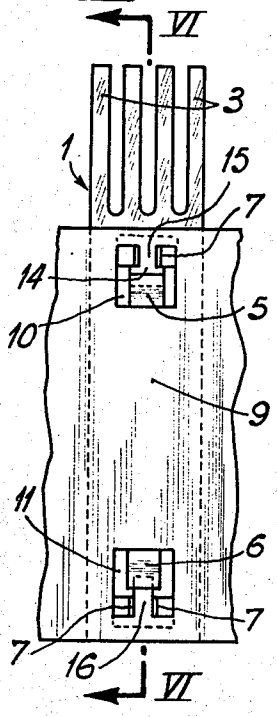


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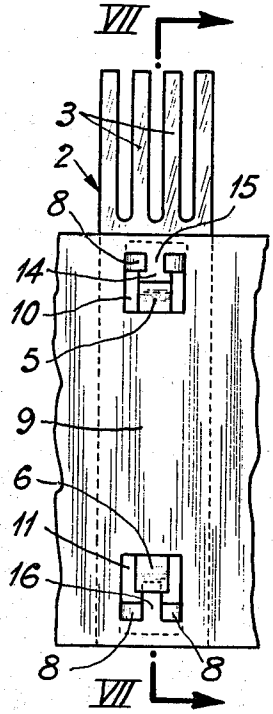


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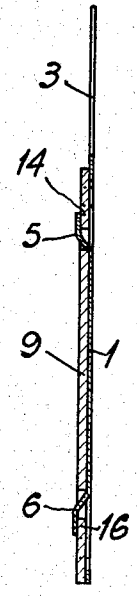


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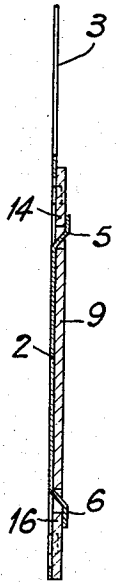


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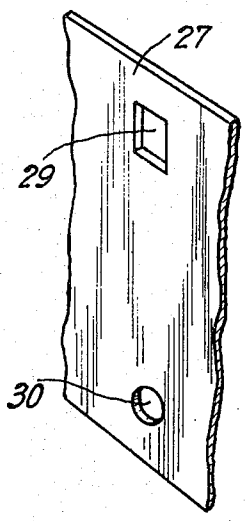


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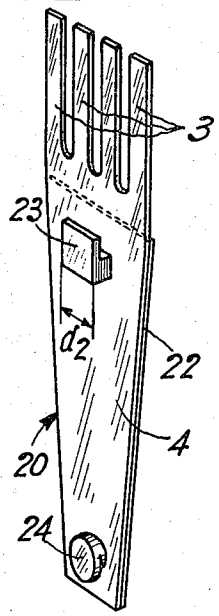


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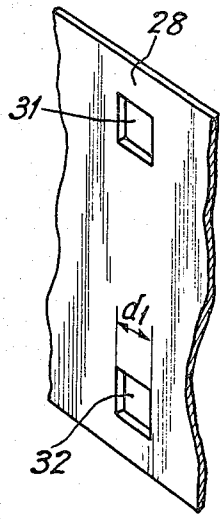


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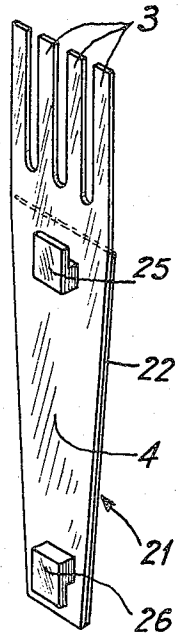


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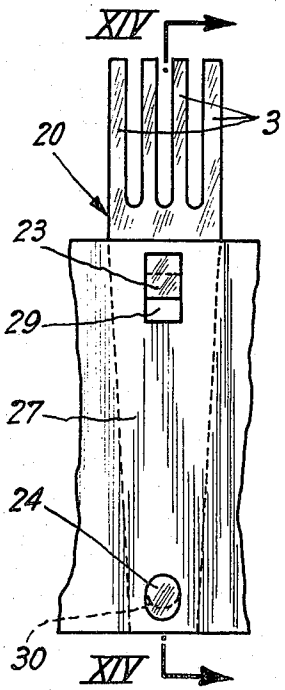


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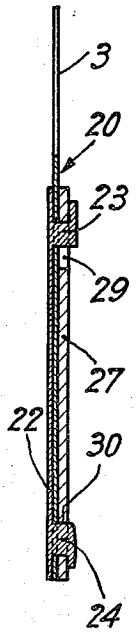


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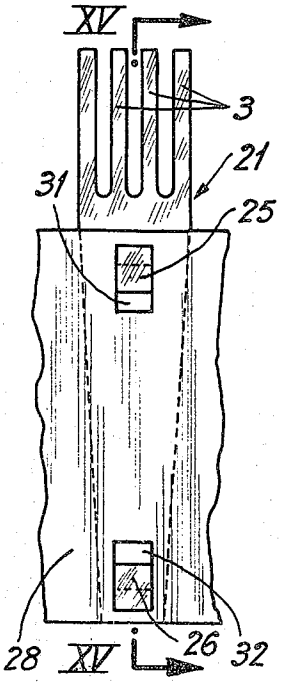


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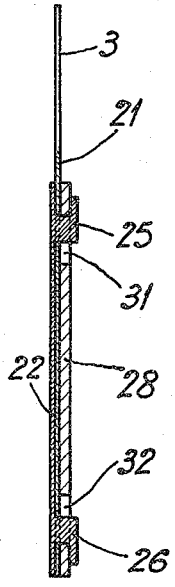


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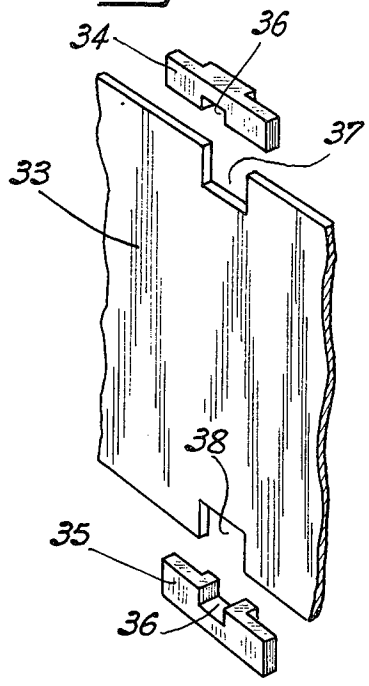


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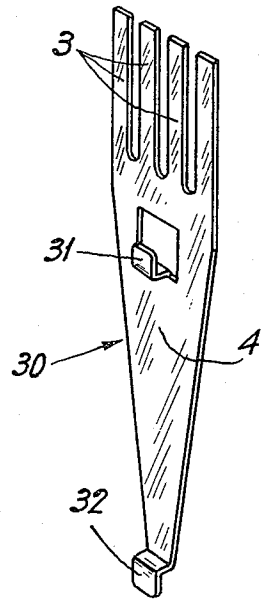


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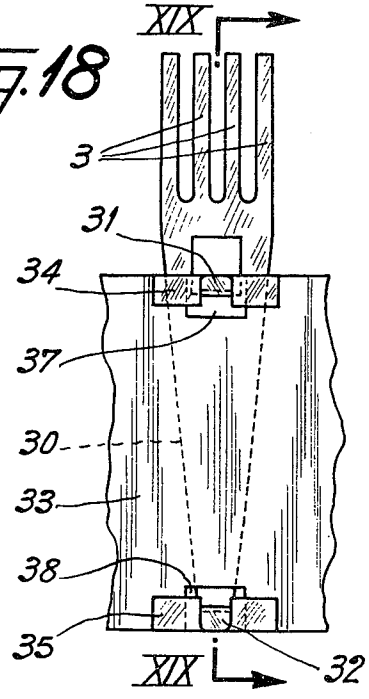


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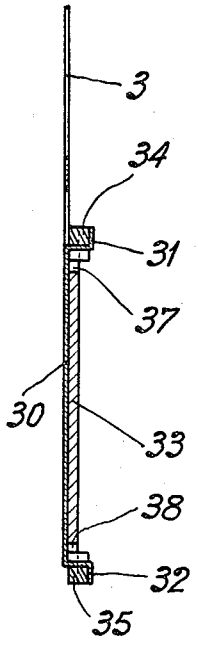


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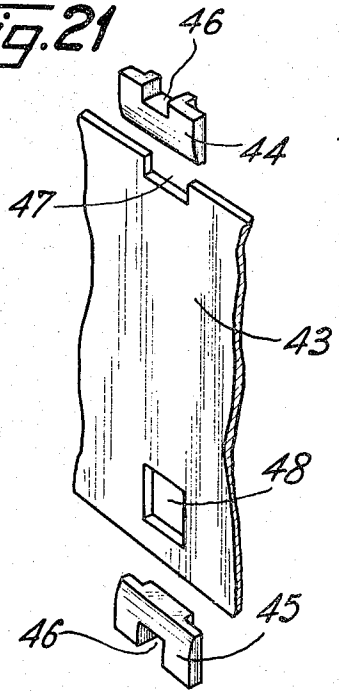


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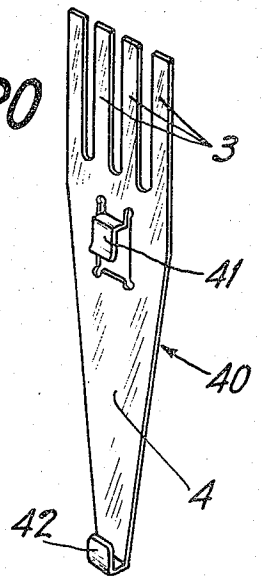


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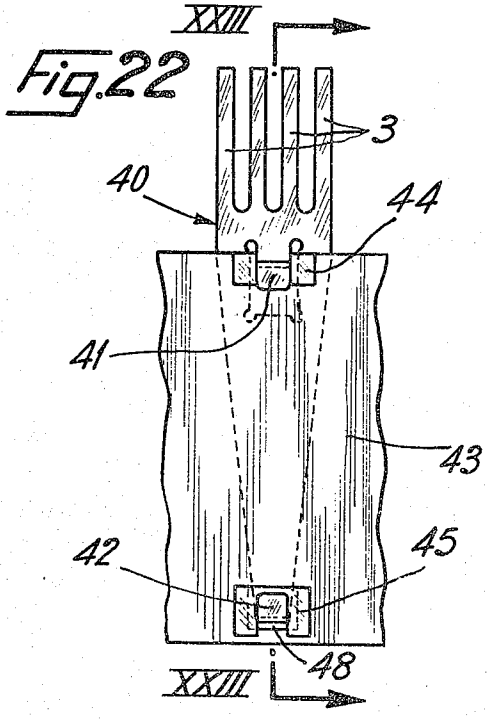


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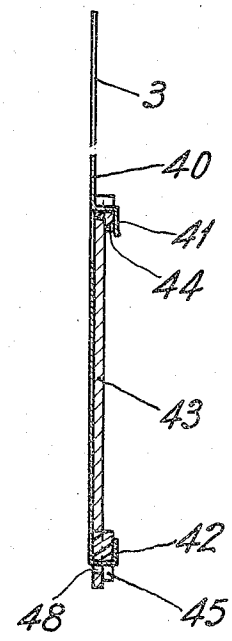


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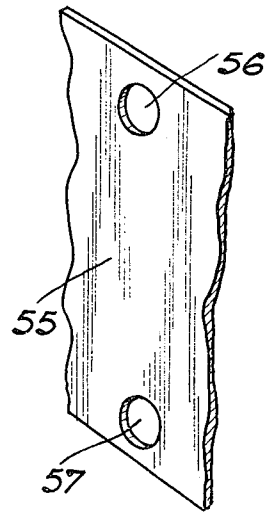


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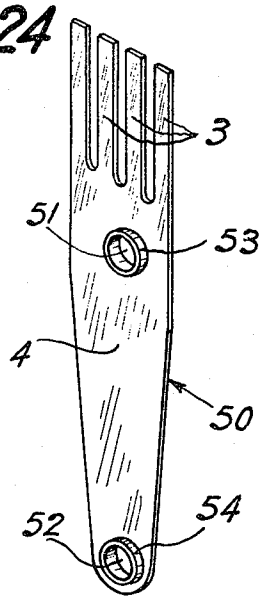


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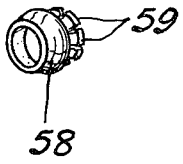


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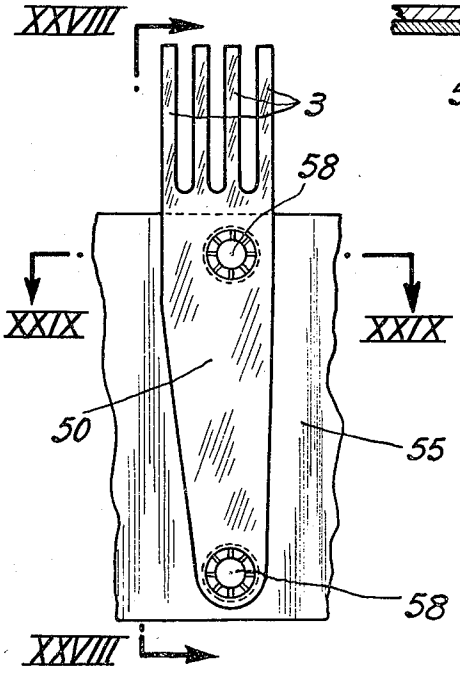


Fig. 29

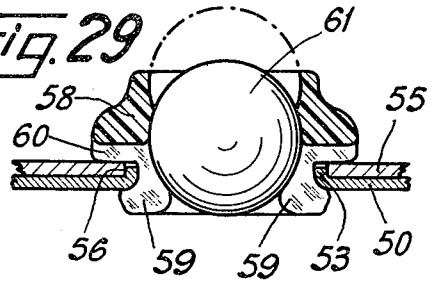
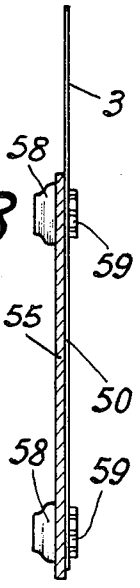


Fig. 28



ENDLESS TYPE-CARRYING TAPE FOR PRINTING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to a type-carrying tape for a printing machine. Printing machines are already known wherein the type is carried at the end of flexible fingers solidly mounted on a flexible tape forming an endless loop moving in such manner that said type is made to pass between a printing substrate and striking hammers actuating said flexible fingers.

The known type-carrying endless tapes of this kind consist of an elongated steel blade connected at its ends to form an endless loop, the fingers for carrying the type being cut out of one of the longitudinal edges of the blade. These fingers are perpendicular to the longitudinal axis of said blade in the way of the teeth of a comb.

Such tapes are well known and it is common knowledge that the type-carrying fingers will wear under intensive use. Therefore, if one of the fingers breaks in operation, all of the tape will become unusable and must be replaced by another, which is costly.

Because the type-carrying fingers are perpendicular to the steel blade's longitudinal axis, i.e. they are transverse to the direction in which the grain of the metal is aligned for achieving the requisite strength of the loop, there is danger of breakage of fingers even if the blade is made of a steel which in itself is very flexible.

The present invention remedies this drawback.

BRIEF SUMMARY OF THE INVENTION

The endless type-carrying tape of the invention for use in a printing machine is provided with flexible fingers projecting laterally and perpendicular to the direction of motion of the tape, said fingers carrying the type at their free ends and the fingers being separate from but fixed to the tape. Preferably, several fingers are provided integral with a common base or blade portion, the base portion being in face-to-face contact with the tape and detachably fixed thereto in order to allow replacement to repair the tape assembly as needed.

Because the tape and fingers are separate, the grain of the metal of the tape may be aligned longitudinally thereof so as to maximize the life of the tape and, as well, the grain of the metal of the fingers may be aligned longitudinally thereof (perpendicular to the axis of the tape) likewise to maximize their life.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIGS. 1 and 2 show two embodiments of type-carrying finger sets of the invention;

FIG. 3 shows part of the tape on which the sets of fingers of FIGS. 1 and 2 may be fastened;

FIGS. 4 and 5 shows the sets of fingers of FIGS. 1 and 2 fastened on the tape of FIG. 3;

FIGS. 6 and 7 are cross-sections along lines VI—VI and VII—VII of FIGS. 4 and 5;

FIGS. 8 and 9 show variations in embodiments of sets of fingers of the invention;

FIGS. 10 and 11 show tape fragments associated with the sets of fingers of FIGS. 8 and 9;

FIGS. 12 and 13 shows sets of fingers of FIGS. 8 and 9 fastened to the tapes of FIGS. 10 and 11;

FIGS. 14 and 15 are cross-sections along lines XIV—XIV and XV—XV of FIGS. 12 and 13;

FIG. 16 shows another variation of an embodiment of sets of fingers of the invention;

FIG. 17 shows a tape fragment on which one may mount the set of fingers of FIG. 16;

FIG. 18 illustrates mounting the sets of fingers of FIG. 16 on the tape of FIG. 17;

FIG. 19 is a cross-section along line XIX—XIX of FIG. 18;

FIG. 20 illustrates yet another variation in the sets of fingers of the invention;

FIG. 21 shows a tape fragment for the set of fingers of FIG. 21;

FIG. 22 illustrates fastening the set of fingers of FIG. 20 on the tape of FIG. 21;

FIG. 23 is a cross-section along line XXIII—XXIII of FIG. 22;

FIG. 24 shows a last variation of a set of fingers of the invention;

FIGS. 25 and 26 show a tape fragment and an expanding bolt or locking-bushing for the set of fingers of FIG. 24;

FIG. 27 shows fastening the set of fingers of FIG. 24 on the tape of FIG. 25; and

FIGS. 28 and 29 are cross-sections along lines XXVIII—XXVIII and XXIX—XXIX of FIG. 27.

DETAILED DESCRIPTION OF THE INVENTION

The sets of fingers 1 and 2 shown in FIGS. 1 and 2 each comprise four type-carrying fingers 3 parallel to each other and joined by a common base or blade portion 4.

Two tongues, 5 and 6, are cut out of each base portion and are lined up with the longitudinal axis of said sets of fingers, forming hooks pointing opposite to each other and directed outwardly. Furthermore, two longitudinal tongues 7 parallel with each other are cut out in the vicinity of each of hooks 5 and 6 of set 1, whereas two transverse tongues 8 are cut out in the vicinity of each of hooks 5 and 6 of set 2.

The tape fragment shown in FIG. 3 comprises two cutouts 10 and 11 which are aligned transversely of the tape, each being of generally U-shaped configuration with the legs thereof being directed toward the corresponding opposite side edges 12 and 13 of the tape. Cutout 10 presents a T-shaped tongue having the wise portion 14 joining the tape by a bridge 15 of lesser width, whereas cutout 11 presents the rectangular tongue 16.

In order to assemble the set of fingers 1 on tape 9 (see FIGS. 4 and 6), said set is flexed slightly to allow the hooks 5 and 6 to pass through the respective openings 10 and 11 whereupon the flexing force is released to allow the set to resume its normal, flat condition, thus firmly interlocking the hooks with their tongues 14 and 16. The tongues 7 of one pair are spaced apart snugly to engage the opposite sides of the bridge 15 and are of widths corresponding to the lengths of such opposite sides of the bridge 15. The tongues 7 of the other pair are spaced apart snugly to engage the opposite sides of the tonuge 16 and when the set is relaxed, or flat, they engage the inner edge of the tape defining the opening 11. Thus, the set of fingers 1 is longitudinally and transversely locked on tape 9.

The assembling of a set of fingers 2 on the tape 9 (see FIGS. 5 and 7) is similar to the process just described for the set 1. However, in this instance, one pair of transverse tongues 8 are offset outwardly from the

plane of base 4 to reside in the spaces on either side of the bridge 15 with the ends of these tongues engaging against such opposite sides of the bridge 15, the widths of these tongues being such that they seat in the openings with very little play within the spacing between the tongue 14 and the bottom of cutout 10 defining the bridge 15. The tongues 8 of the other pair likewise reside in the spaces on either side of the tongue 16 and abut the sides of the tongue 16 while also resting against the bottom of cutout 11 defining said tongue 16.

The sets of fingers 20 and 21 respectively shown in FIGS. 8 and 9 also comprise four fingers 3 and a base 4. This base in each case is covered with a plastic coating 22 on the side thereof facing the tape. As shown in FIGS. 8 and 14, hooks 23 and 24 are formed integrally with the material 22 and project through suitable openings in the base 4. The hooks 23 and 24 are dimensioned to pass snugly through the openings 29 and 30 in the tape 27 (FIGS. 10, 12 and 14) when the set is flexed and when the set is relaxed, the hooks engage over and against portions of the tape which lie outwardly of the openings 29 and 30. The set 20 is thus longitudinally and transversely locked on the tape. In FIGS. 9, 11, 13 and 15, a similar situation prevails except that in this case the two hooks 25 and 26 of the set 21 are both rectangular to fit through the openings 31 and 32 of the tape 28.

The tape fragments 27 and 28 as illustrated respectively in FIGS. 10 and 11 are provided with the apertures 29, 30 and 31, 32 which are aligned transversely to said tapes. Apertures 29, 31 and 32 are rectangular, and their dimensions d_1 parallel to the longitudinal axis of the corresponding tape is barely larger than the width d_2 of hooks 23, 25 and 26 with which they are meant to interact. Similarly, aperture 30 is circular and its diameter is just larger than that of hook 24 to be inserted.

In order to fasten sets 20 and 21 on the respective tape fragments 27 and 28, they will be slightly flexed and their respective hooks 23, 24 or 25, 26 will be inserted in said apertures 29, 30 or 31, 32; then the sets will be allowed to resume their initial plane shape. The hooks then will rest on the edges of said opposite apertures. Thus sets 21 and 20 will be longitudinally and transversely locked to tapes 28 and 27 by the common operation of their hooks with the edges of the corresponding apertures.

The set of fingers 30 shown in FIG. 16 comprises two opposite hooks 31 and 32 pointing outward, while the corresponding tape fragment 33 is solidly fixed to or integrally formed with blocks 34 and 35 (blocks 34 and 35 are shown separated from the tape in FIG. 17 for the sake of clarity). The blocks 34 and 35 are provided with notches 36 fitted to the shape and width of the hooks 31 and 32 so that when the set 30 is flexed, the hooks 31 and 32 may pass through the openings 37 and 38 in the tape 33. Then when the set is relaxed, said hooks 31 and 32 engage behind the blocks 34 and 35 so as to bear upon and seat within the notches 36.

The blocks 34 and 35 corresponding to the various sets 30 may be solidly fastened to each other and may form a continuous rim along the tape 33.

In FIGS. 20–23, the set 40 of fingers 3 is provided with hooks 41 and 42 opposite each other in the base 4, whereas the corresponding portion of the tape 43 is provided with a notch 47 on one edge and with an opening 48 adjacent the opposite edge which are adapted respectively to receive stem portions of the blocks 44 and 45. The blocks 44 and 45 are provided with notches 46 fitted to the shape and width of the hooks 41 and 42. The cutout 47 and aperture 48 fashioned in the tape 43 allow emplacing blocks 44 and 45 and, after flexing of the set of fingers 40, to hook up hooks 41 and 42 in such manner they will be kept in place by the notches 46. The sets of blocks 44 and 45 may be made solid with respect to each other and form a continuous rim along the tape 43.

The illustrative embodiment of the invention shown in FIG. 24 through 28 relates to a set 50 of fingers 3 having two holes 51 and 52 aligned with the longitudinal axis of said set and equipped with collar rims 53 and 54. The corresponding portion of the tape 55 is provided with holes 56 and 57 transversely aligned to this tape and of such dimensions that collars 53 and 54 may penetrate them with slight play.

Expanding bolts or locking-bushings 58 of a known type are inserted into holes 51 and 56, 52 and 57, and allow locking the set of fingers 50 to tape 55.

As shown in FIG. 29, the elastic, expanding fingers 59 of said bolts may be folded back under the action of a movable sphere 61 and toward a shoulder 60 of said fingers; said fingers will press set 50 and tape 55 against said shoulder.

Preferably and in order not to multiply the fastening means used and to facilitate changing broken fingers (they are small and would present difficulties in disassembling and replacing on an individual basis), it will be to advantage that several fingers be arrayed in groups or sets and to fasten them by means common to them all, as is described above for the various embodiments illustrated. One may cut several fingers out of a steel plate or sheet in such manner that they will be kept in place and fastened with respect to each other by means of the base that will fasten the fingers to the tape through the intermediary of the fastening means. It will be observed that the fingers, being independent of the tape, may be cut out or blanked so as to be parallel to the grain of the metal from which they are formed. Thus, they will be less brittle than the fingers of the known tapes wherein the grain of the metal is aligned with the longitudinal axis of the tape so that the grain in the integrally formed fingers is transverse to their lengths.

According to this invention, when one of said fingers breaks, it will be feasible to replace only that group of fingers of which it is a part without throwing away the tape.

In order to avoid discarding too many still usable fingers when one finger of a group breaks, a compromise is entered upon concerning the requirement not to proliferate the fastening means. Experiments performed to that end showed that the optimum number of fingers in a group is nearly four.

Other considerations also limit the number of fingers in each group. The various groups or sets must be sufficiently modest in size so as not to adversely affect tape flexibility. In conformity with the invention, the heel or base of each set of fingers is transversely applied to the tape, fastening means being provided in the vicinity of each edge of said tape.

In order that the finger sets be sufficiently rigidly mounted on the tape to allow a high striking frequency (for instance one strike every 400 microseconds), said

fastening means may be hooks solidly assembled, or part of each set of fingers and operating in concert with cut-outs machined in said tape, the emplacing of such a set on the tape requiring a temporary flexing of the latter. To that end, each set of fingers may be rigidly fastened to, or be of one piece with two oppositely pointing hooks. These hooks may either be blanked from the material of said set of fingers, or else be fastened to it. In the latter case, it will be to advantage that these hooks be rigidly part of a plastic layer, into which they will be molded, which covers the surface of said set opposite the tape, the hooks passing through apertures in said set location.

Obviously means are provided to prevent any kind of play parallel to the tape longitudinal axis between said tape and a set of fingers. This may be achieved either by the interplay of brackets cut out in both the finger sets and the tape, or by notches provided for said blocks and receiving in adjusting manner said hooks, or again by the hooks fitting themselves into the tape cut-outs.

What is claimed is:

1. A type-carrying assembly for impact printers, comprising in combination:

an endless, flexible tape adapted to be supported by the type-carrying drive of an impact printer; and

a series of type-bearing members secured to said tape along the length thereof, each such member comprising an elongate strip of stiff, resilient material presenting a base portion disposed in face-to-face relation with said tape to extend transversely thereof and a free end portion projecting laterally of the tape, said free end portion providing a series of flexible and resilient type-bearing fingers joining said base portion near that edge of the tape from which said free end portion projects and extending therefrom essentially perpendicular to the length of the tape, said fingers being separated from each other, said tape being provided with transversely spaced openings for each member, and the base portion of each member being provided with locking tab means consisting of a pair of oppositely directed and outwardly offset tangs adapted to fit through said openings when the member is sprung into bowed shape and to lock with the tape when released from such bowed shape.

2. A type-bearing assembly as defined in claim **1** wherein said openings are each of generally U-shape and each is disposed adjacent a corresponding edge of the tape with the bights of the U-shapes located innermost from such edges whereby to present mutually opposed tongues, the tangs of each said member engaging over said tongues.

3. A type-bearing assembly as defined in claim **2** wherein each member also includes a pair of outwardly projecting ears adjacent each tang and snugly engaging opposite sides of a corresponding tongue of said tape.

4. A type-bearing assembly as defined in claim **3** wherein each tongue is of T-shape with said ears of each pair thereof engaging opposite sides of the stem of a corresponding T-shaped tongue.

5. A type-bearing assembly as defined in claim **1** wherein both openings of each pair are of rectangular configuration.

6. A type-bearing assembly as defined in claim **1** wherein one opening of each pair is round and the other opening is rectangular.

7. A type-bearing assembly as defined in claim **1** wherein each member is provided with an opening at the region of each tang, the base portion of each member being provided on one side thereof with a layer of synthetic resinous material, said tangs projecting through said openings in the base portion and being integrally formed with said layer.

8. A type-bearing assembly as defined in claim **5** wherein each member is provided with an opening at the region of each tang, the base portion of each member being provided on one side thereof with a layer of synthetic resinous material, said tangs projecting through said openings in the base portion and being integrally formed with said layer.

9. A type-bearing assembly as defined in claim **6** wherein each member is provided with an opening at the region of each tang, the base portion of each member being provided on one side thereof with a layer of synthetic resinous material, said tangs projecting through said openings in the base portion and being integrally formed with said layer.

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