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LOOM PICKER

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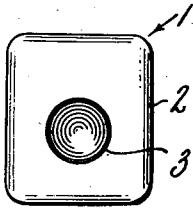


Fig. 2

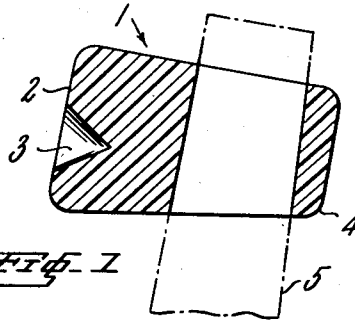


Fig. 1

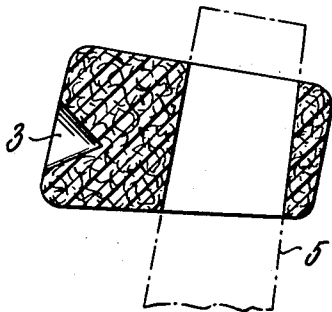


Fig. 4

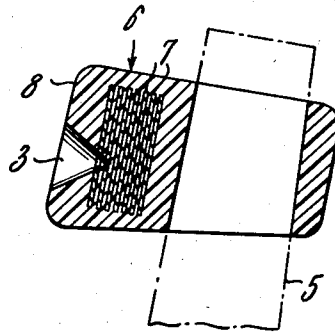


Fig. 3

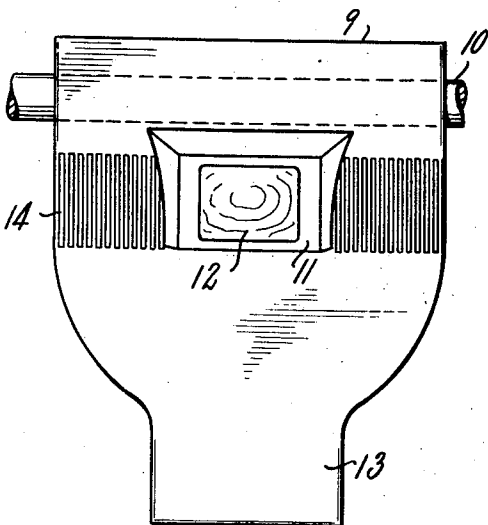


Fig. 6

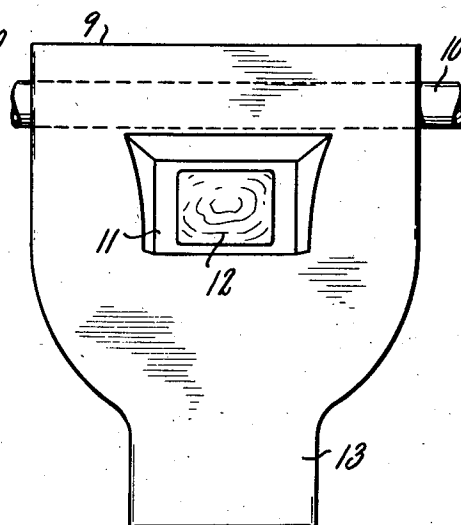


Fig. 5

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LOOM PICKER

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1 Claim. (Cl. 139—159)

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This invention relates to improved loom pickers manufactured by molding and vulcanizing a mixture comprising a butadiene-acrylonitrile elastomeric copolymer and a styrene-acrylonitrile resinous copolymer.

As is well known in the textile industry, a loom picker is the loom part which receives the impact of the shuttle and which through the mechanism of the picker stick throws the shuttle back across the loom. The conditions of use are extremely severe and loom pickers have not had the long life desired. As a result, frequent shutdowns of the looms for replacement of the pickers has been required, entailing interference with production and the expense and trouble of replacing the worn picker with a new one. It has been very difficult to find a material from which a satisfactory loom picker could be made. Loom pickers have long been made from leather, preferably the hide of the water buffalo. More recently a large share of the loom pickers in use commercially have been made of rubber-duck combinations. Neither pickers made from leather nor those made from rubber and textile fabric have exhibited the desired long life. Leather, especially the hide of the water buffalo, is expensive and the cost of assembling it into a picker is high. The cost of assembling a rubber-duck loom picker has likewise been high. As a result, it has been recognized that it would be highly desirable if a loom picker having a longer life and capable of being made in a simple and economical manner without requiring a complicated and expensive hand assembly were available to the art.

I have discovered that a loom picker which is much superior to those used at present can be made by simply molding and vulcanizing a mixture of a rubbery or elastomeric interpolymer of butadiene and acrylonitrile and a hard normally inelastic resinous thermoplastic interpolymer of a major proportion of styrene and a minor proportion of acrylonitrile. The manufacture of such a loom picker will be described in detail hereinafter.

In the accompanying drawings:

Fig. 1 is a vertical sectional view of a one-piece unreinforced loop picker molded in a single integral piece in accordance with my invention.

Fig. 2 is an end elevation of the shuttle-engaging head of the picker of Fig. 1.

Fig. 3 is a vertical sectional view of a modified loop picker made in accordance with my invention and adapted to use under particularly severe conditions by virtue of transverse reinforcement

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ing of the head around and inwardly of the shuttle-receiving cavity.

Fig. 4 is a similar view of a further modification of a loop picker made in accordance with my invention.

Figs. 5 and 6 are plan views of box pickers made in accordance with my invention, the picker of Fig. 5 being of the single-piece unreinforced type and that of Fig. 6 being of a partly reinforced type.

My invention is based on the discovery that a molded vulcanized mixture consisting essentially of a rubbery interpolymer of butadiene and acrylonitrile and a hard normally inelastic thermoplastic interpolymer of a major proportion of styrene and a minor proportion of acrylonitrile is a uniquely suitable material from which to make loom pickers. This composition has such outstanding physical properties that the pickers do not require reinforcement (although as shown below they may be reinforced if desired) and may be made in a single piece in a single molding operation, thereby eliminating the necessity of an assembly operation. The loom pickers made from this composition show greatly increased life over the ordinary pickers made of leather or rubber-duck combinations. The material from which the pickers of the present invention are made possesses sufficient hardness together with sufficient resilience that the pickers withstand unusually well the impact of the shuttle during use. The material is not abrasive so that it does not unduly wear the shuttle or other parts of the loom and it displays other characteristics rendering it ideally suitable for use as a material from which to make loom pickers.

The rubbery interpolymer used in the loom pickers of my invention may be any elastomeric interpolymer of butadiene and acrylonitrile. Such rubbery interpolymers are well-known, being available commercially as synthetic rubber of the type known as Buna N. Buna N is a rubbery copolymer of 1,3-butadiene and acrylonitrile made by emulsion polymerization. The relative proportions of butadiene and acrylonitrile may vary over quite wide limits, but are generally such that the proportion of acrylonitrile combined in the copolymer ranges from 18 to 40% and the proportion of butadiene combined therein correspondingly ranges from 82 to 60%.

The elastic synthetic rubber butadiene-acrylonitrile component has an ultimate elongation of at least 150% while the relatively inelastic hard resinous interpolymer of styrene and acry-

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lonitrile used in the mixture has an elongation of less than 10% and is brittle at room temperatures. Blending of these two widely different types of interpolymers with one another followed by vulcanization of the mixture gives a picker which is desirably hard but not brittle and which is capable of withstanding shock and impact and the rough treatment received in the textile mill over long periods of time.

The normally inelastic resinous thermoplastic interpolpolymer used in my invention is usually made by the same general procedure that is used in making rubbery butadiene-acrylonitrile interpolymers, namely by emulsion polymerization, but using a major proportion of styrene and a minor proportion of acrylonitrile, the proportion of styrene preferably ranging from 65 to 80% and the proportion of acrylonitrile correspondingly ranging from 35 to 20%, these proportions being by weight based on the weights of the styrene and acrylonitrile employed in the monomeric charge. As will appear hereinafter, the monomeric charge may also contain 1,3-butadiene in an amount ranging from 0 to 15% by weight based on the sum of the weights of styrene, acrylonitrile and butadiene. If the monomers consist of styrene and acrylonitrile only, a binary copolymer is produced whereas if they consist of styrene, acrylonitrile and butadiene a ternary copolymer is produced. The normally hard inelastic resinous thermoplastic interpolymers so obtained have softening points which generally are within the range of from 150° F. to 300° F.

In more detail the thermoplastic hard normally inelastic interpolpolymer may be prepared by the emulsion polymerization of styrene and acrylonitrile as disclosed in U. S. Patent No. 2,140,048 in the presence of an emulsifying agent and a polymerization catalyst. The customary regulators used in making synthetic rubber may be included. A convenient recipe is

	Parts
Water	180 - 400
Peroxidic catalyst	0.1- 1.5
Styrene	65 - 80
Acrylonitrile	20 - 35
Butadiene	0 - 15
Emulsifying agent (e. g., soap)	0.5-150
Regulator (e. g., dodecyl mercaptan)	0 - 1

After the autoclave, which is equipped with a stirrer, is charged with the above recipe it is heated with stirring until there is a 90% or better conversion of the monomeric components to the desired resinous interpolpolymer. Time and temperature are co-related. The temperature may range from 80° F. to 200° F.; at 95° F. about 10-14 hours are required. The resulting emulsion is withdrawn from the autoclave and coagulated with stirring in a conventional way as by admixture of acid or salt solution. The coagulate is separated in any suitable manner, washed with water and dried to produce a friable powder. The solid resinous interpolpolymer at room temperatures, e. g. 20° C., is completely lacking in elastic (rubber-like) properties; it can be milled into a sheet which is hard, tough and brittle at ordinary room temperatures.

The rubbery interpolpolymer and the hard inelastic resinous interpolpolymer are completely compatible with one another and may be blended to a homogeneous mixture in any suitable manner as on a rubber mill or in a Banbury mixer at any suitable elevated temperature, for example at 320-350° F., whereupon the resulting mix may

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be cooled, for example to 150-180° F., whereupon the other ingredients required for vulcanization including the vulcanizing agent which is almost invariably sulfur, vulcanization accelerators, anti-oxidants (for the rubbery interpolpolymer) and other rubber compounding agents such as zinc oxide, etc. may be added on the mill. The mix is then sheeted off and cut into appropriately sized pieces. The loom picker may then be molded from the resulting mix in any suitable way, e. g., by compression or transfer methods, and cured to effect vulcanization by heating under pressure in the manner used to vulcanize rubber, e. g., for 30 minutes at 307° F., under a pressure of 1,000 p. s. i.

The amount of the sulfur or other vulcanizing agent should be such that it would vulcanize the synthetic rubbery interpolpolymer of butadiene and acrylonitrile used in the formulation to a soft vulcanized state if the rubbery interpolpolymer were cured alone. The amount of sulfur employed will usually range from 1 to 10% by weight of the rubbery interpolpolymer. It is not known whether or not all of the sulfur combines with the elastomer but in any event incorporation of vulcanizing ingredients and vulcanization as disclosed herein give a picker showing extremely good wear-resistance and strength.

The relative proportions of the several ingredients used in making loom pickers in accordance with my invention may vary as indicated in the following table:

	Parts
Elastomeric interpolpolymer of butadiene and acrylonitrile	30 - 70
Hard inelastic resinous interpolpolymer of styrene and acrylonitrile	70 - 30
Sulfur	0.3- 7.0
Accelerator	0.3- 1.0
Zinc oxide	0.3- 7.0
Anti-oxidant	0.3- 1.4

While the one-piece unreinforced molded pickers are preferred because of the simplicity of manufacture and the excellent results produced therewith, as an alternative construction for the most severe uses on high speed looms I may use fabric reinforcement in my loom pickers. While the pickers may be reinforced throughout I find that only partial reinforcement is sufficient for the most severe conditions of use. In making a reinforced loom picker I may provide reinforcement with parallel layers of textile fabric only in the portion receiving the greatest wear or strain, for example in the impact-receiving head of a loop picker or in the portion of a box picker surrounding the picker stick-receiving opening which portion is subject to the greatest strain and likelihood of breakage because of the reduced cross-sectional area at this point.

In making a reinforced loop or box picker of the type just described I may first coat the reinforcing fabric with the composition described herein as by calendering or by passing the fabric through an aqueous dispersion or latex of the composition. The thus-coated fabric is then plied up alternately with thin layers of the composition described herein and the plied-up assembly is pressed together on a warm press to cause welding or flowing together of the plastic with the formation of a laminate without vulcanizing the stock. An appropriately sized piece of the resulting laminate is positioned in the mold and the mold is filled with the composition as by transfer molding, the resulting picker then being cured as above.

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Another alternative method of construction of reinforced pickers of my invention comprises coating textile fabric with the composition described herein, as by calendering or passing through a latex bath, then cutting up or macerating the coated fabric into relatively small pieces, for example into pieces about 1" square, compacting the appropriate weight of these pieces of coated fabric by light pressing and placing in a compression type mold where the picker is molded and cured as before. In such a method the small pieces of coated fabric are disposed in random arrangement and the picker is reinforced throughout resulting in long life under severe service conditions.

Still another, and often preferred, method of making a reinforced picker in accordance with my invention comprises uniformly and randomly distributing a suitable proportion, preferably from 5 to 25 per cent by weight based on the sum of the weights of the rubbery butadiene-acrylonitrile interpolymers and the inelastic resinous styrene-acrylonitrile interpolymers, of loose (i. e., unwoven) fibrous material, either as separate filaments or in the form of yarn, usually of relatively short length, i. e., not over 1" in length, throughout the composition indicated in the foregoing table, molding pickers from the resulting mixture and vulcanizing the resulting pickers. For this purpose nylon fiber, such as nylon yarn ranging in length from 1/4" to 1", is preferred. As is well known, nylon fiber is made from a synthetic linear super polyamide (molecular weight in excess of 7,000). Other fibers such as cotton, wool or asbestos fibers may be used in place of nylon for this purpose but nylon fibers give the most outstanding results in increasing the toughness and the life of the pickers.

The loom pickers of the present invention are molded in conventional sizes and shapes to fit the textile looms in commercial use. As is evident from the foregoing they may be made of any type, including both the loop type and the box type.

Referring now to the accompanying drawing and first to Figs. 1 and 2 thereof, reference numeral 1 denotes a one-piece unreinforced loop picker molded from the composition described above. Picker 1 has the usual impact portion 2 with the shuttle-engaging recess 3, and the customary loop portion 4 which engages the picker stick 5 which is shown in dotted lines. Fig. 3 portrays a loop picker 6 which is identical with that of Figs. 1 and 2 except that it is provided with reinforcing layers of textile fabric 7 extending transversely of the axis of the head portion 8. These layers of fabric 7 are in part disposed around the inner portion of the shuttle-engaging cavity 3 and are also disposed inwardly thereof, thereby providing a loop picker which is capable of withstanding extreme conditions of service, any tendency of the steel point of the shuttle to split the head being greatly reduced by the reinforcement.

Fig. 4 portrays a loop picker which is identical with that shown in Figs. 1 and 2 except that it is reinforced throughout as by being molded from small sections or pieces of textile fabric coated with the composition described or from the above-described fiber-reinforced composition containing from 5 to 25% of fibers. The reinforced picker of Fig. 4 is adapted to withstand unusually severe conditions of use.

Figs. 5 and 6 portray box pickers made in accordance with my invention. These pickers

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are of the usual shape, having a relatively large portion 9 which is adapted to slidably engage the spindle 10 and having the vertical aperture 11 adapted to receive the picker stick 12 and the relatively smaller portion 13 which is adapted to engage the shuttle in known manner. The picker of Fig. 5 is of a one-piece unreinforced construction while the picker of Fig. 6 is provided with partial textile fabric reinforcement 14 in the middle thereof adjacent the picker stick-receiving cavity 11 where the greatest strain takes place with the greatest tendency to breakage. The picker of Fig. 6 may be made by assembling a laminate having the shape of the reinforcement 14 in the manner described above, placing this laminate in the appropriate position in the mold, filling the mold with the composition described herein, and vulcanizing to give a picker having the shape and structure shown in Fig. 6.

Example

Loom pickers were manufactured in the manner described above from the following formulation:

	Parts
Elastomeric copolymer of 65% butadiene and 35% acrylonitrile	50
Hard inelastic resinous copolymer of 70% styrene and 30% acrylonitrile (softening point 200° F.)	50
Sulfur	3.0
Accelerator (mercaptobenzothiazole)	0.5
Zinc oxide	2.0
Anti-oxidant (phenyl alpha naphthylamine)	0.5
Fibers (preferably nylon)	5-25

The advantages of the present invention are numerous. The principal advantage is the long life of the pickers made in accordance with the present invention since the quality of a loom picker is usually judged by its service life.

Experimental pickers made in accordance with my invention have run an average of six months on a loom where conventional commercial pickers lasted an average of only four months. In another test my pickers lasted five months where commercial pickers were averaging three months' life. A further advantage of the pickers is that the pickers of my invention may be made by a simple molding process with no or only a minimum of hand build-up labor. They are more economical than conventional commercial pickers. The pickers of my invention exhibit an unusual combination of high hardness coupled with high impact strength and other properties which make them much more satisfactory than conventional pickers.

All parts and percentages herein are by weight. The terms "copolymer" and "interpolymer" are used herein in their commonly accepted meanings, that is as substantially synonymous designations for multipolymers in which units corresponding to a plurality of different monomers are chemically combined in the molecule. Unless otherwise indicated, these terms are used in a non-excluding sense that is as not excluding the presence of small amounts of other monomers which do not detract from the essential characteristics of copolymers or interpolymers of the named monomers. For example in the manufacture of the Buna N component a small amount of 2-chloro-1,3-butadiene may be employed together with 1,3-butadiene without interference with the essential rubbery elastic na-

ture of the resulting multipolymer. Likewise, as explained above, in the manufacture of the hard, inelastic, thermoplastic styrene-acrylonitrile resin, a small amount of butadiene may be used as a third chemically combining monomer to give a ternary copolymer or interpolymers. As used in this specification the terms "copolymer" and "interpolymer" generally denote multipolymers of monomers comprising mainly the monomers mentioned and often denote multipolymers of monomers consisting substantially or solely of those named.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

A loom picker formed of a molded vulcanized mixture of a rubbery interpolymers of butadiene and acrylonitrile and a hard normally inelastic resinous thermoplastic interpolymers of monomers consisting of from 65 to 80% of styrene, from 20 to 35% of acrylonitrile and from 0 to 15% of butadiene, and loose fibrous nylon uniformly distributed therethrough, the mixture containing from 30 to 70% of said rubbery interpolymers and correspondingly from 70 to 30% of said resinous interpolymers and containing

from 5 to 25% of said loose fibrous nylon, said percentages being by weight based on the sum of the weights of said rubbery interpolymers and said resinous interpolymers.

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