

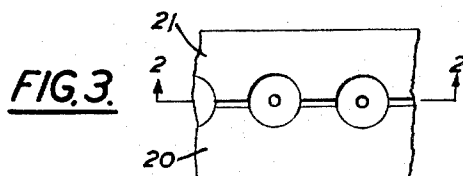
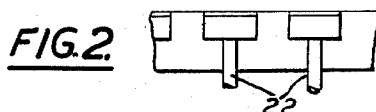
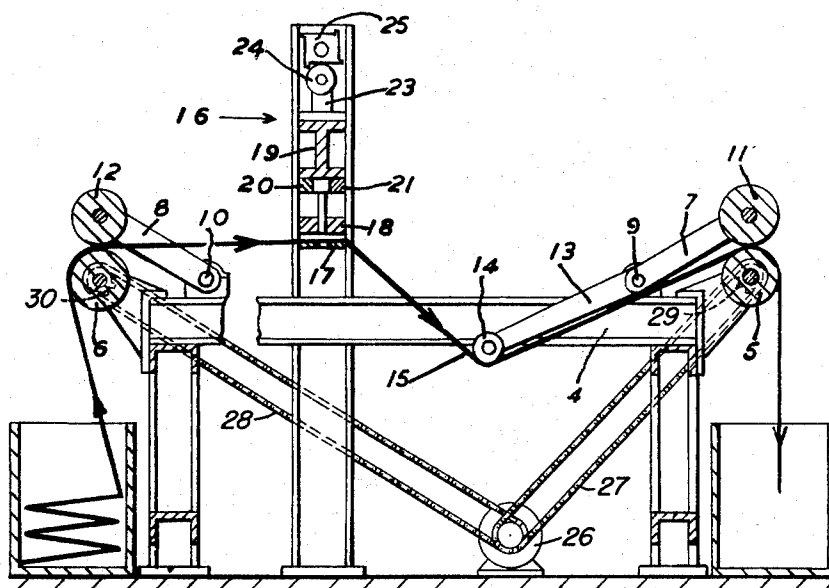
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DEVICE FOR PERFORATING ELASTIC SHEET MATERIAL

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DEVICE FOR PERFORATING ELASTIC
SHEET MATERIAL

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This invention relates to a device for produc-
ing in elastic sheet materials perforations spaced
at predetermined intervals.

For certain purposes it is desirable to produce
an elastic sheet material, e. g. a sheet of rub-
ber or of a rubber substitute, which is cleanly
perforated at predetermined intervals, and it is
an object of the present invention to provide a
device for producing such perforations in sheet
material of this kind.

A device for perforating elastic sheet mate-
rials in accordance with the present invention
comprises a perforator and means for contin-
uously drawing the sheet materials in a stretched
state through the said perforator.

In its preferred form the invention consists
in a device which comprises a pair of nip rollers
adapted to draw and forward the sheet mate-
rial from a supply continuously, a second pair
of nip rollers adapted to draw the sheet mate-
rials continuously from the first pair of nip
rollers and maintain it in a stretched state while
travelling between the two pairs of nip rollers,
and between them a perforator through which
the sheet material passes and an intermediate
movably mounted and preferably free running
roller adapted to bear on and depress the sheet
materials. The intermediate roller may be sit-
uated on either side of the perforator, but is
preferably between the perforator and the nip
rollers through which the sheet material leaves
the device.

The lower roller of each pair of nip rollers
may be driven from the same shaft as the per-
forator, for example by chain and sprocket, while
the upper roller of each pair may be free-run-
ning and arranged to press on the lower roller,
by its own weight or otherwise, so as to grip
the sheet material and prevent slip. The up-
per roller may for example run in bearings car-
ried by pivoted arms. In order to impart the
desired degree of stretch to the material the lower
roller of the second pair is driven at a slightly
higher peripheral speed than that of the first
pair; for example it may be driven at the same
angular velocity and be somewhat larger in di-
ameter, preferably by about 2-15%. The inter-
mediate roller may be spring-weighted, but it
is preferable that it should be freely mounted
and caused to bear on the material by its own
weight. For example it may be mounted on a
pair of arms pivoted at some suitable point,
which may with advantage be approximately in
line with the nips of the two pairs of nip roll-
ers.

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The perforator may comprise upper and lower
guide plates, between which the sheet material
is caused to travel, and a set of punches ar-
ranged for example transversely across the
width of the material and moving through clear-
ance holes in the upper guide plate into corre-
sponding clearance holes in the lower guide plate.
The lower guide plate is preferably positioned
slightly above the direct line between the two
pairs of nip rollers.

If desired the intermediate roller may be
omitted, but I have found that it is not then
possible always to achieve regular spacing of the
perforations. In the absence of this roller there
frequently occur irregularities of spacing which
appear to be connected with irregularities in the
thickness and in the tackiness of the sheet ma-
terial.

Perforating devices constructed in accordance
with the invention are especially useful for per-
forating at regular intervals thin and thus
easily stretched elastic sheets having a basis of
natural rubber or a rubber substitute such for
example as plasticized polyvinyl chloride, styrene
polymers and diolefin polymers (including co-
polymers), and of elastic laminated sheet ma-
terial consisting for example of a thin sheet of
rubber or of a rubber substitute united with a
stretchable woven or knitted fabric. Other
laminated materials may be made by first per-
forating a thin sheet of rubber or of a rubber
substitute by means of the device described above,
and then uniting the perforated sheet with a
suitable imperforate stretchable woven or
knitted fabric which is sufficiently loosely woven
or knitted to permit the free passage of air;
for example laminated material very suitable for
corset manufacture may be made by uniting a
perforated sheet of a plasticized polyvinyl chloride
composition with a stretchable loosely woven or
knitted fabric having a basis of a cellulose es-
ter or ether, in particular cellulose acetate.

A device for perforating elastic sheet material
in accordance with the invention is illustrated in
the accompanying drawings, in which Figure 1
represents a sectional view of the device as a
whole, and Figures 2 and 3 are side and plan views
respectively of the means whereby the punches
of the perforator are held in position. The de-
vice comprises a skeleton framework 4 on which
are mounted driven feed rollers 5 and 6 of slight-
ly different diameters, arms 7 and 8 freely piv-
oted in bearings 9 and 10 and carrying free run-
ning rollers 11 and 12 resting on the driven
rollers 5 and 6 respectively, arms 13 freely pivoted

in the bearings 9 and carrying a free-running intermediate roller 14 adapted to rest on and be supported by the sheet material 15 passing through the device, and a perforator 16. The feed rollers 5 and 6 are driven at the same angular velocity by means of a motor 26 driving chains 27 and 28, which pass over sprockets 29 and 30 mounted at one end of each of the rollers 5 and 6, respectively. The perforator comprises a lower guide plate 17 and an upper guide plate 18, both provided with clearance holes for punches so arranged that each hole in the upper guide plate 18 is opposite a hole in the lower guide plate 17. The lower guide plate 17 is at a level slightly above that of the nips of the pairs of rollers 5 and 11, and 6 and 12 respectively. Above the guide plates is positioned a carrier bar 20, 21 attached to and below a spring-mounted pressure bar 19; the carrier bar is capable of vertical reciprocating movement and is split longitudinally into a section 20, which is permanently attached to the lower face of the pressure bar 19, and a section 21, which is removable at will. The sections 20 and 21 are provided with corresponding grooves which, when the section 21 is in position, form sockets adapted to hold removable punches 22 in positions corresponding to the clearance holes in the guide plates. The pressure bar 19 carries on its upper face a bracket 23, which in turn carries roller cam followers 24 which are in contact with and adapted to be depressed by a cam 25 driven from the same shaft as the rollers 5 and 6.

In operation, the elastic sheet material is continuously fed either through the nip of the rollers 5 and 11, under the intermediate roller 14, between the guide plates 17 and 18 of the perforator, and finally through the nip of the rollers 6 and 12, or in the reverse direction. While both these alternatives give good results, the second is preferred, as it has been found to cause even more regular spacing of the perforations. In either case, the diameter of the driven roller over which the material passes when leaving the device is larger than that of the driven roller over which it passes when entering the device by an amount such that sheet material passing through the device is stretched to a degree substantially below its breaking stretch.

The free running rollers 11 and 12 bear on the driven rollers 5 and 6 sufficiently heavily to prevent the sheet material slipping in the nip of either pair of rollers.

Having described my invention, what I desire to secure by Letters Patent is:

1. A device for perforating elastic sheet material, which comprises a pair of nip rollers adapted to draw and forward sheet material from a supply, a second pair of nip rollers spaced from and parallel to the first and adapted to draw sheet material from the first pair, means for continuously driving at least one of the first pair of nip rollers, means for continuously driving at least one of the second pair of nip rollers at a predetermined peripheral speed at least 2% higher than that of the first pair and in the same direction as the corresponding roller of the first pair, a perforator positioned between the two pairs of nip rollers and comprising a perforated guide plate over which the sheet material passes and reciprocating punches which in one extreme position are well clear of the guide plate and in the other extend into the perforations in the guide plate, and between one of the pair of nip rollers and the perforator a single jockey roller

parallel to the nip rollers and carried in an independently movable mounting such that in the absence of sheet material passing through the device the jockey roller will take up a position substantially below the plane in which lie the nip of the nip rollers next to the jockey roller and that edge of the upper surface of the guide plate which is the nearer to the jockey roller.

2. A device for perforating elastic sheet material, which comprises a pair of nip rollers adapted to draw and forward sheet material from a supply, a second pair of nip rollers spaced from and parallel to the first and adapted to draw sheet material from the first pair, means for continuously driving at least one of the first pair of nip rollers, means for continuously driving at least one of the second pair of nip rollers at a predetermined peripheral speed at least 2% higher than that of the first pair and in the same direction as the corresponding roller of the first pair, a perforator positioned between the two pairs of nip rollers and comprising a perforated guide plate over which the sheet material passes and reciprocating punches which in one extreme position are well clear of the guide plate and in the other extend into the perforations in the guide plate, and between one of the pair of nip rollers and the perforator a single, free running jockey roller parallel to the nip rollers and carried in an independently movable mounting such that in the absence of sheet material passing through the device the jockey roller will take up a position substantially below the plane in which lie the nip of the nip rollers next to the jockey roller and that edge of the upper surface of the guide plate which is the nearer to the jockey roller.

3. A device for perforating elastic sheet material, which comprises a pair of nip rollers adapted to draw and forward sheet material from a supply, a second pair of nip rollers spaced from and parallel to the first and adapted to draw sheet material from the first pair, means for continuously driving at least one of the first pair of nip rollers, means for continuously driving at least one of the second pair of nip rollers at a predetermined peripheral speed at least 2% higher than that of the first pair and in the same direction as the corresponding roller of the first pair, a perforator positioned between the two pairs of nip rollers and comprising a perforated guide plate over which the sheet material passes and reciprocating punches which in one extreme position are well clear of the guide plate and in the other extend into the perforations in the guide plate, and between the second pair of nip rollers and the perforator, a single jockey roller parallel to the nip rollers and carried in an independently movable mounting such that in the absence of sheet material passing through the device the jockey roller will take up a position substantially below the plane in which lie the nip of the second pair of nip rollers and that edge of the upper surface of the guide plate which is nearer to the jockey roller.

4. A device for perforating elastic sheet material, which comprises a pair of nip rollers adapted to draw and forward sheet material from a supply, a second pair of nip rollers spaced from and parallel to the first and adapted to draw sheet material from the first pair, means for continuously driving at least one of the first pair of nip rollers, means for continuously driving at least one of the second pair of nip rollers at a predetermined peripheral speed at least 2% higher than

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that of the first pair and in the same direction as the corresponding roller of the first pair, a perforator positioned between the two pairs of nip rollers and comprising a perforated guide plate over which the sheet material passes and reciprocating punches which in one extreme position are well clear of the guide plate and in the other extend into the perforations in the guide plate, and between the second pair of nip rollers and the perforator, a single, free running jockey roller parallel to the nip rollers and carried in an independently movable mounting such that in the absence of sheet material passing through the devices of the jockey roller will take up a position substantially below the plane in which lie the nip of the second pair of nip rollers and that edge of the upper surface of the guide plate which is nearer to the jockey roller.

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