Jan. 28, 1958 H. KERNEN 2,821,254

FOAM-PLASTIC SKIVING MACHINE

Filed Oct. 4, 1954 4 Sheets-Sheet 1

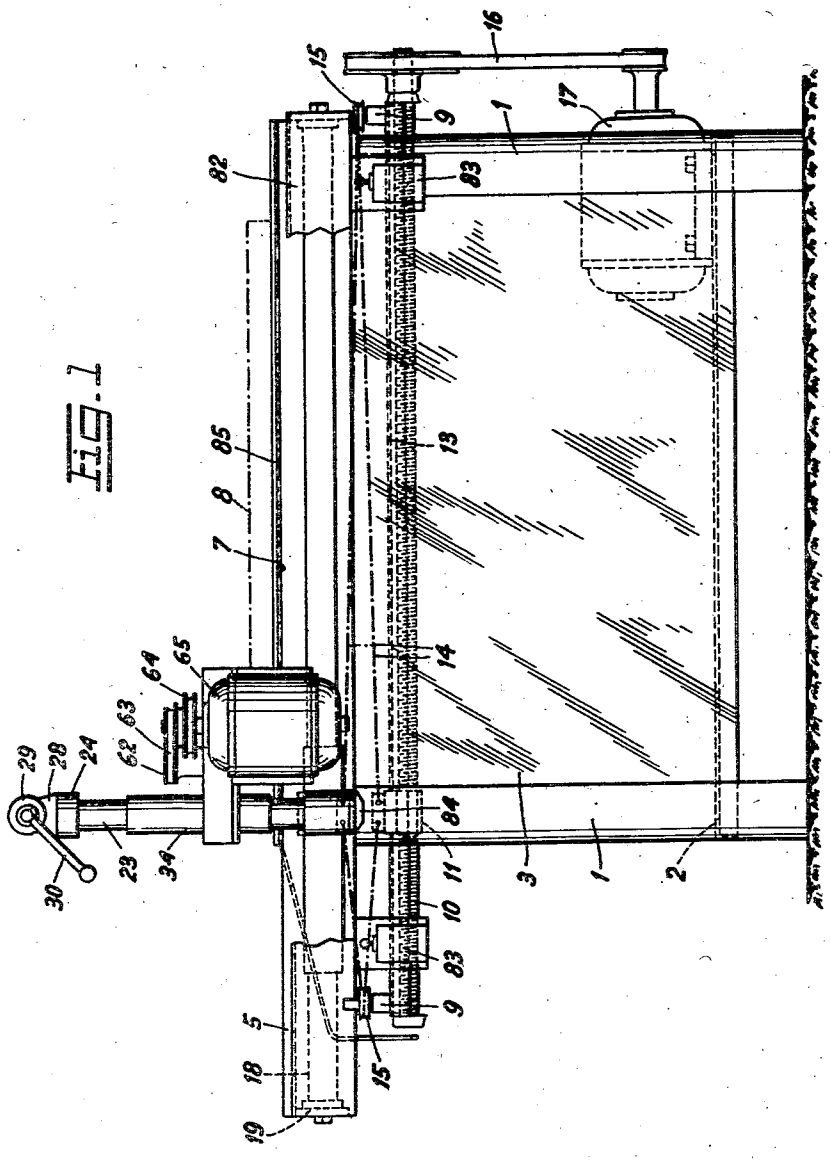


Fig. 1

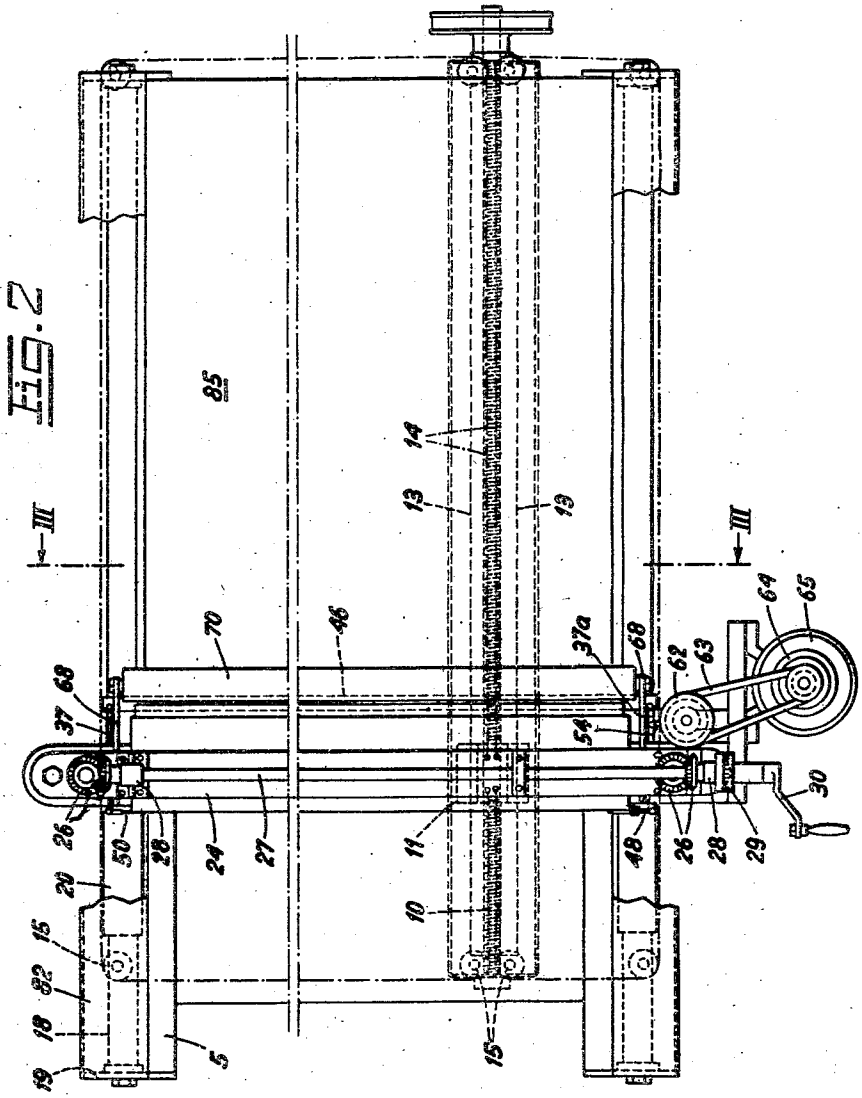
Inventor
Hans Kernen
By
Stevens, Davis, Miller & Mosher
his attorneys

Jan. 28, 1958 H. KERNEN 2,821,254

FOAM-PLASTIC SKIVING MACHINE

Filed Oct. 4, 1954 4 Sheets-Sheet 2

Fig. 2



Inventor
Hans Kernen
by
Steinman, Davis, Mueller & Mueller
his attorneys

Jan. 28, 1958 H. KERNEN 2,821,254

FOAM-PLASTIC SKIVING MACHINE

Filed Oct. 4, 1954 4 Sheets-Sheet 3

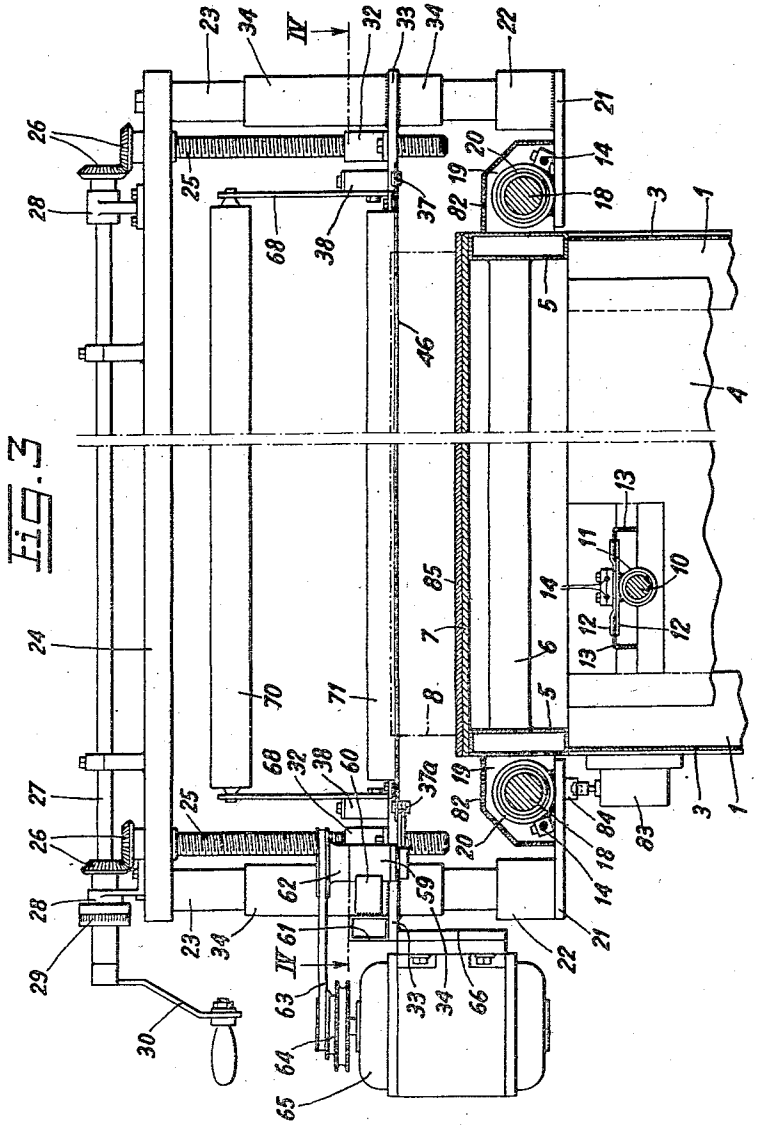


Fig. 3

Inventor
Hans Kernen
Stevens, Davis, Miller & Mosher
his attorneys

Jan. 28, 1958 H. KERNEN 2,821,254

FOAM-PLASTIC SKIVING MACHINE

Filed Oct. 4, 1954 4 Sheets-Sheet 4

Fig. 4

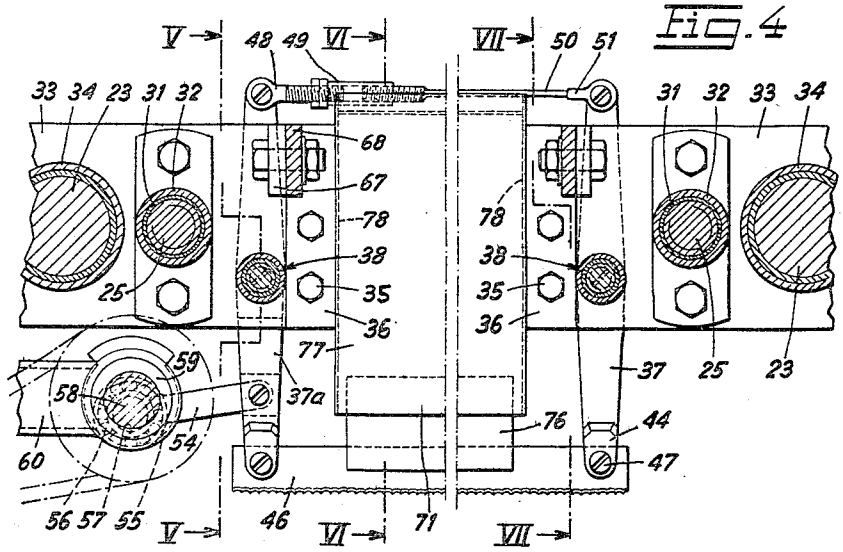


Fig. 5

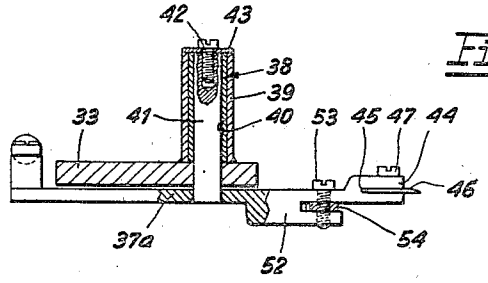


Fig. 6

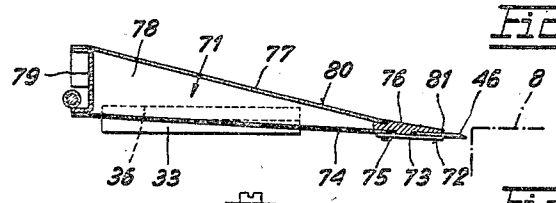
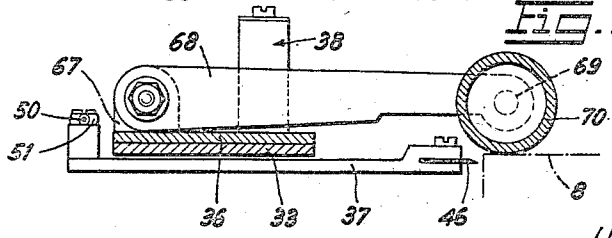


Fig. 7



Inventor
Hans Kernen
by
Stevens, Davis, Miller & Mosher
his attorneys

United States Patent Office 2,821,254 Patented Jan. 28, 1958

2,821,254

FOAM-PLASTIC SKIVING MACHINE

Hans Kernen, Bern, Switzerland

Application October 4, 1954, Serial No. 460,156

Claims priority, application Switzerland October 10, 1953

9 Claims. (Cl. 164—75)

In the arts and industry there is a growing demand for foamed-plastic foils. Foamed plastic is rather expensive and is supplied by the manufacturers only in sheets of at least ⅜ inch thickness and mostly in thicknesses of one inch and more. So far it has been practically impossible to skive or cut up such sheets into foils, and in particular into foils having a smooth surface.

The main object of my present invention is to remedy such disadvantage. According to the method disclosed by my present invention, a skiver or knife having a serrated cutting edge is moved through the sheet and subjected to longitudinal oscillations with such frequency that the foamed plastic to be cut cannot resonate.

In the skiving machine disclosed herein, the longitudinally oscillatable skiver is a stretched spring-steel band of which one longitudinal edge forms the cutting edge, being ground towards the underside in serrated and pointed manner.

One form of my present invention is shown, by way of example, in the accompanying drawing which also serves to illustrate the method disclosed by the invention. In the drawings:

Fig. 1 shows the machine in elevation,

Fig. 2 is a top plan view thereof,

Fig. 3 is a cross-section on the line III—III of Fig. 2,

Fig. 4 is a horizontal section on the line IV—IV of Fig. 3, and shows, in an enlarged scale, details of the bearing and driving arrangement of the knife, and

Figs. 5 to 7 are cross-sections on the lines V—V, VI—VI and VII—VII of Fig. 4 respectively.

As shown in Fig. 1, the skiving machine comprises a stand which in the main is composed of corner posts **1**, a lower frame **2**, side sheets **3** and **4**, two horizontal and parallel top box-girders **5**, and bracing tubes **6** interconnecting the latter. To the girders **5** is secured a plate **7**, e. g. by welding, which serves a table. The foamed-plastic sheet **8** to be cut into foils, either is secured to said table by adhesive means or simply laid thereon.

As shown in Fig. 3, a screw spindle **10** is rotatably but axially immovably mounted in two bearings **9** disposed on transverse members of the stand outside of the side sheets **4**. Said spindle coacts with a nut **11** which by means of lateral forked wings **12** is guided on two rails **13** secured to the sheets **4**. To nut **11** are secured the ends of two steel cables **14** trained over idling discs **15** mounted on the stand. An electric motor **17** mounted on frame **2** rotates spindle **10** through a belt drive **16** and, thus, moves nut **11** and the two cables **14** in one or the other sense. Outside the girders **5** and parallel thereto are arranged guide rods **18** of which the end faces through gussets **19** are connected to said girders. On rod **18** is movably mounted a sleeve **20** to which is welded a horizontal plate **21**. The opposite ends of the cables are fixed to the sleeves **20**, as shown in Figs. 2 and 3. Thus, when the nut is moved, the sleeves **20** and the parts carried thereby are moved. For example, when the nut **11**, as shown in Figs. 1 and 2, is moved to the left, the sleeves **20** and the parts carried thereby are moved to the right. In a ring **22** welded to

the latter is rigidly mounted a guide column **23**. The two columns **23** are rigidly interconnected on top through a horizontal transverse member **24** in which two screw spindles **25** are mounted rotatably but axially immovably. The spindles **25** through two bevel gears **26** are drivably connected to a shaft **27** which is rotatable in bearings **28** fixed to member **24** and on one end of which is provided a graduated disc **29** and a crank **30**. Each of the spindles **25** coacts with a threaded bush **31** rigidly inserted in a holder **32**. The latter is screwed to a lateral lug **33** of a sleeve **34** which is longitudinally movable on the associated column **23**, as shown in Figs. 3 and 4.

As shown in Figs. 3 and 4, lugs **36** of a knife beam **71** are inserted between the lugs **33** and secured thereto by screws **35**. Lugs **33** and **36** together form a rigid carrier for two similar two-arm oscillating levers **37** and **37***a* of which the bearings are designated by **38**. Each of said levers comprises a piece of pipe **39** welded to one of the lugs **33**, a sliding bush **40** inserted in pipe **39**, a bearing pin **41** welded to said lever, a screw **42** mounted and secured in pin **41**, and a disc **43** supported on the upper end face of bush **40** for taking up the small axial forces. The front forked ends **44** of the levers **37**, **37***a* are provided with a horizontal slot **45** in which is inserted one or the other end of a skiver or knife blade **46**, the latter being mounted on a hardened screw **47**. The rear ends of the two oscillating levers are interconnected through a stretching device comprising a threaded member **48**, a threaded wire-receiving sleeve **49**, a stretching wire **50** and a member **51**. Lever **37***a* has a lug **52** to which is pivoted, on a screw **53**, a bar **54** of an eccentric ring **55**. The latter by means of balls **56** is mounted on the eccentric pin **57** of a shaft **58** which is rotatable in a bearing **59** which through parts **60**, **61** is fixed to the adjacent sleeve **34**. Shaft **58** through a belt drive **62** to **64** is connected to an electric motor **65** which is screwed down on a plate **66** welded to part **61**.

As shown in Figs. 4 and 7, arms **68** are pivotally mounted in bosses **67** of the lugs **33**. In bores of the latter are rotatably mounted pins **69** of a loading roller **70** which is parallel to the cutting edge of knife blade **46** and slightly in front of the latter. Roller **70** serves to press down the plastic sheet **8** on to a coating **85** of table **7**, which coating increases the friction. Roller **70** in an extreme case may be situated only slightly lower with respect to knife **46** than shown in the drawing, as the arms **68** then rest on member **36**.

Knife **46** is reciprocated at least 800 times per minute by motor **65** through the eccentric drive **55**, **57** and lever **37***a*, and is made of a spring-steel band of which the longitudinal edge forming the cutting edge is serrated and ground sharply towards the underside in a manner similar to that of bread knives. The rear longitudinal edge of the knife moves in a guide formed on knife beam **71** of which the underside **72** is parallel to the knife underside, the spacing not exceeding the knife thickness. Such spacing corresponds to the thickness of a sheet **73** which at **75** is riveted to another horizontal sheet **74**. The rear and top portion of said guide is formed on a solid constructional member **76** of triangular cross-section. To stepped surfaces at the rear of member **76** are brazed the lower and upper sheets **74** and **77** respectively, of a box-like structure to the somewhat thicker sidewall sheets **78** of which are welded the lugs **36**. Said structure at the rear is braced by a sheet-iron member **79** of U-shaped cross-section. Fig. 6 further shows that the knife-beam upperside **80** rises rearwardly from a front edge **81** which is spaced from knife-beam upperside **80** by one to two knife thicknesses, first only at a slight slope and then somewhat steeper.

The carriage by the sleeves **20** is guided on the rods **18** which over their entire length are protected from impuri-

ties through cover plates **82** which are secured to the plates **19**. For the operation of cutting off foils from the sheet **8** stuck to table **7**, the carriage is run back until the cutting edge of knife **46** is situated in front of sheet **8** (Figs. 6 and 7). By actuating crank **30**, the foil thickness is set, whereupon a foil may be cut off when motor **65** is operating.

At the end of the forward and rearward runs of the carriage, motor **17** is reversed or stopped through limit switches **83** (Fig. 3) secured to the stand and through cams **84** secured to the carriage.

Tests have shown that with the machine disclosed, foils of very good surface property and minimal thickness of approximately 1/32 of an inch may be cut off from foam-plastic sheets up to 3¼ inches thick, provided that the frequency of the knife oscillations is sufficiently higher than the frequency at which the surface of sheet **8** could resonate. A frequency of 800 per minute is quite sufficient in most cases. In order to diminish the foil surface roughness, it is advisable to make the tooth back somewhat rounded, i. e. to avoid burrs on the ground face of the knife serrations. The machine shown and described is only an example which in many details could be varied without leaving the scope of the invention.

What I claim as new and desire to secure by Letters Patent is:

1. A method of cutting off foils from a foam-plastic sheet, comprising the steps of supporting the sheet in a flat superposed position on a firm supporting surface, advancing a knife having a serrated cutting edge longitudinally of the surface and through said sheet and of simultaneously subjecting said knife to longitudinal oscillations with a frequency of such rate that the sheet to be cut cannot resonate.

2. A method as set out in claim 1, in which the frequency of said longitudinal oscillations is at least 800 per minute.

3. A method as set out in claim 1, in which the sheet portion situated in front of the cutting edge is held down by a slight, non-deforming pressure on the surface.

4. A machine for cutting off foils from a foam-plastic sheet comprising a horizontal supporting table on which the sheet is laid flat, a vertically adjustable frame transversely overlying the table, a spring steel cutting knife carried by the frame and positioned transverse of the sheet, said knife having a longitudinal cutting edge facing the sheet, means for longitudinally oscillating the knife, guide means in which the opposite longitudinal side edge of the knife is guided as the knife is longitudinally oscillated and means for moving the frame longitudinally of the table to advance the knife through the sheet.

5. A machine as claimed in claim 4, wherein the cutting edge is serrated and sharply ground towards the knife underside.

6. A machine as claimed in claim 4, wherein the guide is carried by the frame and has a slot in which the opposite longitudinal edge of the knife slides, the guide consisting of a knife beam having a flat underside which is spaced from the underside of the knife by an amount less than the thickness of the knife.

7. A machine as claimed in claim 4, wherein the guide is a knife beam which has a slot in which the opposite longitudinal edge of the knife slides, the knife beam having an upper surface which slopes rearwardly from the knife, the front edge of the beam, in which the slot is formed, being a distance of from one to two knife thicknesses above the knife.

8. A machine as claimed in claim 4, wherein said means for longitudinally oscillating the knife includes a pair of spaced apart, parallel horizontal arms, disposed transversely of the ends of the knife, means connecting the ends of the knife to one of the ends of the arms, axially adjustable stretching means interconnecting the opposite ends of the arms to stretch the knife, means mounting the arms, intermediate their ends, for pivotable movement about vertical axes, and power means connected to one of the arms for oscillating the arms.

9. A machine as claimed in claim 8, wherein said last means includes a drive motor, an eccentric driven thereby and a link connection between the eccentric and one of the arms.

References Cited in the file of this patent

UNITED STATES PATENTS

368,758	Dredge	Aug. 23, 1887
1,839,383	Erpelding	Jan. 5, 1932
2,457,301	Brand	Dec. 28, 1948
2,565,400	Skeoch	Aug. 21, 1951
2,609,048	Samans et al.	Sept. 2, 1952
2,627,237	Angell	Feb. 3, 1953

FOREIGN PATENTS

130,317	Austria	Nov. 10, 1932