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(54) **Apparatus for winding metal strip.**

(57) A coiler for metal strip is decribed which has a coiler mandrel 1, wrapper rolls 2, 3 and 4 spaced about the mandrel 1 for guiding the initial wraps of a coil about the mandrel 1, and hydraulic rams 5, 6 and 7 for each of the wrapper rolls for urging the respective roll into engagement with the strip and for displacing that roll outwardly. Each wrapper roll has a sensor associated with that wrapper roll which gives a sensor signal on the passage of the leading end of a strip past a given location. A control circuit for the associated wrapper roll receives the sensor signal and immediately operates the associated hydraulic ram of that wrapper roll in advance of said given location to displace that wrapper roll away from the mandrel.

EP 0 145 295 A1

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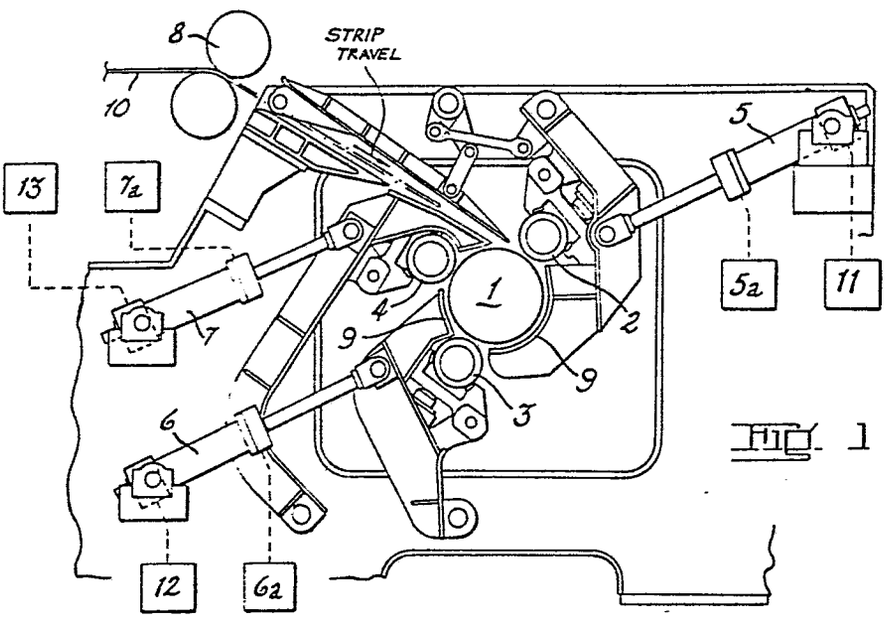

FIG. 1

Apparatus for Winding Metal Strip.

This invention relates to an apparatus for winding strip metal, and in particular one in which the strip is guided onto a mandrel or the like by two or more wrapper rolls.

It is well known to use wrapper rolls to guide metal strip round a mandrel while the first few turns are coiled. Once the coil is established the wrapper rolls are withdrawn and the mandrel expanded slightly to grip the coil. A problem arises during those first turns when the leading edge of the strip passes under the wrapper rolls and the strip is damaged by the rolls hammering the strip. The hammering occurs even when the leading edge is overlaid by the coiled strip because the overlying strip is deformed into a step adjacent the leading edge. Thus, damage can be caused over the whole period of the wrapper roll engagement and therefore be costly.

Accordingly, one aspect of the invention provides a coiler for metal strip which has a coiler mandrel, at least two wrapper rolls spaced about the mandrel for guiding the initial wraps of a coil about the mandrel, and actuating means for each of the wrapper rolls for urging the respective roll into engagement with the strip and for displacing that roll outwardly; and which includes, for each wrapper roll, sensing means associated with that wrapper roll and giving a sensor signal on the passage of the leading end of a strip past a given location, and means controlled by the sensor signal for operating immediately the actuating means of a wrapper roll in advance of said given location to displace that wrapper roll away from the mandrel.

It is intended that the term "leading edge" should be considered to cover not only that edge alone but also that edge as ovelayed during coiling process.

Another aspect of the invention provides a method of coiling metal strip on a coiler which has a coiler mandrel, at least two wrapper rolls spaced about the mandrel for guiding the initial wraps of a coil about the mandrel, and actuating means for each of

the wrapper rolls for urging the respective roll into engagement with the strip and for displacing that roll outwardly, the method comprising:

(a) positioning the wrapper rolls adjacent the coiler mandrel for engaging with the strip;

(b) feeding strip towards the coiler mandrel and wrapper rolls;

(c) sensing the passage of the strip past a given point; and

(d) controlling the actuating means of a wrapper in advance of said given location, immediately passage of the strip is sensed, to displace that wrapper roll away from the mandrel.

Preferred embodiments of the invention will now be described with reference to the accompanying drawings, wherein:

Figure 1 is a schematic elevation of one embodiment; and

Figure 2 is a schematic elevation of another embodiment.

Referring to the drawings, an apparatus for winding metal strip 10 includes a mandrel 1 for receiving the strip 10 and wrapper rolls 2, 3 and 4 for guiding the strip about the mandrel. Each wrapper roll has a respective double-acting hydraulic ram 5, 6 or 7 which, in use, presses the associated wrapper roll 2, 3 or 4 the strip 10 into the mandrel 1 to coil the strip. Guide plates 9 are provided about the mandrel, to assist in the guidance of the strip. A set of pinch rolls 8 is arranged to feed the strip 10 to the mandrel.

Referring now to Figure 1, each of the hydraulic rams 5, 6 and 7 has a respective sensor 11, 12 or 13 arranged to sense the hydraulic pressure in that ram, and in particular to sense any rise in that pressure. The sensors 11, 12 and 13 are each connected with a control unit 5a, 6a, 7a, of an adjacent ram; in particular each sensor 11, 12 and 13 is connected with the control unit of the last ram in the advance direction of strip travel next to the roll with that particular sensor, or in other words, adjacent the ram in the opposite direction to the mandrel rotation (strip travel) i.e. the sensor at 11 is connected with the control unit 7a, the sensor 12

with control unit 5a, and the sensor at 13 with the ram control unit 6a.

In use, the wrapper rolls at 2 and 3 are displaced from the mandrel an amount slightly less than the thickness of the strip to be coiled, and the wrapper roll at 4 is left in contact or thereabouts with the mandrel. The strip 10 is fed to the mandrel 1 from pinch rolls 8 and engages the wrapper roll 2, urging that roll outwards. The strip is held between the wrapper roll at 2 and the mandrel 1 and the sensor 11 senses the increase in pressure in the hydraulic ram 5. The sensor provides a signal to the control unit 7a so that the ram 7 can displace the wrapper roll 4 outwards by an amount slightly less than the strip thickness. Similarly, when the leading edge of the strip 10 has progressed sufficiently to engage with the wrapper roll at 3, the sensor 12 provides a signal to the control unit 5a so that the ram 5 displaces the wrapper roll 2 outwards. Again, when the leading edge of the strip 10 reaches and engages the wrapper roll 4, the sensor 13 signals to the control unit 6a so that the ram 6 displaces the wrapper roll 3 outwards.

The process of outward displacement of a wrapper roll continues until the stage where the wrapper rolls are completely removed.

It will be appreciated that by successively displacing rolls outwards by slightly less than the strip thickness the effect of hammering when each roll engages the strip is greatly reduced. The strip is still held in engagement with the mandrel by at least one wrapper roll.

Other means than the pressure sensor may be used to sense the outward displacement of the wrapper rolls, for example, accelerometers could be mounted on the roll carrying frame to sense the outward acceleration of the wrapper rolls when engaged by the leading edge or step in the strip.

Referring now to Figure 2, in another embodiment the arrangement of mandrel 1 wrapper rolls 2, 3 and 4, and hydraulic rams 5, 6 and 7 is as already described. Mounted on the frame of each of the wrapper rolls 2, 3 and 4 is a respective sensor roll 16, 17 and

18. Each sensor roll is a comparatively light roll which is arranged to engage the strip 10 and be displaced by the leading edge or the step in the strip, and to respond to the displacement so that the signal indicative the leading edge or step is produced e.g. by an accelerometer or pressure sensor which is connected to the sensor roll. The sensor rolls 16, 17 and 18 are designed not to press the strip into engagement with the mandrel.

In use whenever one of the sensor rolls senses the passage of the leading edge or step in the strip, a control signal is produced and the associated wrapper roll is displaced outwards before the edge of the strip reaches that roll. The wrapper roll can remain outwardly displaced for a predetermined time sufficient for the leading edge to pass the roll and then be returned to engage with the strip.

Although the preferred embodiments have been described with three wrapper rolls it will be appreciated that the number may be varied, but usually at least two rolls will be required.

CLAIMS:

1. A coiler for metal strip which has a coiler mandrel, at least two wrapper rolls spaced about the mandrel for guiding the initial wraps of a coil about the mandrel, and actuating means for each of the wrapper rolls for urging the respective roll into engagement with the strip and for displacing that roll outwardly; and which includes, for each wrapper roll, sensing means associated with that wrapper roll and giving a sensor signal on the passage of the leading end of a strip past a given location, and means controlled by the sensor signal for operating immediately the actuating means of a wrapper roll in advance of said given location to displace that wrapper roll away from the mandrel.

2. An apparatus as claimed in claim 1 wherein the each sensing means is connected to the operating means of the last wrapper roll in the advance direction next to that roll and when a sensing means senses displacement of the associated wrapper roll by the leading edge of the strip, the operating means of that last wrapper roll in the advance direction causes displacement of that roll.

3. An apparatus as claimed in claim 1 wherein the sensor means includes a sensor roll mounted on or adjacent to the associated wrapper roll and arranged so that the leading edge of the strip engages the sensor roll before that leading edge arrives at that wrapper roll and the associated wrapper roll is outwardly displaced before the leading edge arrives there.

4. An apparatus as claimed in claim 2 or 3 wherein the sensing means includes a pressure sensor.

5. An apparatus as claimed in claim 2 or 3 wherein the sensing means includes an accelerometer.

6. A method of coiling metal strip on a coiler which has a

coiler mandrel, at least two wrapper rolls spaced about the mandrel for guiding the initial wraps of a coil about the mandrel, and actuating means for each of the wrapper rolls for urging the respective roll into engagement with the strip and for displacing that roll outwardly, the method comprising:

(a) positioning the wrapper rolls adjacent the coiler mandrel for engaging with the strip;

(b) feeding strip towards the coiler mandrel and wrapper rolls;

(c) sensing the passage of the strip past a given point; and

(d) controlling the actuating means of a wrapper in advance of said given location, immediately passage of the strip is sensed, to displace that wrapper roll away from the mandrel.

7. A method as claimed in claim 6 wherein the displaced wrapper roll is moved outwards by an amount slightly less than the strip thickness.

8. A method as claimed in claim 6 wherein the displaced wrapper roll is moved outwards by an amount exceeding the strip thickness and is returned to engage the strip after the strip has past that wrapper roll.

9. A method as claimed in claim 7 wherein the wrapper roll is displaced outwards for a predetermined time and then brought inwards to engage with the strip.

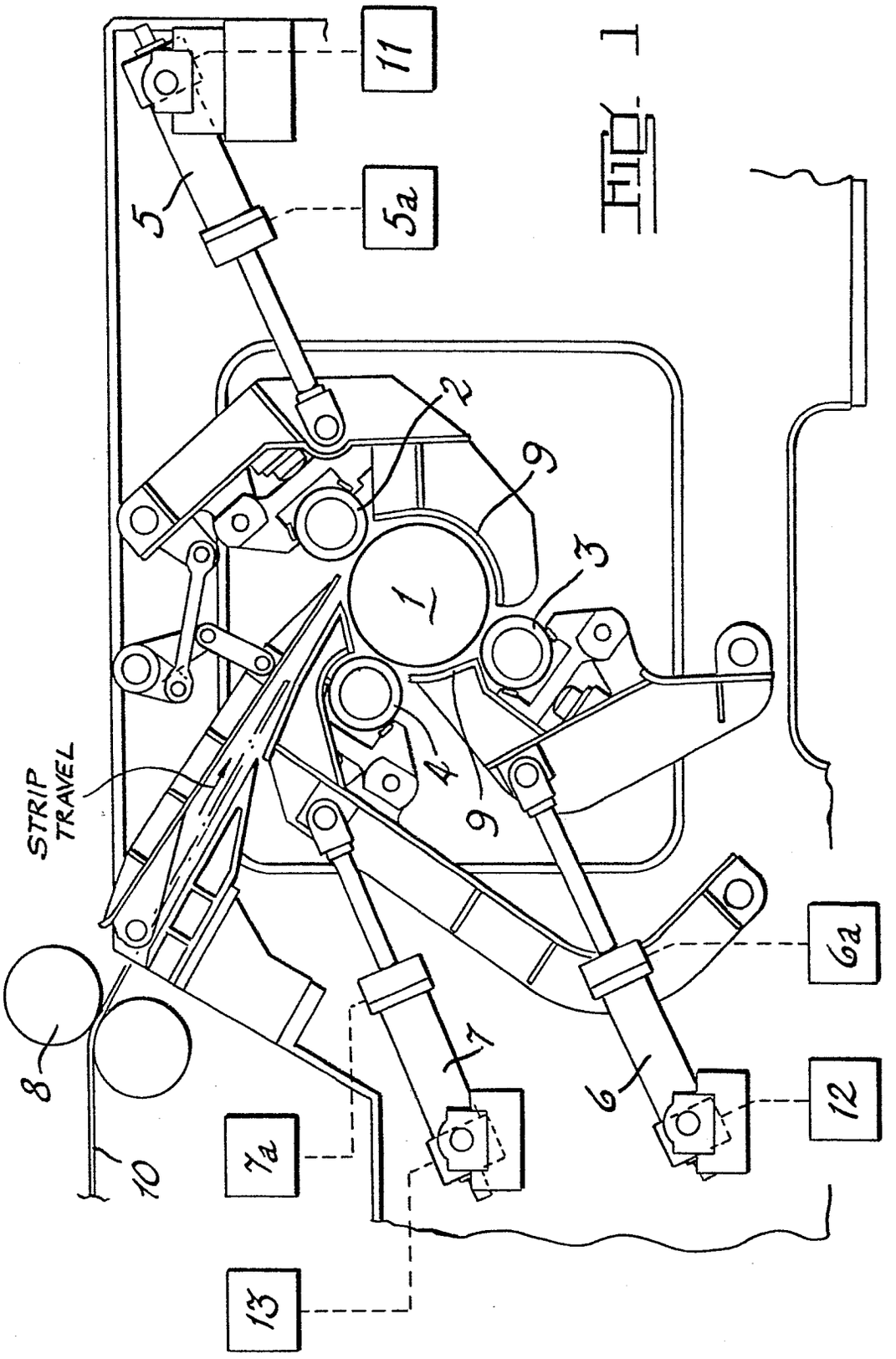

Fig. 1

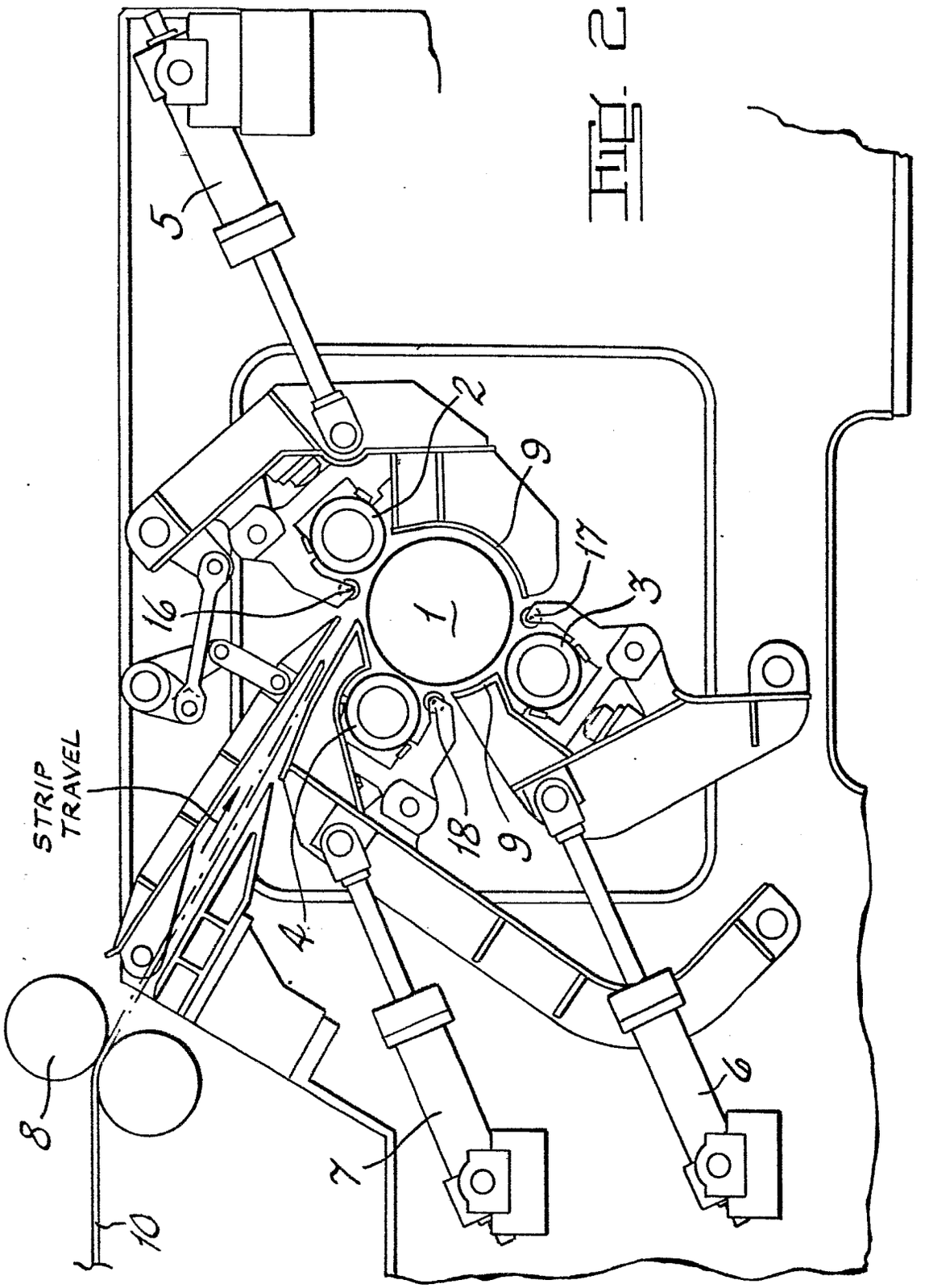

Fig. 2

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EUROPEAN SEARCH REPORT

Application number 0145295

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 84307793.4

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl 4)
X	US - A - 4 380 164 (KUWANO)	1,6,8	B 21 C 47/06
Y	* Abstract; fig. 2-4; description, column 2, lines 10-18 *	9	B 65 H 19/26
	* Description, column 3, lines 51-67 *		B 65 H 26/08
A		5	
	--		
X	US - A - 3 028 114 (ASBECK)	1,6,	
Y	* Fig.; description, column 3, lines 41-44, 52-58 *	9	
A		2-4	
	--		
X	DE - B2 - 2 158 721 (INDRAMAT GES.)	6,7,9	
	* Fig. 1,2; description, column 2, lines 30-34 *		
	* Column 3, line 1 - column 4, line 4 *		TECHNICAL FIELDS SEARCHED (Int. Cl 4)
	--		B 21 C
X	PATENT ABSTRACTS OF JAPAN, unexamined applications, section M, vol. 6, no. 69, April 30, 1982	6	B 65 H
	THE PATENT OFFICE JAPANESE GOVERNMENT page 135 M 125		
	* Kokai-no. 57-9 531 *		
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	07-02-1985	SÜNDERMANN

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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D : document cited in the application
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EUROPEAN SEARCH REPORT

0145295
Application number

EP 84307793.4

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	PATENT ABSTRACTS OF JAPAN, unexamined applications, section M, vol. 6, no. 14, January 27, 1982 THE PATENT OFFICE JAPANESE GOVERNMENT page 92, M 108 * Kokai-no. 56-134 016 *	6	
A		1-4	

			TECHNICAL FIELDS SEARCHED (Int. Cl.4)

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