In the Matter of

CERTAIN STEEL ROD TREATING APPARATUS AND COMPONENTS THEREOF

Investigation No. 337-TA-97

(Order Permitting Entry Under Bond)

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United States International Trade Commission / Washington, D.C. 20436

UNITED STATES INTERNATIONAL TRADE COMMISSION

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In the Matter of CERTAIN STEEL ROD TREATING APPARATUS AND COMPONENTS THEREOF	Investigation No. 337-TA-97

COMMISSION ACTION AND ORDER

Introduction

On December 1, 1981, the Commission determined that section 337 had been violated by unfair acts and unfair methods of competition practiced in the sale for importation of certain steel rod treating apparatus and components thereof, the effect or tendency of which was to substantially injure an industry, efficiently and economically operated, in the United States. The Commission found that certain steel rod treating apparatus imported or sold by respondents Korf Industrie and Handel, GmbH, Korf Engineering, GmbH, Korf Industries, Inc., Ashlow Ltd., Ashlow Corp., Georgetown Steel Corp., Mr. Willy Korf, and/or Mr. Johann Heinrich Rohde, infringed U.S. Letters Patent 3,390,871 (hereinafter '871 patent). The '871 patent is owned by complainant Morgan Construction Co. On December 14, 1981, the Commission delivere' its Action and Order and Memorandum Opinion to the President pursuant to section 337(g) (19 U.S.C. § 1337(g)).

During the pendency of the Commission's investigation, respondents Ashlow Ltd. and Ashlow Corp. filed a declaratory judgment action in the U.S. District Court for the District of South Carolina seeking a judgment that the '871 patent was invalid and unenforceable. Ashlow Ltd. et al. v. Morgan Construction Co., D.S.C. Civil No. 81-936-5. The suit was filed on May 13, 1981, and after an abbreviated discovery period, came to trial on November 30, 1981. On December 30, 1981, the court issued an oral ruling from the bench, indicating that in a final order and opinion to be entered on or about February 1, 1982, the court would find the '871 patent invalid and unenforceable.

On December 31, 1981, respondents moved (Motion No. 97-64) that the Commission stay or suspend its exclusion order, and for an expedited decision thereon. Complainant Morgan opposed the motion.

This Action and Order provides for the disposition of Motion No. 97-64 and is based upon the Commission's determination that there is a violation of section 337. That determination necessarily incorporated a determination that there was reason to believe that section 337 had been violated.

Action

Having reviewed the record in this investigation, including the Commission Action and Order of December 10, 1981, Motion No. 97-64, and the papers in support thereof and in opposition thereto, the Commission, on January , 1982, determined that--

1. Motion No. 97-64 is granted and the Commission's Action and Order of December 10, 1981, is revoked insofar as it provides that (1) the appropriate remedy for the violation of section 337 is an exclusion order pursuant to section 337(d), (2) the public interest considerations do not preclude issuance of such an order, and (1) the appropriate bond is 100 percent of the entered value of the imported articles;

2. The appropriate remedy for such violation of section 337 is an order excluding such articles from entry except under bond, pursuant to subsection (e) of section 337 of the Tariff Act of 1930 (19 U.S.C. § 1337(e)), providing for the entry under bond of steel rod treating apparatus and components thereof which infringe U.S. Letters Patent 3,390,871 and which are manufactured by or on behalf of respondents Korf Industrie and Handel, GmbH, Kotf Engineering, GmbH, Korf Industries, Inc., Ashlow Ltd., Ashlow Corp., Mr. Willy Korf, and/or Mr. Johann Heinrich Rohde, or any successor, assignee, parent company, affiliated person, subsidiary, or related business entity of the above-named parties respondent, or which are sought to be imported by or on behalf of Georgetown Steel Corporation;

3. The public-interest factors enumerated in subsection (e) of section 337 of the Tariff Act of 1930 do not preclude the issuance of a temporary exclusion order in this investigation;

4. The bond provided for in section 337(e) of the Tariff Act of 1930 shall be in the amount of 100 percent of the entered value of the imported articles. The bonding provision shall remain in effect until such time as the Commission shall render a final determination as to permanent relief under section 337(d) or section 337(f). If following a final judgment by the Court of Appeals for the Fourth Circuit or the Court of Customs and Patent Appeals, the Commission shall determine to issue permanent relief under section 337(d) or section 337(f), and such order shall be approved by the President, all bonds posted shall be forfeited;

5. This investigation shall be suspended pursuant to section 337(b)(1) until such time as the Court of Appeals for the Fourth Circuit shall render a final judgment as to the appeal from the final order of the District Court to be issued on or about February 1, 1982, or until otherwise reopened by the Commission.

Order

Accordingly, it is hereby ORDERED THAT:

1. Steel rod treating apparatus and components thereof which infringe U.S. Letters Patent 3,390,871, which are manufactured by or on behalf of respondents Korf Industrie and Handel, GmbH, Korf Engineering, GmbH, Korf Industries, Inc., Ashlow Ltd. , Ashlow Corp., Georgetown Steel Corp., Mr. Willy Korf and/or Mr. Johann Heinrich Rohde, or any successor, assignee, parent company, affil'ated person, subsidiary, or related business entity of the above-named parties respondent, or which are sought to be imported by Georgetown Steel Corporation, are hereby excluded from entry except under bond;

2. The bond provided for in section 337(e) of the Tariff Act of 1930 shall be in the amount of 100 percent of the entered value of the imported articles; The bonding provision shall remain in effect until such time as the Commission shall render a final determination as to permanent relief under section 337(d) or section 337(f); If following a final judgment by the Court of Appeals for the Fourth Circuit or the Court of Customs and Patent Appeals, the Commission shall determine to issue permanent relief under section 337(d) or section 337(f), and such order shall be approved by the President, all bonds posted shall be forfeited;

- This investigation shall be suspended pursuant to section 337(b)(1) until such time as the Court of Appeals for the Fourth Circuit shall render a final judgment as to the appeal from the final order of the District Court to be issued on or about February 1, 1982, or until otherwise reopened by the Commission;

- The Secretary shall publish notice of this Action and Order in the Federal Register;

The Secretary shall serve a copy of th's Action and Order and the Commission opinion in support thereof upon each party of record to this investigation and upon the Department of Health and Human Services, the Department of Justice, the Federal Trade Commission, and the Secretary of the Treasury.

By order of the Commission.

Kenneth R. Mason
Secretary

issued: ..1J.nuary 15, 1982

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C. 20436

In the Matter of

CERTAIN STEEL ROD TREATING
APPARATUS AND COMPONENTS THEREOF)[1]

COMMISSION OPINION

This opinion concerns a motion (Motion No. 97-64) to suspend the Commission's exclusion order in Certain Steel Rod Treating Apparatus and Components Thereof, Inv. No. 337-TA-97. The Commission's order was issued on December 10, 1981, sent to the President on December 14, 1981, and presently is before the President for his review. The one year statutory deadline for completion of this investigation expires on January 28, 1982.

Because of the special circumstances presented here, we conclude that we should reconsider our earlier determinations as to remedy, the public interest, and bonding. We leave our determination as to violation in effect. Upon reconsideration, we determine that it is appropriate to revoke our exclusion order and to issue a temporary exclusion order since the criteria for issuance of a temporary exclusion order have been met. We further determine that such relief should remain in effect during the per[4]od of suspension.

Procedural History

Complainant Morgan Construction Co. of Worcester, Massachusetts initiated this investigation on December 27, 1980 by filing a complaint seeking temporary and permanent relief under section 337. The complaint alleged that Korf Industrie and Handel, GmbH (KIH), Korf Engineering, GmbH (KE), Korf Industries Inc. (KII), Ashlow Steel & Engineering Co., Ltd. (AS&E), Ashlow Corp. and Georgetown Steel Corporation were engaged in the sale for importation of a steel rod treating apparatus covered by the claims of U.S. Letters Patent 3,390,871 ('871 patent). The apparatus in question was to be constructed by AS&E in England for GSC's plant in Georgetown, South Carolina.

In public session on January 14, 1981, the Commission instituted a section 337 investigation based on Morgan's complaint. The Commission's notice of investigation was published in the Federal Register on January 28, 1981, and named KIH, KE, AS&E, Ashlow Corp., KII, and GSC as parties respondent. 1/ The Commission later amended the notice of investigation to dismiss AS&E as a party respondent and to add Ashlow Ltd. in AS&E's place. 2/ On motion of complainant Morgan, the Commission, on June 2, 1981, further amended the notice of investigation to add Mr. Willy Korf and Mr. Johann Heinrich Rohde as parties respondent. 3/

Following discovery and a trial, the administrative law judge (ALJ) recommended that the Commission determine that there is violation of section 337 in the importation and sale of the accused apparatus. The ALJ found the '871 patent was valid and enforceable, that the subject apparatus infringed

1/ 46 F.R. 9263 (Jan. 28, 1981).
27 46 F.R. 22083 (Apr. 15, 1981).
3/ 46 F.R. 30738 (June 10, 1981).

the patent, and that the sale would cause substantial injury to the domestic industry. Pursuant to section 210.52 of the Commission's rules, the ALJ's recommended determination (RD) and the record in the investigation were certified to the Commission. 19 C.F.R. § 210.52 (1980).

The Commission conducted its public hearing on October 14, 1981 and hear'[4] oral argument and presentations from the parties regarding violation of section 337, remedy, the public interest, and bonding.

On December 1, 1981, the Commission unanimously determined that the sale for importation of the subject apparatus violated section 337, that the appropriate remedy was a limited exclusion order and that public interest considerations did not preclude issuance of such an order. The Commission also determined (Vice Chairman Calhoun dissenting) that the appropriate bond was 100 per cent of the entered value of the imported articles. Pursuant to section 337(g), the Commission then transmitted its exclusion order and opinion to the President on December 14, 1981 for his review.

During the pendency of the Commission's investigation, respondents Ashlow Ltd. and Ashlow Corp. filed a declaratory judgment action in the U.S. District Court for the District of South Carolina. Ashlow and its U.S subsidiary sought a declaratory judgment that the '871 patent was invalid for obviousness and unenforceable for fraud on the Patent and Trademark Office.

The complaint was filed on May 13, 1981. 4/ On May 28, 1981, respondents Ashlow Ltd., Ashlow Corp, and GSC moved that the Commission stay its investigation pending a final judgment in the South Carolina action (Motion

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4/ Ashlow Ltd. et al. v Morgan Construction Co., D.S.C. Civil Action No. 81-936-1.

No. 97-45). Alternatively, respondents sought to have the Commission investigation designated "more complicated," thereby extending the Commission's investigation for 6 months, or until after the scheduled December date of importation of the subject apparatus. 5/ The ALJ denied respondents' motion on June 3, 1981. 6/

After an abbreviated discovery period, the trial in the district court action began on November 30, 1981. On December 30, 1981, the court issued an oral ruling from the bench. The court indicated that it would issue a final order on or about February 1, 1982 and that it would find the '871 patent invalid and unenforceable. 7/

I. Revocation of Exclusion Order

In the instant motion No. 97-64, respondents seek a stay and suspension of the Commission's exclusion order based on the District Court's forthcoming finding of invalidity and unenforceability. Respondents argue that the facts of this investigation precisely parallel those of Certain Large Video Matrix Display Systems and Components thereof ("Scoreboards"). 8/ In Scoreboards, the Commission modified its exclusion order to suspend that portion of its order relating tb patents ruled invalid by a later District Court decision. 9/

5/ 19 U.S.C. § 1337(b)(1).

6/ Transcript of Conference Call, p. 50 (June 3, 1981). Respondents' counsel indicated at that time that the District Court case might come to trial in one and a half to two years. Id. at 42. The case was reassigned to the Honorable Robert W. Hemphill, Senior Judge, and expedited.

7/ Ashlow Ltd. et al v. Morgan Construction Co., Transcript at 2243 et seq.; Letter from Honorable Robert W. Hemphill, Senior Judge, to Office of General Counsel USITC (rec'd Jan. 7, 1982).

8/ Inv. No. 337-TA-75, USITC Pub. No. 1158 (June 1981).

9/ Stewart-Warner Corp. v. City of Pontiac, No. 79-73536 (E.D. Mich. unpublished order July 16-17, 1981).

Complainant opposes Motion No. 97-64, and seeks to distinguish Scoreboards on the grounds that that case involved a finding of invalidity in a suit brought by the patent owner, whereas the South Carolina District Court litigation was a declaratory judgment action filed by respondents Ashlow Corp and Ashlow Ltd. Complainant argues that respondents' purpose in filing a declaratory judgment action was to attack collaterally the Commission's determination and thereby circumvent appellate review in the Court of Customs and Patent Appeals (CCPA). 10/

Revocation of the Commission's exclusion order is not, strictly speaking, compelled under Blonder Tongue Laboratories v. University of Illinois Foundation, 402 U.S. 303 (1971). In Blonder-Tongue, the Supreme Court overruled Triplett v. Lowell, 247 U.S. 638 (1936), and abolished the doctrine of mutuality of estoppel with regard to judgments of patent invalidity. The Court held that once a court has ruled a patent invalid after a full and fair opportunity to litigate, that judgment binds the patent holder through the doctrine of collateral estoppel. Hence, the patent holder cannot assert that the patent is valid in later actions against persons infringing the patent, even if such persons were not privy to the first judgment. In short, the patent becomes unenforceable.

Blonder-Tongue, however, does not extend to judgments entered prior to a judgment of invalidity. Thus in Jamesbury Corp. v. United States, 198 U.S.P.Q. 455 (Ct. Cl. 1978), the Court of Claims found a patent valid and infringed in 1975, but separated the trial as to damages to permit further

10/ This claim was litigated before the District Court and need not be decided by the Commission.

discovery. Prior to the damages trial, a district court held the patent invalid. The Court of Claims denied a motion for a new trial. The Court held:

> There is no showing by defendant and it does not contend that the Blonder-Tongue doctrine has ever been applied by any court to a prior court decision holding a patent valid when there is a subsequent decision by another court to the contrary.
>
> The court concludes, as a matter of law, that the Blonder-Tongue doctrine has no application in these cases.

199 U.S.P.Q. at 456; accord Huron Machine Products v. A & E Warbern Inc., 615 F.2d 222, 226 u.2 (5th Cir. 1980).

We believe that the rule set forth in Jamesbury extends to administrative proceedings. The concerns regarding judicial economy which underlie Blonder-Tongue do not support retroactive extension of the doctrine to proceedings already completed. Hence, Blonder-Tongue does not preclude issuance of a Commission remedial order based on its determination of December 1, 1981, since the Commission made that determination prior to the District Court's judgment. Furthermore, under the doctrine of res judicata, a judgment is not conclusive until the court issues a final order. 1B Moore's Federal Practice 0.419[1]. No final order has been issued by the District Court. Judge Hemphill has, however, advised the Commission by letter of his oral ruling of December 30, 1981. 11/

Nevertheless, other considerations strongly favor restraint in the face of the forthcoming district court judgment. The federal district courts have original jurisdiction over civil actions under the patent laws. 28 U.S.C.

11/ Letter from the Honorable Robert W. Hemphill to Office of General Counsel, U.S. International Trade Commission (rec'd Jan. 7, 1982).

§ 1338. Congress has indicated that the Commission may in its discretion suspend an exclusion order after a district court's adjudication of invalidity.

> Any order issued by the Commission, whether temporary or final, would be terminated by the Commission when, on its own motion or upon request of an interested party, it finds that the conditions which lead to the issuance of the order no longer exist. If, for example, a court of competent jurisdiction should hold invalid or unenforceable a patent involved in an exclusion order, the Commission would take the matter under consideration, and, where appropriate, would terminate or suspend the order of exclusion.

H.R. Rept. No. 93-571, 93rd Cong., 1st Sess., p. 79 (1973). Accordingly, we believe that we may appropriately exercise our power to revoke or modify Commission orders in light of changed conditions under section 337(h). 12/ We believe that the general policy of deference to the decisions of the district courts articulated by the Commission in Scoreboards is proper and should be adhered to in this case. 13/ Therefore, we have decided to revoke our exclusion order.

Revocation rests on sound policy grounds. Generally, a court will stay a patent infringement proceeding once another court has found a patent invalid. The stay remains in effect until the judgment has become final and appeal rights have been exhausted. Famolare, Inc. v. Melville Corp., 472 F.Supp. 738, 741 (D. Hawaii 1979), aff'd 652 F.2d 62 (9th Cir. 1981). Thus as a practical matter, the patent becomes unenforceable once the appeals court

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12/ Section 337(h) provides:

> (h) Except as provided is subsections (f) and (g) of this section, any exclusion from entry or order under this section shall continue in effect until the Commission finds, and in the case of exclusion from entry notifies the Secretary of the Treasury, that the conditions which led to such exclusion from entry or order no longer exist.

19 U.S.C. § 1337(h).

13/ Certain Large Video Matrix Display Systems and Components Thereof, Inv. No 337-TA-75, Commission Action and Order, p. 2 (Aug. 10, 1981).

affirms. If the District Court's decision is affirmed on appeal, a situation could arise in which the '871 patent is unenforceable against domestic infringers, while an exclusion order continues to be enforced against foreign persons subject to the order. Hence, continued exclusion raises possible problems of fairness. 14/ 15/

II. Section 337(e)

Our decision to revoke as a matter of discretion is predicated on our conclusion that the Commission has the means available to protect the status quo pending an expedited appeal of the District Court's decision to the Fourth Circuit. 16/

14/ We note that the foreign policy considerations arising from such disparate treatment are within the scope of the President's power to disapprove of Commission orders. The disparity of treatment, of course, rests on the time of the judgment rather than the foreign status of the goods. U.S. infringers subject to prior judgments of validity and infringement would fall in the same class as any foreign persons subject to a prior Commission order and would be subjected to the same disparity of treatment.

15/ Commissioner Stern notes that enforcement of a section 337 remedy in the face of a U.S. district court's judgment that a patent is invalid or unenforceable raises serious questions of trade discrimination. See Certain Skateboards and Platforms Therefor, Inv. No. 337-TA-37 (1980), Dissenting Opinion of Commissioner Stern. These problems arise after the district court has made its ruling and prior to the completion of the appeals process. They occur whether the relief is permanent or temporary, although obviously to a lesser degree if the relief is temporary. After weighing all of the equities in this situation, which are amplified in this opinion, T conclude that the action taken by the Commission is the most appropriate. Congress intended the public interest to be paramount in the administration of section 337. U.S. Senate, Trade Reform Act of 1974; Report of the Committee on Finance . . S. Rept. No. 93-1298, 93d Cong., 2d Sess., 1974, p. 197. Failure to preserve the status quo could seriously compromise the Commission's ability to execute the responsibilities that Congress entrusted to it.

16/ The District Court granted Morgan's motion for an expedited appeal pursuant to 28 U.S.C. § 1292(b). Transcripts of Trial Proceedings, Ashlow Ltd. et al. v. Morgan Construction Co., pp. 2252-54 (Dec. 30, 1981)

We determine that this use of section 337(e) as a means to preserve the status quo after a finding of violation, falls within Congress' intention that such relief be used during the course of an investigation to prevent immediate and substantial harm to a domestic industry.

This investigation is unusual in that it centers on a particular sale of a particular apparatus for a particular act of importation. Complainant Morgan instituted this proceeding after losing an order for two controlled steel rod cooling lines to Ashlow Ltd.'s predecessor AS&E. The lines in question were to be manufactured by Ashlow Ltd. in England and installed at GSC's Georgetown, South Carolina plant. Throughout this investigation, Morgan has sought an expedited investigation that would permit it to obtain a Commission adjudication of its claims prior to the December importation of the subject apparatus.

Thus on February 28, 1981, Morgan waived its request for temporary relief after respondents stipulated to an advancement of the trial date that would result in a final Commission determination by December. 17/ Morgan renewed its request for temporary relief after obtaining evidence that respondents might be attempting to circumvent any Commission remedy by early importation of the apparatus (Motion No. 97-55), but withdrew the request after respondents assured the Commission that importation would not occur until after December 30, 1981. 18/ Respondents Ashlow Ltd. and Ashlow Corp. for

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17/ Transcript of Preliminary Conference, Inv. No. 337-TA-97, pp. 78-79, 89, 108 (Feb. 28, 1981).

18/ Preliminary Response, p. 1 (Sept. 10, 1981).

their part have insisted that the GSC order is the only proven sale for importation. 19/

Hence, while we believe that we should revoke our order, we conclude that it is imperative that we take steps to preserve the status quo. Rule 62(c) of the Federal Rules of Civil Procedure provides an instructive analogy. The rule concerns stays of injunctive relief and provides:

> When an appeal is taken from an interlocutory or final judgment granting, dissolving, or denying an injunction, the court in its discretion may suspend, modify, restore, or grant an injunction during the pendency of the appeal upon such terms as to bond or otherwise as it considers proper for the security of the rights of the adverse party.

FED.R.CIV. P. 62(c) (emphasis added).

Commission exclusion orders are similar to injunctions in that they provide a prospective remedy. Once an exclusion order is suspended, the goods are free to enter the country. During a period of suspension, the GSC apparatus, which by respondents' admission, is the only known importation, could not be subjected to a denial of entry. If we were to suspend our order without any protective measures, and the Fourth Circuit were to later overturn the District Court decision, the possibility of preventing the GSC importation through an exclusion order would be lost.

19/ Indeed, Ashlow argued that an exclusion order was unnecessary because the GSC order was the only importation. "An exclusion order would also be overbroad and inappropriate in this case in that there is no evidence of the threat or possibility of other imports." Respondents Ashlow Limited, Ashlow Corporation, Korf Industries, Inc. and Georgetown Steel Corporation's Prehearing Statement Concerning Relief, Bonding, and the Public Interest, p. (Sept. 29, 1981); Transcript of Commission Hearing, pp. 278, 288 (Oct. 14, 1981) (Testimony of Mr. Esch).

Morgan could sue GSC for patent infringement, but seeking damages would require a duplicative expenditure of resources and present an uncertain prospect of remedy. 20/ In any case, the domestic industry has a vital interest in obtaining section 377 relief against GSC. Congress explicitly provided that such relief is "in addition to" other remedies available in an action at law. The unnecessary destruction of the domestic industry's interest in obtaining relief should be avoided if at all possible.

We believe that section 337(e) authorizes us to issue orders permitting entry under bond in situations such as this one. 21/ Section 337(e) provides in pertinent part:

> (e) If, during the course of an investigation under this section, the Commission determines that there is reason to believe that there is a violation of this section, it may direct that the articles concerned, imported by any person with respect to whom there is reason to believe that such person is violating this section, be excluded from entry into the United States, unless, after considering the effect of such exclusion upon the public health and welfare, competitive conditions in the United States economy, the production of like or directly competitive articles in the United States, and United States consumers, it finds that such articles should not be excluded from entry...

The legislative history of section 337(e) appears to contemplate a flexible remedy designed to prevent immediate and substantial harm to the domestic industry. The House Report provides:

20/ The District Court separated the trial as to patent infringement until some later date. It is unclear how much additional discovery would be required. In addition, it is doubtful that certain portions of the domestic industry have any remedy at law. Sub-contractors included in the domestic industry and employees of the firms comprising the domestic industry do not have standing to sue for damages for patent infringement. Hence, such persons could not obtain relief in an action at law, and for them section 337 is a unique remedy.

21/ For example, after a finding of violation, the Commission might conclude that it requires additional information to determine an appropriate final remedy or to determine whether the public interest considerations preclude an exclusion order. The sensible course may be to issue an order permitting entry under bond, and seek additional information.

> The Commission would be authorized at any time, after a hearing in the course of its preliminary inquiry or full investigation but before completing its investigation, to issue a temporary order of exclusion if it is satisfied from the evidence in its possession that a probable unfair method or act has been established, and that, in the absence of such temporary order of exclusion, immediate and substantial harm would result to the domestic industry.

H.R. Rept. No. 93-571, 93rd Cong., 1st Sess., p. 78-79 (1973). Congress intended that the Commission use section 337(e) to prevent "immediate and substantial harm" to a domestic industry when for one reason or another permanent relief is not available.

III. Order Permitting Entry Under Bond

Accordingly, while we conclude that we should revoke our exclusion order of December 10, 1981, and reopen our investigation as to the issues of remedy, the public interest, and bonding for reconsideration in light of the changed circumstances arising from the District Court's forthcoming order, we must also issue temporary relief pursuant to section 337(e) to preserve the status quo and the possibility of granting meaningful relief to the domestic industry. 22/ Alternatively, the Commission could do nothing now and then later attempt to modify its order to compel GSC to cease and desist from using the subject apparatus, but such an order would be more disruptive in that it might involve dismantling GSC's plant.

Because this investigation proceeded on an expedited basis, the one year period for concluding an investigation expires on January 28, 1982. The Commission's determination is not final under section 337(g) or section

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22/ Any goods licensed by Morgan, the patent holder, will, of course, he free to enter the country without bond.

210.56(d), of the Commission's rules, 23/ since the period for Presidential approval or disapproval has not yet expired. A reconsideration of a prior determination within the statutory period is not a new proceeding, but merely a step in the proceeding in which the prior determination was made. See Lambert Construction Co., Inc. v. State of New Hampshire, 345 A.2d 396 (N. H. S. Ct. 1975). Hence, the issuance of an order permitting entry under bond in a reopened investigation is "during the course of an investigation." 19 U.S.C. § 1337.

An administrative agency has broad inherent discretion to reconsider its determinations and reopen its proceedings. United States v. Sioux Tribe, 616 F.2d 785 (Ct. Cl. 1980); Greater Boston Television Corp. v. F.C.C., 463 F.2d 268 (D.C. Cir. 1971) cert. denied 406 U.S. 950 (1972; Confederated Tribes of the Warm Springs Reservation v. United States, 177 Ct. Cl. 184 (Ct. Cl. 1966); Alaska Steamship Co. v. Federal Maritime Commission, 356 F.2d 59 (9th Cir. 1966).

Indeed, Congress has expressly provided that the Commission may revoke an exclusion order after finding "that the conditions which led to such exclusion from entry or order no longer exist." 19 U.S.C. § 1337(h). See 19 C.F.R. § 211.59 (published at 46 F.R. 17523) (power to modify or set aside final Commission action in view of changed conditions of law or fact).

An administrative agency also has broad discretion to fashion an appropriate remedy. In Jacob Siegel Co. v. Federal Trade Commission, 327 U.S. 608 (1946), the Supreme Court reviewed a cease and desist order issued by the Federal Trade Commission pursuant to section 5 of the Federal Trade Commission Act. The Court held:

23/ 19 C.R.F. § 210.56(d), (published at 46 F.R. 17531 (Mar. 18, 1981)).

> The Commission has wide discretion in its choice of a remedy deemed adequate to cope with the unlawful practices in this area of trade and commerce. Here, as in the case of orders of other administrative agencies under comparable statutes, judicial review is limited. It extends no futher than to ascertain whether the Commission made an allowable judgment in its choice of the remedy.

Id. at 611-12 (emphasis added). The Court emphasized:

> The Commission is the expert body to determine what remedy is necessary to eliminate the unfair or deceptive trade practices which have been disclosed. It has *wide* latitude for judgment and the courts will not interfere except where the remedy selected has no reasonable relation to the unlawful practices found to exist.

Id. at 612-13. An agency's broad remedial discretion extends to the modification of orders after reconsideration or a rehearing.

The considerations which weigh in favor of modification and reconsideration of our remedy have been discussed above. The circumstances of this case have changed drastically in light of the forthcoming District Court order. Continued enforcement of an absolute exclusion order would be unfair and contrary to the Commission's policy of deferring to the district courts. It is clear that we should suspend or revoke. It is equally clear, however, that in light of the imminent importation of the GSC apparatus suspension without temporary relief would result in immediate and substantial harm to the domestic industry that section 337(e) was intended to prevent.

In the event that the District Court's decision is overturned, the bond will be forfeited and will offset any unfair competitive advantage derived by respondents. 24/ This relief, while less than that arising from absolute

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24/ See fn. 30 (Views of Vice Chairman Calhoun).

exclusion of the imported article, is identical to that Morgan would obtain if respondents chose to import the apparatus during the period of Presidential review under section 337(g).

IV. Criteria for Temporary Relief

In Certain Apparatus for the Continuous Production of Copper Rod ("Copper Rod II"), 25/ and Certain Slide Fastener Stringers and Machines and Components for Producing Such Slide Fastener Stringers, 26/ the Commission set forth the criteria for issuance of an order permitting entry under bond. The persons seeking such relief must show that there is reason to believe that a violation of section 337 has occurred. The complainant must also demonstrate that it is equitably entitled to relief by showing that the domestic industry would suffer immediate and substantial harm in the absence of temporary relief and that the adverse impact on other parties is not disproportionate. The Commission will balance the various factors and the weakness of one criteria can be offset by the strength of another. 27/

All three criteria are met by the facts of this case. On December 1, 1981, we determined that there was a violation of section 337. That determination necessarily incorporated a determination that there was reason to believe that there was a violation under the lower standard of section 337(e). 28/

25/ Inv. No. 337-TA-89, USITC Pub. No. 1132 at 4 (1981).
26/ Inv. No. 337-TA-85, USITC Pub. No. 1142 (1981).
27/ Id. at 3.
28/ Id. at 5.

The requirement of immediate and substantial harm has been satisfied. The Commission unanimously found that the importation of the GSC apparatus alone would cause present substantial injury to the domestic industry. It bears repeating that in light of our revocation of the previously imposed exclusion order, the failure to issue temporary relief would result in the irreparable destruction of the status quo and the irreparable loss of Morgan's right to section 337 relief against the GSC importation.

The issuance of a temporary order permitting entry under bond will not have a disproportionate impact on respondents. Since respondents could choose to import the GSC apparatus under bond during the 60-day period of Presidential review of our permanent exclusion order, their position has not changed. Respondents are free to import the subject apparatus, with the knowledge that if the Fourth Circuit affirms the District Court, the Commission will immediately order the release of the bond. A Presidentially approved final order of exclusion, on the other hand, is much more drastic since it denies any possibility of importation after the 60-day period. Once the expedited appeal is heard in April or May, GSC will receive its apparatus if the appellate court finds the '871 patent invalid and unenforceable. Any delay will be de minimis and is outweighed by the irreparable consequences to Morgan if it is left without a section 337 remedy in the event of reversal.

V. Public Interest

Public interest considerations do not preclude issuance of an order permitting entry under bond. The order would be directed at certain named persons, who were parties to the Commission's proceedings and had ample

opportunity to contest the award of section 337 relief. Such a limited order has only a narrow effect on trade and on competition within the U.S.

We found earlier that issuance of a permanent exclusion order would not result in the closing of GSC's plant in Georgetown, South Carolina, since the plant can continue to operate profitably with its existing Stelmor apparatus. An order permitting entry under bond presents an even easier situation, since such an order does not result in absolute exclusion of the imported article. If respondents decide to import the subject apparatus under bond, Georgetown will receive any economic benefits to be derived therefrom. If the Korf Group decides to wait, the expedited appeal should be resolved in a short time and will result in only a minor delay of GSC's modernization program. In the meantime the GSC plant can continue to function.

VI. Bonding

We adopt our earlier determination that a bond of 100 percent of the entered value of the imported article will offset any unfair competitive advantage derived by the Korf Group. 29/ 30/

29/ Articles which are the subject of a Commission order under section 337(e) are entitled to entry under a bond to be determined by the Commission. The legislative history provides that the Commission, in determining the amount of the bond, "shall determine, to the extent possible, the amount which would offset any competitive advantage resulting from the unfair method of competition or unfair act enjoyed by persons benefiting from the importation." The standard for calculating a bond under section 337(g)(1) is identical to that under section 337(e). 19 C.F.R. § 210.14(a)(3)(1980).

In our earlier determination we stated:

> The competitive advantage enjoyed by respondents results in their ability to sell a steel rod treating apparatus which infringes a valid U.S. patent. The effect is to use without authority or compensation the patented invention conceived and developed by McLean and Easter and assigned to Morgan. The Korf respondents enjoy a competitive advantage because the Korf Group is willing to advance large sums of money and to incur large losses in order to

(Footnotes continued)

VII. Suspension

The Commission has the authority to suspend its investigation pending an exhaustion of Morgan's appeal rights, while leaving its remedial order in effect. The Commission's authority to suspend its investigations, its authority to issue temporary relief, and its authority to revoke or suspend its remedial orders are contained in three separate and independent subsections of the statute. Thus, subsection (b)(1) provides for suspension

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(Footnotes continued)
secure the importation of this article. The new GSC apparatus once functioning could be used as a "show case" for future sales and could operate as a loss leader helping respondents establish a foothold in the U.S. market. We conclude therefore that a bond of 100 percent of the value of the accused apparatus is appropriate. E.g., Certain Apparatus for the Continuous Production of Copper Rod and Components Thereof. Inv. No. 337-TA-89, USITC Pub. No. 1132 (1981); Certain Headboxes and Pepermaking Machine Forming Sections for the Continuous Production of Paper and Components Thereof, Inv. No. 337-TA-82a, USITC Pub. No. 1197, p. 15 (1981). Such a bond will ensure that any competitive advantage enjoyed by respondents will be offset by a reasonable increase in the cost of the accused apparatus.

30/ Vice Chairman Calhoun is of the view that the considerations discussed in the above paragraph together with other evidence supplied by complainant establish that a more appropriate bond is 300 percent of the entered value of the subject article. There is ample evidence in the record of respondents' indifference to the cost of securing the importation of the infringing apparatus. The Ashlow bid for the GSC order appears to have been unrealistically low. Since that time Ashlow has incurred significant additional expenses, raising the possibility of a large loss on the order. KIH and Bridon have willingly subsidized the large losses incurred by their subsidiary through a generous line of credit. Transcript of Commission Hearing at 252, 271, 294-95, 298; Complainant's Written Submission on the Issues of Public Interest, Remedy and Bonding, Tabs J, X, W; CX-25 Tab P. In view of there being only three and a half years remaining in the life of the patent, these factors suggest a strong interest by respondents in completing the GSC sale for purposes of advance showcasing their apparatus with a view to future sales. Accordingly, Vice Chairman Calhoun concludes that a 300 percent bond is necessary in order effectively to deter future unlawful importations. Certain Headboxes and Continuous Papermaking Machine Forming Sections for the Continuous Production of Paper and Components Thereof, Inv. No. 337-TA-82, Opinion of Chairman Bill Alberger, Vice-Chairman Michael J. Calhoun, and Commissioner Catherine Bedell, USITC Pub. No. 1138, p. 45 (1981).

of an investigation while proceedings involving the subject matter of the investigation are before a court or agency of the United States. 19 U.S.C. 1337(b)(1). The power to issue temporary relief is contained in section 337(e). This power exists for the entire duration of an investigation, once the Commission has found a reason to believe there is a violation. The power to revoke or suspend an order is contained in subsection (h), which provides;

> [A]ny exclusion from entry or order under this section shall continue in effect until the Commission finds, and in the case of exclusion from entry notifies the Secretary of the Treasury, that the conditions which led to such exclusion from entry or order no longer exist.

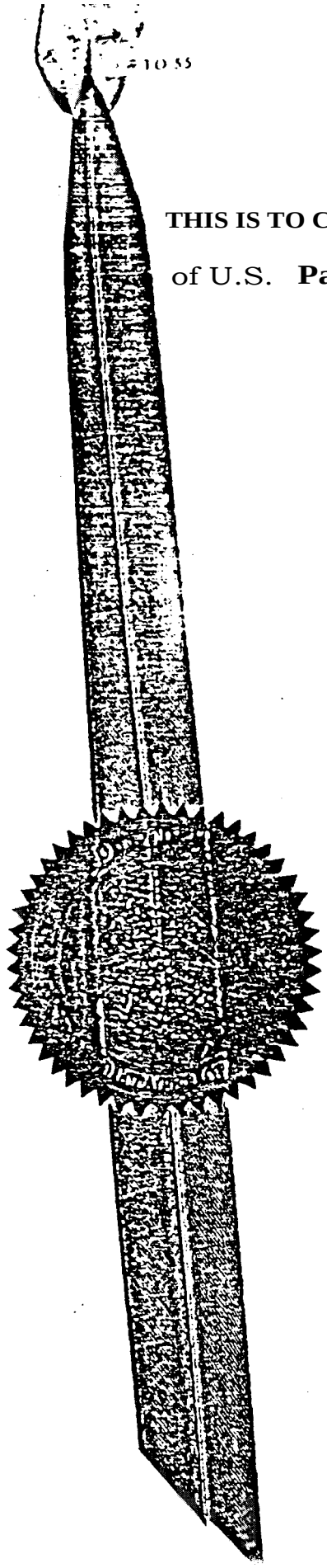
Thus an order can be revoked or modified only after a finding of changed conditions, and must remain in effect during a period of suspension unless such changed conditions have been found. The fact that an investigation has been suspended for concurrent proceedings in the courts pursuant to section 337(b)(1) does not mean that the reasons for providing temporary relief have ended, since in many cases total removal of relief would result in irreparable harm to the domestic industry.

In summary, then, the District Court's order has changed the conditions that led to the Commission's final exclusion order. We believe that as a matter of discretion, we should revoke the permanent exclusion order. If we do so, our investigation is perforce reopened, as we are still in the 12 month period for the investigation and will not have issued a determination. With our investigation open, we must consider courses of action that will be consistent with both the District Court judgment and our governing statute. Under the circumstances, the most equitable course of action is issuance of an order under section 337(e). The prerequisites for this order exist. The

record in our investigation supports our finding that there is reason to believe that section 337 has been violated. Complainant has shown immediate and substantial harm, as a subsequent exclusion order would be ineffective against the Georgetown importation. Since respondents are not being denied an opportunity to import the subject apparatus, but are instead required only to post a bond that is fully refundable, we conclude there is no disproportionate harm. Once an order under 337(e) issues, the appropriate course is to suspend our investigation pending the outcome of appeal from the District Court's judgment.

Conclusion

We determine that the exclusion order of December 10, 1981 should be revoked. We further determine that the investigation as to the issues of remedy, bonding and the public interest should be reopened in view of the changed circumstances arising from the District Court's decision. We determine that the changed circumstances presented compel the issuance of an order permitting entry under bond pursuant to section 337(e). We determine that the appropriate bond is 100 percent of the entered value of the imported article. Finally, we determine that this investigation should thereupon be suspended until the Court of Appeals for the Fourth Circuit issues a final judgment in the expedited appeal from the final order of the District Court to be issued on or about February 1, 1981 or otherwise reopened by the Commission.



.U. DEPARTMENT OF COMMERCE.
United Sates Patent and Trademark Office

October 10, 1980
Meta

THIS IS TO CERTIFY that the annexed is a true copy **from the records of this office**

of U.S. **Patent Number 3,390,871.**

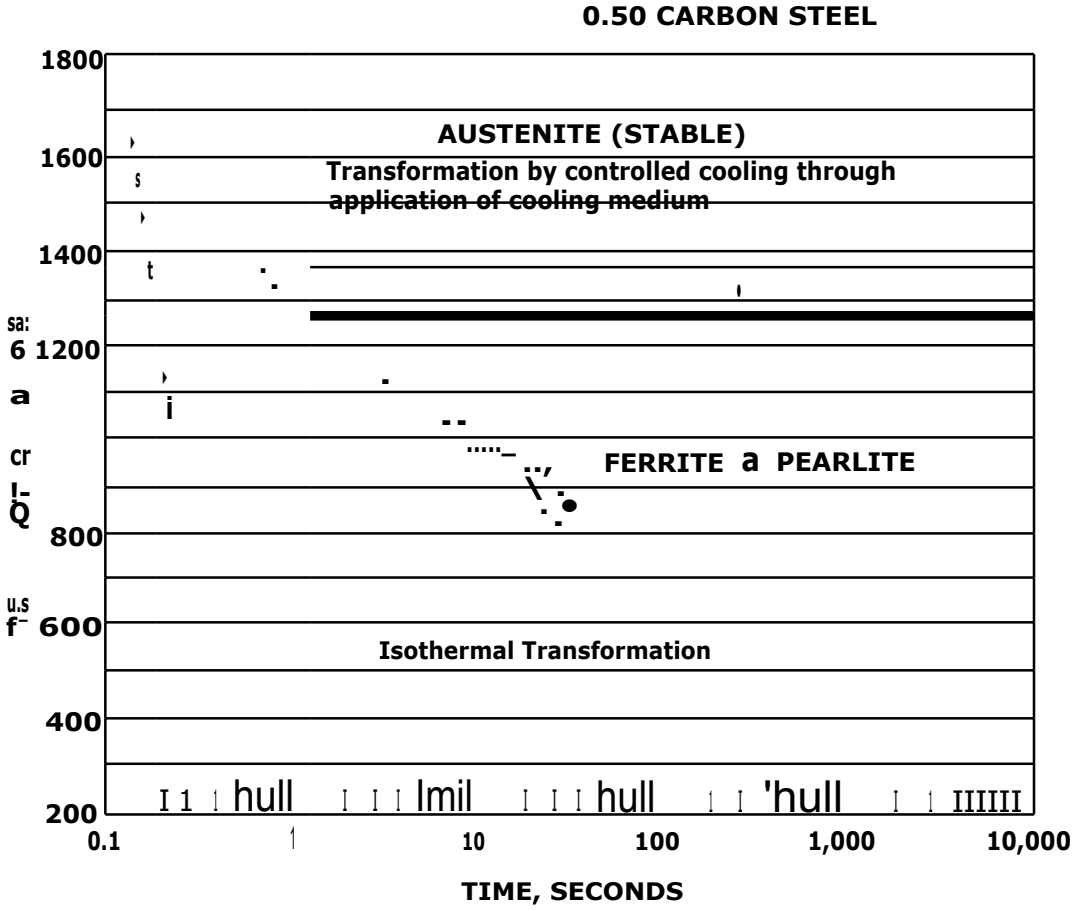
13y authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

G. V. Mosley
Certifying Officer.

APPARATUS FOR THE CONTROLLED COOLING OF RODS

Filed June 29, 1964 3 Sheets-Sheet 1

FIG.I



IN VENTORS
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ATTORNEYS

• United States Patent Office 3,390,871
Patented July 2, 1968

3,390,871

APPARATUS FOR THE CONTROLLED COOLING OF RODS

David 14. McLean, Hamilton, Ontario, and Charles G. Easter, Burlington, Ontario, Canada, assignors by 3 mein(assignments, to Morgan Construction Company, *Worcester,* Mass.

Continuation of application Ser. No. 219,220, Aug. 24, 1962. This application June 29, 1964, Ser. No. 378,812
7 Claims. (Cl. 266-3)

This invention, which is a continuation of U.S. Ser. No. 219.220, filed Aug. 24, 1962. now abandoned, relates to a means for imparting selected micro-structure and mechanical properties to hot rolled metal rods by controlled cooling in direct sequence with a hot rolling mill generally called a rod mill, and more particularly to an apparatus for imparting to rods of various grades of steel different micro-structures and mechanical properties, &pending upon the grade of steel, subsequent processing and intended use, by controlled cooling in direct sequence with a rod mill.

In the normal production of steel rods, the rods leave the finishing stand of the rod mill at a temperature of approximately 1800' F. The delivery pipes which carry rods to the laying reels are equipped with water nozzles, and the rods are normally cooled to about 1450' F. as they enter the reels. Here the rods are formed into coils, *each* coil normally representing the product of a complete billet weighing from 400 to about 1200 pounds. Little cooling occurs during coiling in conventional laying reels because the collected mass of the coil within the enclosed chamber of the *reel* retards heat loss during the time of approximately one minute required for coiling. After completion of coiling, coils are discharged from the reels to a conveyor on which they travel slowly, cooling slowly in still air. When each coil has cooled sufficiently (to about 1000 to 1200* F.) to permit suspension from a hook without being deformed out of circular shape, it is normally transferred to a hook carrier. This transports the coils in succession toward points of inspection, trimming, tying and shipping, to storage, or to a wire mill. It also provides sufficient time for additional slow cooling to a suitable temperature for inspection, tying and handling. This normal practice leads to a number of detrimental and costly results. The prolonged exposure to air at high temperature produces a layer of scale (iron oxide) on all exposed surfaces, resulting in a direct metal loss amounting to about 1.5%. The slow cooling promotes grain growth, and in grades of steel containing more than .20% carbon leads to metallurgical and mechanical properties which preclude subsequent processing, such as wire drawing, unless further treated. In medium and high carbon grades, steel rod coils produced in this conventional manner must be subjected before drawing into wire to a separate heat treating process generally known as patenting.

Numerous efforts have been made to overcome these objections to the conventional practice. One such effort is disclosed in United States Patent No. 2,756.169 (Corson, Goetz and Lewis) and further amplified in United States Patent No. 2.994,328 (Lewis). This involves providing alternate cooling and heat diffusion zones in the pipes leading from the mill to the laying reels. This process was designed specifically for use with high carbon steel rods and was intended to produce micro-structure and mechanical properties equivalent to those expected from subsequent patenting. This has failed to achieve its objective fully because_ of practical _difficulties associated — particularly with rod delivery speeds. This process was applied to an early rod mill having a maximum delivery speed of about 4000 feet per minute and even at this relatively low speed required location of the reel 110 feet from the finishing stand of the mill. At modern delivery speeds of 6000 to 7000 feet per minute, the distance required precludes practical use of this process because rods cannot *be* pushed consistently through pipes of such length without buckling. Another effort in this direction is disclosed in United States Patent No. 2,516,248 (O'Brien). This involves placing a hood on the top of the rod coil its after discharge from the laying *reel* and blowing air from the inside of the coil through the rings comprising the coil. Still another effort is shown in United States Patent No. 2,673.820 (Morgan) where air is blown through the rings comprising the coil while the coil is being formed in the laying reel. This and the method disclosed by O'Brien provided significant improvement over the conventional practice, particularly with regard to the reduction of scale loss. These methods, however, cooled the rod rings at quite different rates, depending upon the location of each rod ring within the coil. In the O'Brien method, the inner and outer rings are cooled quite rapidly, in fact, too rapidly to produce suitable properties for drawing into wire, while rings within the interior of the coil arc cooled too slowly. In the Morgan method, the rings comprising the first and final portions of the coil receive relatively little cooling, resulting in variations of properties along the length of the rod. Furthermore, both the O'Brien and Morgan methods, originally applied to rod coils weighing less than 1000 pounds, produce intolerable variations of properties when applied to rod coils weighing 1200 to 1400 pounds.

The objects of this invention will shortly be stated in more detail in the following description, aided by the accompanying drawings in which:

FIG. I is a transformation diagram for .50% carbon steel;

FIG. 2 is a side elevation showing an-apparatus—embodying the concepts of the invention;

FIG. 3 is a plan view of FIG. 2 taken on the line 3-3 of FIG. 2;

FIG. 4 is an enlarged section on the line 4—4 of FIG. 2;

FIG. 5 is an enlarged section on the line 5-5 of FIG. 2;

FIG. 6 is a still further enlarged section on the line 6-6 of FIG. 5;

FIG. 7 shows a modified form of transverse air passage which may be used without a hood over the conveyor; and

FIG. 8 shows still another modified air passage.

The micro-structure and metallurgical and mechanical progenies which are desired in rods depend upon the composition of the rod material, the subsequent processing. and the intended use. In the case of steel rods, the desired micro-structure and properties depend principally upon the carbon content of the steel. For steel containing less than about .20% carbon the desired micro-structure is predominantly fine-grained ferrite. The latter is a common metallurgical term applied to grains of steel containing little or no carbon. In steels containing about .25

to .70% carbon, the micro-structure ordinarily drsircd for wire drawing is fine-grained pearlite interspersed with fine-grained ferrite, the proportions of the two constituents depending upon the carbon content within this range. pearlite is a metallurgical term applied to grains of steel which contain appreciable amounts of carbon but less than .89%. It is composed of alternate layers of ferrite (Fe) and cementite (iron carbide Fe,C), having been formed by sufficiently slow cooling to avoid the harder, brittle constituents hainite and martensite. For some pia-, posef, however, steels in this carbon range may be desired to have a micro-structure composed of coarse-grained pearlite interspersed with coarsc-grained ferrite. The micro-structure desired in steels containing more than .70% carbon can be defined in terms of similar constituents. 'The desired micro-structure can be affected by alloying elements, such as nickel, chromium and silicon, if these are present in significant amounts, and in such cases also the requirements can be defined in terms of the constituents found in the micro-structure. The character of the micro-structure produced depends in part upon the composition of the rods, and in part upon the manner in which the rods are cooled. The effect of the manner of cooling can be best understood by reference to FIG. 1 which is a temperature-time-transformation diagram (hereinafter referred to as a "TTT diagram") in conjunctioa with the following description'

This illustration relates specifically to steel containing .50% carbon and containing no significant alloy additions. It will be -understood that similar diagrams for other grades Of plain carbon or alloy steels would have different characteristics. This type of chart is known as an isothermal transformation diagram, having temperature as ordinate and time as abscissa. The term "transformation" as used here relates to the allotropic transformation which accompanies the cooling of steel. At rolling temperature, the iron of which steel is principally composed is in the form of gamma iron which has the property of containing up to 2% carbon in solid solution. This solid solution is known as austenite. Upon cooling through a critical temperature, the austenite undergoes a transformation, becoming ferrite, which has much less capacity for holding carbon in solid solution. The carbon rejected from solid solution during transformation, as well as the carbon retained in solid solution, may take one or more of many different forms, depending upon the temperature at which transformation begins and the rate of cooling during transformation. The crescent-shaped curve at the left of FIG. 1 represents for each temperature the time required to initiate the transformation. The second or inner crescent-shaped curve represents for each temperature the time at which the transformation would be completed if the temperature remained constant during transformation. Because the transformation is an exothermic reaction, because there is at most times some temperature gradient within the cross-section of the rods, and because in most cases the transformation does not occur at constant temperature, this diagram is not numerically exact; but it will serve, nevertheless, to illustrate the requirements. To produce the desired micro-structure for drawing into wire: it is essential that transformation be completed fully approximately at or near the "knee" of the inner curve. This can be accomplished in various ways. One way is by isothermal transformation, corresponding to conventional, lead patenting of steel rod, in which the rod is cooled rapidly by submerging it in a liquid bath held at constant preselected temperature (in this case approximately 1000' F.) and holding it in this liquid bath at constant temperature until transformation is completed. Another way is to cool the rod rapidly to a temperature of 1200 to 1500' F. and then to impose a cooling rate such that transformation will begin at a temperature sufficiently above the knee of the inner curve to have been completed before the temperature has dropped to that at the knee of the

These two ntternatives are shown diagram-

natives arc available within the scope of this invention.

One object of this invention, therefore, is to produce, in hot rolled steel rods delivered from a rod mill, micro-structure and mechanical properties which enable the rods to be drawn into wire without intervening heat treatment.

Another object is to produce, in hot rolled rods delivered from a rod mill in most grades of steel commonly rolled in continuous rod mills, a micro-structure and mechanical properties preselected for the particular grade of steel and for the subsequent processing and end use which will enable the rods to enter subsequent processing without intervening heat treatment.

A further object is to produce, in hot rolled metal rods, micro-structure and mechanical properties which arc uniform from end to end of the rods as well as throughout the cross-section.

Still another object is to produce, in steel rods delivered from a rod mill at delivery speeds of 6000 feet per minute or higher, micro-structure and mechanical properties uniform throughout thc length of the rods which will enable the rods to be drawn into wire without intervening heat treatment regardless of the weight and size of coils formed from the rods.

An additional object of the invention is to subject rods delivered from a rod mill to rapid but adjustably controlled cooling so that a minimum amount of scale will be formed on the surface of the rods and so that the metallurgical and mechanical properties of the rods can be controlled to suit the composition of the rod material, the subsequent processing, and the intended end use.

The novel mechanism which is used to carry out the above-stated objectives will now be described. Referring first to FIGS. 2 and 3, the last stand of a rolling mill is indicated at 2. The rod 4 passes through pipe 6, in which it may be water-cooled in a manner now known to the industry, to a temperature in the range from 1200 to 1500' F. The rod is then turned downwardly by a chain guide 8 to be fed into a laying head 10. The laying head may be of conventional construction of the same type as that customarily used in laying rod in a laying reel. The rod 4 is deposited on a conveyor, preferably a continuously moving conveyor, 12, which preferably slopes upwardly at a small angle so that the discharge end of the conveyor at 14 is high enough above the floor jas level to facilitate subsequent collection of the rod rings at the collecting position 16.

Since the conveyor moves the rod in the direction of the arrow 18, the rod as deposited thereon will be in the form of a succession of non-concentric, substantially circular convolutions 20, which are clearly shown in FIG. 3. These non-concentric convolutions are continuously deposited on the conveyor to the extent of the metal present in the original billet fed into the rolling mill. Thus the collected coil 22 will have a weight substantially the same as that of the billet. While a simplified method of collecting the rod in coil 22 has been shown, it will be understood that other means or reassembling the non-concentric rings as they leave the conveyor may be used without in any way affecting the invention herein disclosed and claimed.

The preferred form of the conveyor 12 is shown in more detail in FIGS. 4, 5 and 6. It will be seen to consist of a plurality of parallel longitudinally extending tracks 24 whose upper surfaces reside in a common plane. The tracks are supported by a longitudinally 'extending upper floor 25. Between these tracks are conveyor chains 26 to which are attached upwardly extending fingers 28 of sufficient length to engage the non-concentric rod rings in a manner effective to move them steadily and without distortion along the tracks 24. The chains travel over driven sprockets 30, the speed of which may be controlled to change the rate of travel of the rings along the conveyor:

In the, preferred construction, the conveyor has longi

length of the conveyor. The top of each of the walls 32 is preferably at about the same *level* as the rod rings. A longitudinally extending roof or cover 34 is located above most of the conveyor, being supported by a plurainy of spaced posts 36 that extend upwardly from the watts 32. The roof 34 terminates on both sides in a short downturned wall 38 which is, however, sufficiently above the walls 32 to provide an adequate space 39 for the discharge of cooling air, or other medium, which, in a manner to be explained, is forced through the traveling rod rings..

The preferred mechanism .for forcing cooling air through the moving non-concentric.rod rings will now be described. The side walls 32 extend downwardly a substantial distance betow the upper surface of the con- *veyor* as indicated at 40, and these walls are connected by a bottom imperforate floor 42. A plurality of vertical walls 44; 46, 48 and 50 divide the space within upper and lower floors 25 and 42 and the walls 40 into a ph,- rality of plenum chambers which .are designated A, B and C. Each of these chambers has an opening in its side as shown at 52 in FIG. 4, to which opening is conmeted a pipe 54 leading from the discharge side of a powerful fan 56. As shown in FIG. 2, there are three fans 56 and each is driven by a suitable motor 58. It will be understood that the number and size of plenum chambers and the size and capacity of the fans may be varied at will to produce the desired volume of air that is.to be passed over the moving rod ring 4 as they travel continuoosly along the conveyor. It will also be understood that cooling media other than air may be used, and that the cooling medium may be delivered from one or more of the plenum chambers at selected temperatures above or below atmospheric temperature to accomplisb the objects of the invention. In addition, it will be understood that a liquid cooling medinum may be used, in which case the coolant will be delivered through pipes and nozzles rather than through a plenum chamber, and the portion not vaporized will be collected and drained through sumps and pipes.

In order that the air may be directed over and past the rod rings to provide the uniform cooling effect that is required in the practice of this invention, the following mechanisms are utilized:

The floor 25 has a substantial number of transverse openings extending thereacross. These openings are of uniform cross-section, and one such opening is shown in FIG. 6 and indicated at 60. At this opening, the adja. cent edges 62 and 64 of the floor 25 have been turned upwardly to direct the air escaping from the plenum chamber through the rod rings. These edges also engage a valve member 66. Valve member 66 is large enough to cover opening 60 and is carried by a shaft 68 which extends laterally beyond the wall 40 as shown in FIG. 5. Shaft 68 has fixed on its end an arm 70 which carries a counterweight 72, It will be seen in FIG. 6 that when the arm 70 has been swung to the left counterweight 72 will hold the valve 66 in closed position, blocking any air flow through opening 60. When the counterweight has been swung to the right, the valve 66 will assume the open dotted line position so that air forced into the plenum chamber B by fan 56 may flow freely upwardly through opening 60 to pass over all parts of the moving rod rings 4 as they move steadily over opening 60,

It is appreciat$_{e}$d that the rod is resting on the upper edges of the tracks 24, but these tracks are relatively narrow in transverse dimension so that there is no perceptible diminution of the cooling effect of the upwardly flowing air because of the tracks 24.

By examination of FIG. 5, it will be appreciated that when the rod is laid on the moving.conveyor in the form of non-concentric rings, as shown in FIG. 3, there will be a minimum of concentration of metal at the center of the conveyor with increasing concentrations as the sides of the conveyor are approached. That is to say, over any selected cross-section through the rings there will be an increasing number of crossings as the sides of the rings are approached. Furthermore, the position of that part of each deposited ring at the center of the conveyor extends generally transversely, whereat those parts of each ring at the sides of the conveyor extend generally in the direction of the conveyor. The result of this is that where a transverse slot or an opening of uniform width is utilized through which cooling air is blown upwardly in substantially uniform quantities per unit of time over the entire area of the opening a greater cooling effect will be present at the center portions of the openings than at the edges because there is a smaller mass of metal present over a given cross-sectional area of the opening at the center than at the sides. Since the cooling air is moving upwardly *at* a uniform rate over the entire area of the transverse opening, it follows that the cooling rate of the rod would, under normal circumstances, be faster at the center than at the rides. Since it is essential in the present method that the rate of cooling of all parts of each ring be substantially uniform, means has been provided for applying in effect more cooling air to the side portions of the ring than at the center. What we have done is to take the air which has come upwardly through the center portions of the transverse openings and which has not been heated to the same extent as the air coming upwardly at the sides of the rings and redirect it laterally so that as it flows toward and out the side openings 39 it will flow over and around all portions of the .rod rings on both sides of the center and particularly over the heavy concentrations of metal that are present toward the sides.

Putting it still another way, the hood over the conveyor and transverse openings causes a turbulent re-direc- lion of the air that has come up through the center of the openings where there is a lesser mass of metal to he cooled. This re-directed central air, which is of somewhat lower temperature than the air that has passed up and over the heavy concentration of metal at the sides of the rings, is mingled with hotter sidc air and passes again over the sides of the rings so that heat is extracted from all parts of all of the rings at substantially the same rate. In this way uniform cooling is achieved.

. On referring to FIG. 3. it will be noted that there are shown twenty transverse air- passages 60, and each of these passages is controlled by a valve 66. In the roof of each of the plenum chambers A, B and C have been shown six passages, while two passages, normally closed, precede the transverse wall 44. Through the use of these valve passages, the quantity of air passed *over* the moving rod rings may be controlled in a manner to give the proper rate of cooling for the particular rod then being processed so that the requirements of that *rod's* transformation curve can be met to produce a rod with the correct metallurgical properties.

It is not essential that the successive curtains of cooling medium be directed vertically. The walls of the passages 60 could be sloped forwardly to rearwardly to cause the air or other medium to flow upwardly at an angle to the vertical without adversely affecting the cooling requirements.

Furthermore, it is to be understood that the invention is not to be limited to means for directing the cooling medium upwardly through the rings. Inverted supply channels could be provided which would direct the cooling medium downwardly through the rings to *give* the same cooling effect.

It will be noted in FIG. 2 that the roof 34 over the conveyor commences at 74 and terminates at 76. Thus there is an uncovered space on the conveyor between laying head 10 and the start of the roof at 74. In this open area of the conveyor, appreciable cooling of the rod is achieved through radiation. This open area thus provides a zone in which rods can be cooled for a brief period of time at a relatively slow rate without requiring application of a special cooling medium. This period of relatively

low cooling prior to allotropic transformation psrmits grain growth to a selected degree, which is dcsilahle for some materials and uses. It is to he understood that the length of the hood 34 and the preceding open area may be varied to meet particular cond,tions called for by the metallurgical properties of the rod being treated. Likewise, the number and dimensions of ports 60 may be increased or decreased and the volume of coolant passed through the ports that are open may be changed by the operator as needed to meet the requirements of the transformation curve. The basic consideration is that all parts of each of the non-concentric rings be uniformly cooled in a proper time so that the resulting collected rings forming coil 22 will have the required uniform metallurgical properties. It is the rapidity, control and uniformity of cooling which has not heretofore been capable of achievement by other known mechanism that is the outstanding accomplishment of the present invention.

By the time the rings have reached the end of the hood 34, the temperature of the rod will have fallen at a rate sufficient to have passed through the inner curve of the transformation diagram at a point above the inner knee, thus put;ing the rod in such condition that subsequent cooling at reasonably rapid rates will have no further effect on the metallurgical properties nor will there be any significant scale development thereafter. in fact, by this cooling process there is negligible scale formation after the rod leaves the laying head 10 because the overall cooling is achieved so rapidly.

Other alternative means for achieving the uniform cooling of rod as it is moved along the conveyor from the laying head to the collecting position are shown in FIGS. 7 and 8. In these two structures, the overhead hood may be dispensed with insofar as the cooling requirements are concerned.

In the construction shown in FIG. 7, the rectangular transverse opening shown in FIG. 3 has been changed to a configuration in which the transverse opening is narrow in the center and expands gradually to a maximum dimension at the sides. The curvature of the sides of this opening will be proportioned to the mass of metal present at any given longitudinal section along the overlapping non-concentric rings. In this way, the lesser mass of metal at the center, which will be subjected to the succession of cooling zones for a minimum total time, will be cooled at the same rate as the greater mass of metal at the outer edges, which will be subjected to the succession of cooling zones for a maximum and proportionately longer time. The intermediate portions of the transverse openings will be correspondingly shaped to apply the coolant for such total time as required to achieve the same uniform rate of cooling of the intermediate portions of the rings.

The number of rings of the rod per unit of length of the conveyor may be varied at will without affecting the uniformity of cooling, although for a constant flow of coolant and constant rod size the rate of cooling will decrease as the number of rings is increased. When the concentration of the rings is greater, the volume of coolant forced through the transverse openings may be increased to achieve cooling at the same rate. Conversely, when the concentration of rings is decreased, the volume of coolant per unit lime may be suitably decreased, thereby to achieve the same cooling rate.

When air or other gas is used as a coolant, in order to insure that the velocity of the coolant passing through the transverse opening shown in FIG. 7 is uniform over all portions, the passage may be partitioned in the manner indicated by the thin curved vertical walls 80. With a substantially uniform pressure in each of the plenum chambers A. B and C passages of uniform size will give substantially uniform velocities flowing upwardly past the rings as they move thereover.

Another modification of air passage construction which kill result in uniform cooling of the non-concentric rings without the use of a hawK1 is shown in FIG. 8. Here there arc a succession of full-width passages 82, which arc similar to those shown in FIG. 3. In between these full-width passages arc a series of shorter nassarcs 84, and between each pair of passages 84 is a still shorter passage 85. The cumulative effect of this arrangement is to produce the needed greater flow of air over the sides of the overlapping rings and a lesser flow as the center is approached. 'I he number and size of the passages may be readily adjusted to be in agreement with the varying mass of metal of the rings, which is at a minimum at the center and increases at first slowly as the sides are approached and finally rapidly just before the side areas of the rings are reached.

The collecting mechanism 16 is of a simplified form. The rod rings 4 as they leave the end of the conveyor fall over the conical head 88 to be collected in a coil 22. As soon as the last ring of the coil is deposited, the turntable 90 is rotated, bringing a new head 92 to the collecting position to receive the next oncoming succession of rod rings. As this next coil is being assembled, the coil 22 is removed from the core 88.

It is our intention to cover all changes and modifications of the examples of the invention herein chosen for purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. Apparatus for producing steel rod comprising in combination: a mechanism for rolling steel to rod diameter at an elevated temperature above transformation temperature; a delivery means for receiving said rod .continuously and directly from said mechanism; spaced supports positioned to *receive* said rod from said defivery means; rod laying means for directing said rod from said delivery means and for continuously depositing said rod on said spaced supports in the form of discretely offset rings while said rod is still at a temperature above transformation, said rod laying means and said supports constructed and arranged to provide an offset of said rings and a dimension of contact between said rod and said supports which allows substantially complete exposure of the surface of said rod to a flowing current of a gaseous cooling medium; means associated with said delivery means for cooling said rod rapidly from rolling temperature above transformation down to a temperature near to but above transformation directly after said rod issues from said rolling mechanism and while the austenitic grains thereof are still small due to the mechanical action of said rolling mechanism, whereby austenitic grain growth following rolling is inhibited; and, means for imparting a substantially uniform fine grained pearlitic structure suitable for extensive cold working to said rod including means associated with said spaced supports for directing a flowing current of said gaseous cooling medium around said spaced supports through said rings and to substar.tially all exposed surfaces of said rod to cool said rod through transformation substantially uniformly throughout the length of said rod.

2. The apparatus as set forth in claim I wherein the cooling means associated with said delivery means includes means for applying a liquid coolant to the surface of rod passing through said delivery means.

3. The apparatus as set forth in claim I wherein said gaseous cooling medium is forcibly applied.

4. The apparatus as set forth in claim 3 wherein the flow of said gaseous cooling medium is distributed in proportion to the distributed mass of metal to be cooled.

5. The apparatus as set forth in claim 4 further characterized by means for re-directing the gaseous cooling medium that has passed over the center portion of said offset rings laterally to contact the side portions of said rings where the concentration of metal is the greatest.

6. The apparatus as claimed in claim 3 means for pro-

durin$_g$ a slicves.ion of cooling zones through which said Wiwi ling% are carried along said spaced suppons. ilic applicrtion of gaseous coolant to the rings in each said cooling zones being independently variable.

7. 'I he apparatus as claimed in claim I wherein said spaced supports are so small in the dimension of contact with said rod rings as to have negligible influence on the cooling ride of said rod by conduction of heat into said supports, and negligible interference with the uniform application of said gaseous coolant to the surfaces cif said rod

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I. D. HOBART. E. MAR. *Assistant Examiners.*

APPARATUS FOR SHE CONTROLLED COOLING OF HODS

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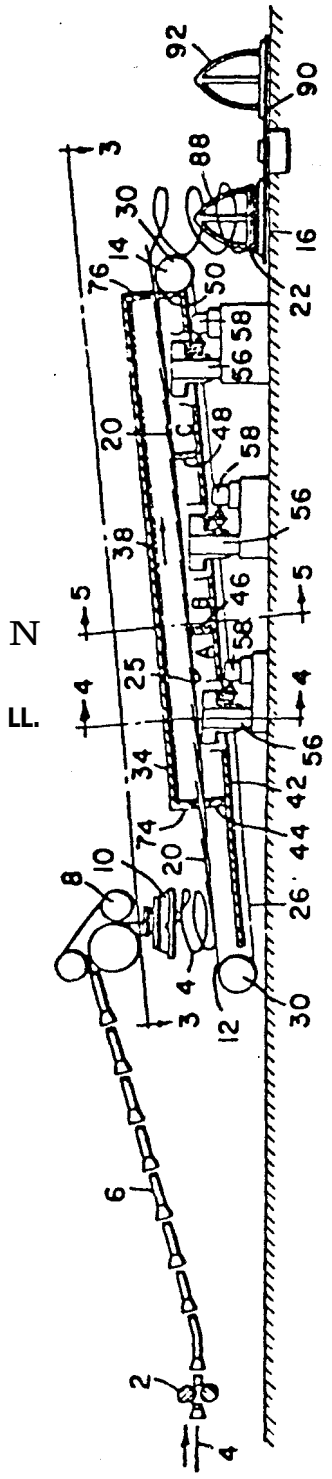

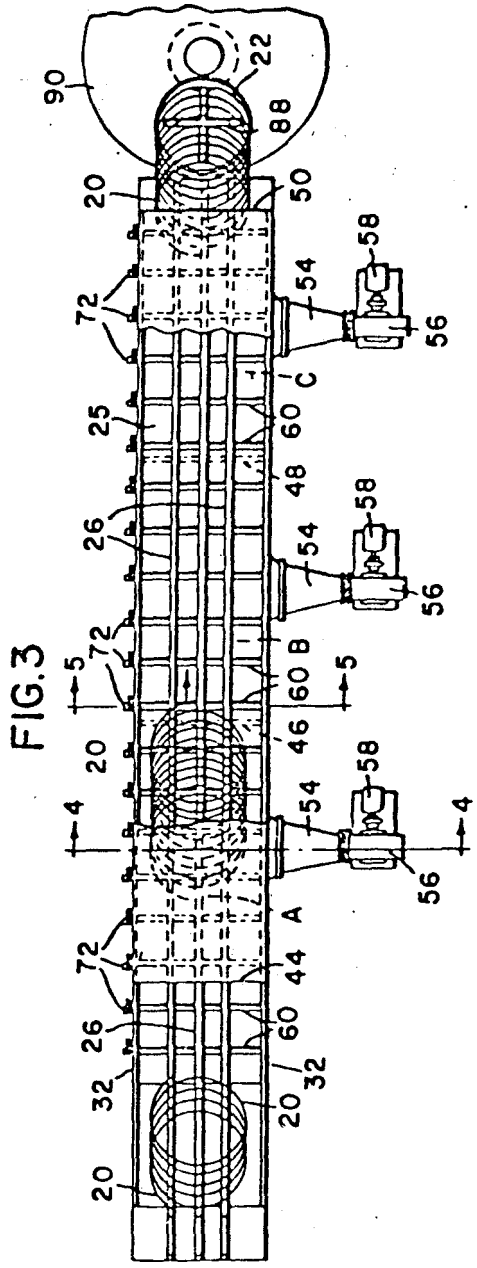

FIG.3

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APPARATUS FOR THE CONTROLLED COOLING OF RODS

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FIG. 4

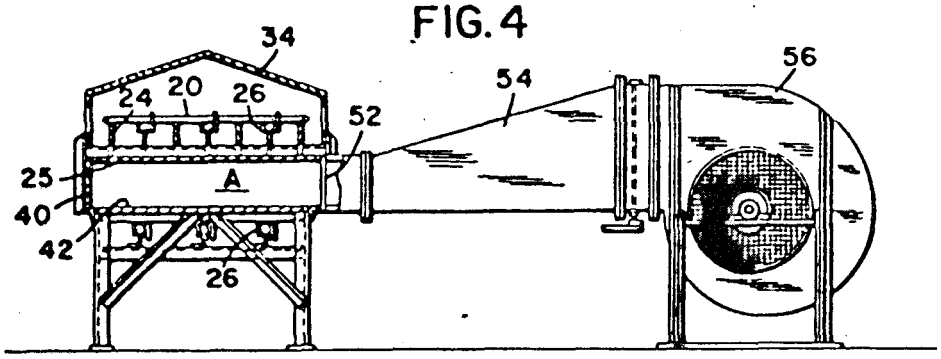


FIG. 5

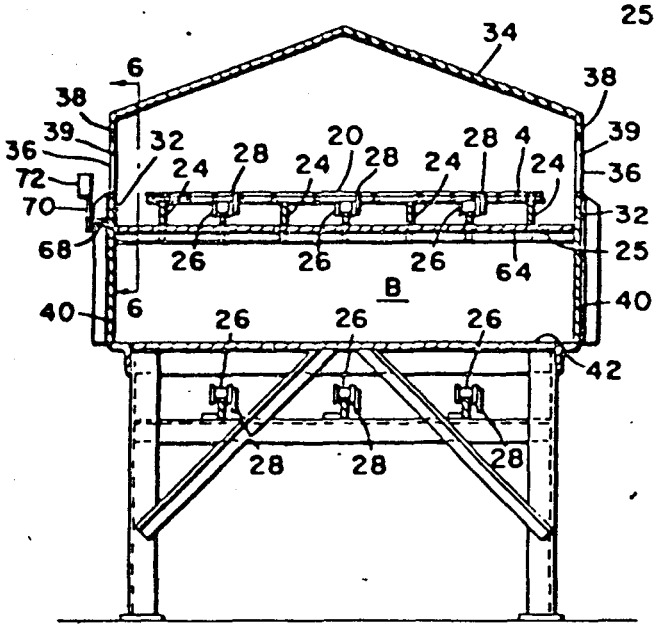


FIG. 6

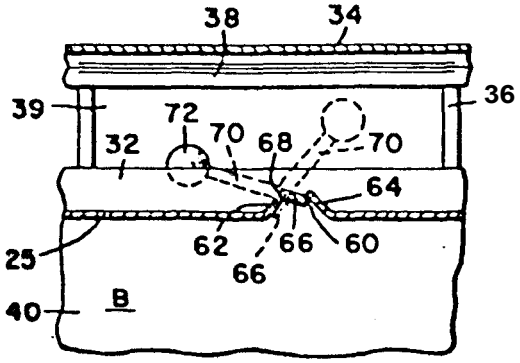


FIG. 7

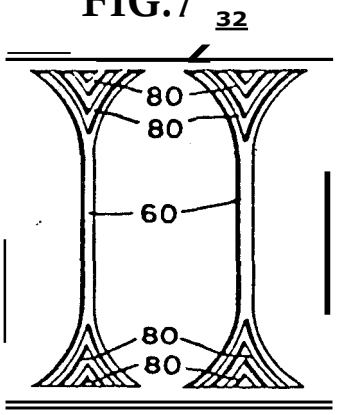
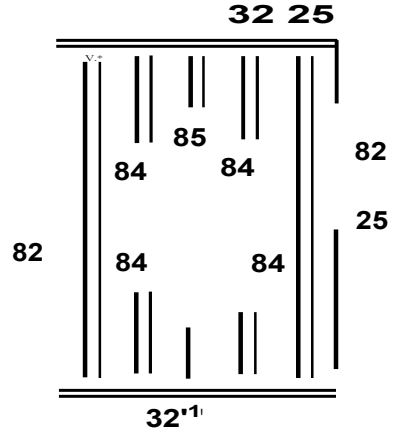


FIG. 8



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