July 7, 1964 R. F. TURNBULL 3,139,716

INTERLOCKING CRIMPING MACHINES

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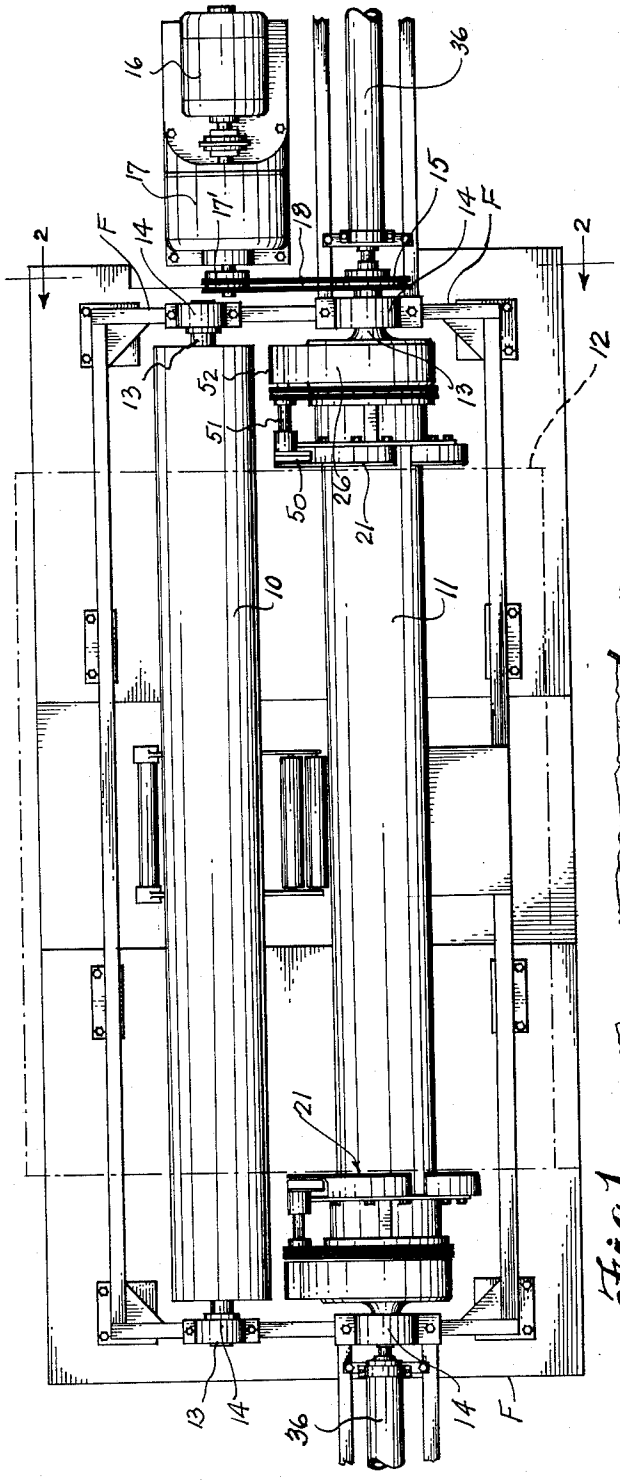


Fig. 1

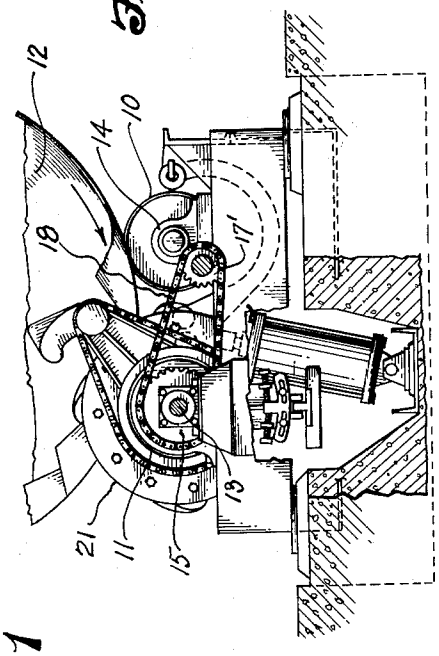


Fig. 2

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Fig. 4

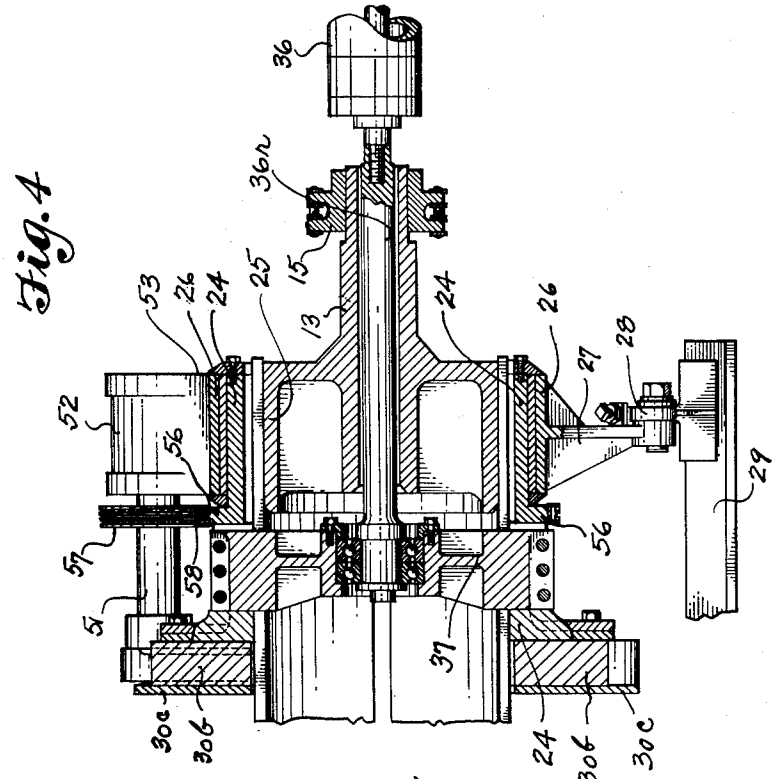
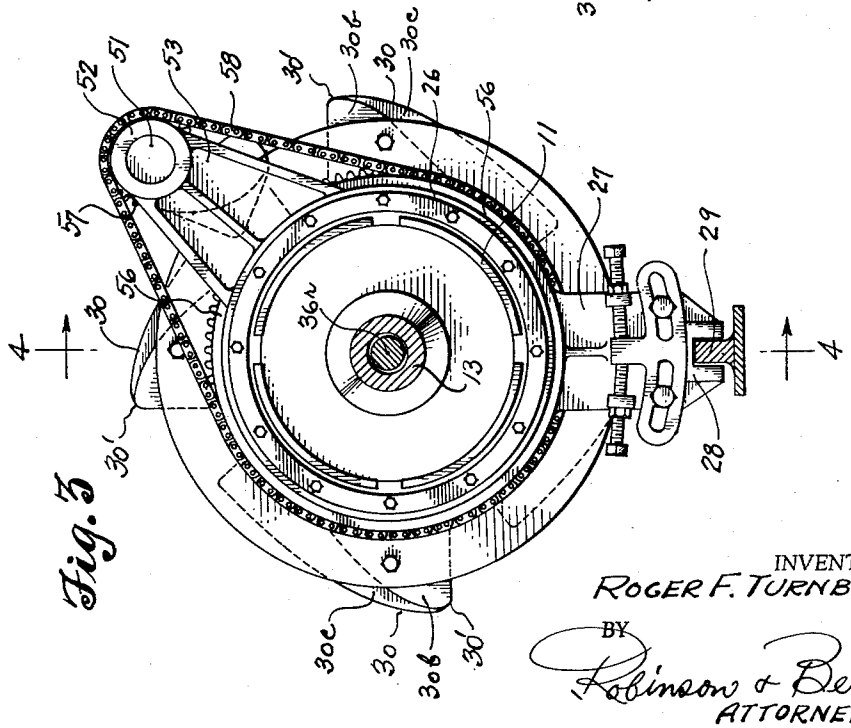


Fig. 5



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Fig. 5

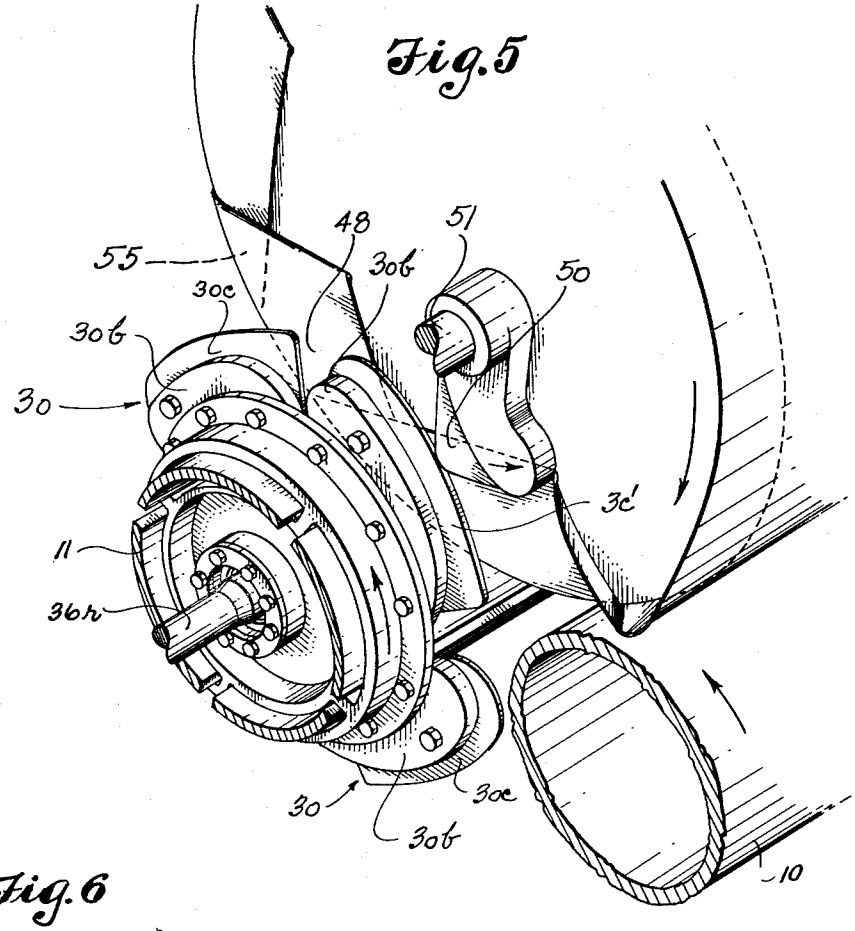


Fig. 6

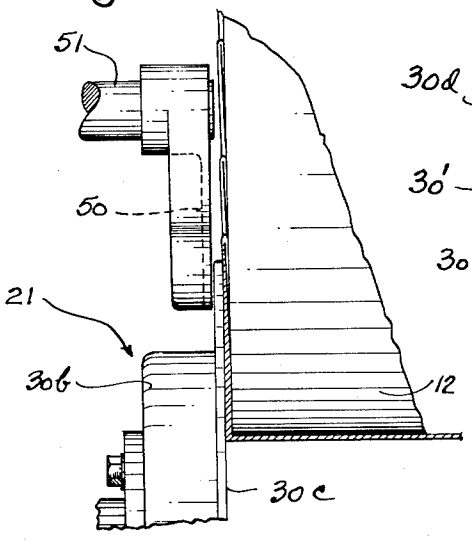
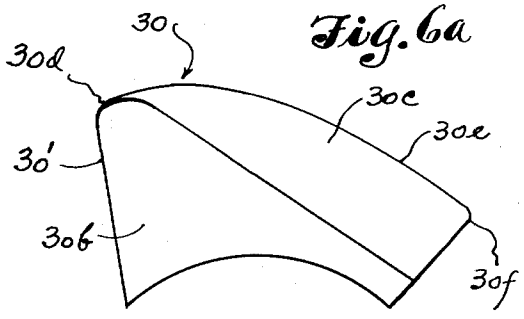


Fig. 6a

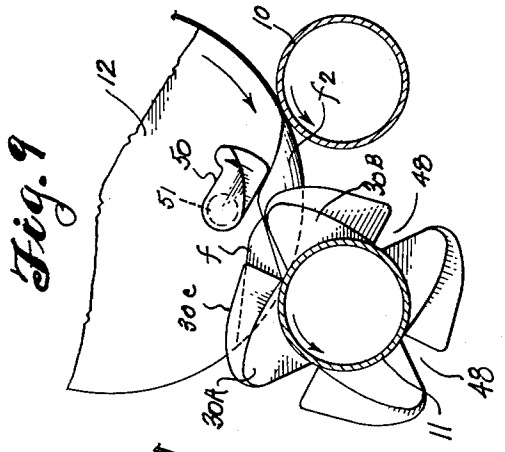


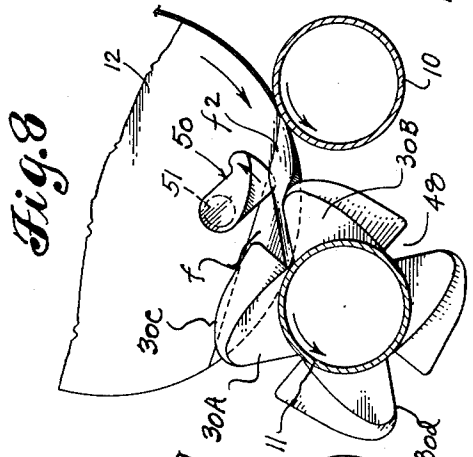
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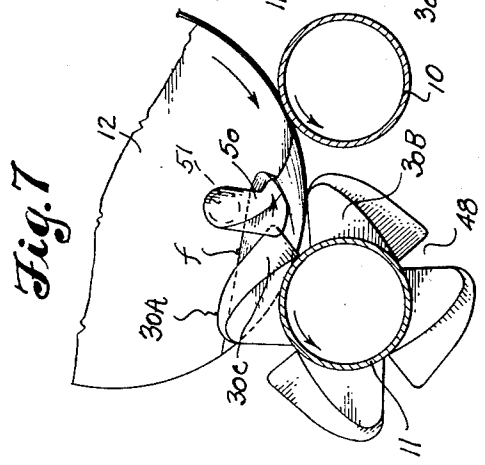
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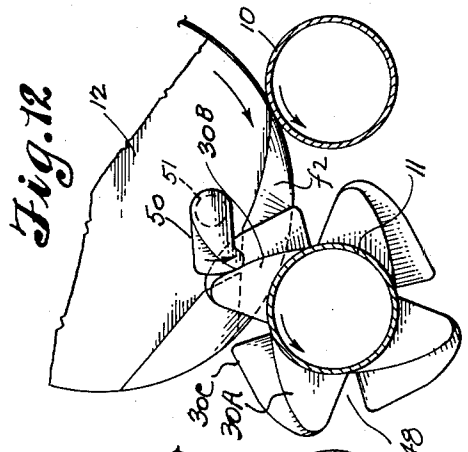
INTERLOCKING CRIMPING MACHINES

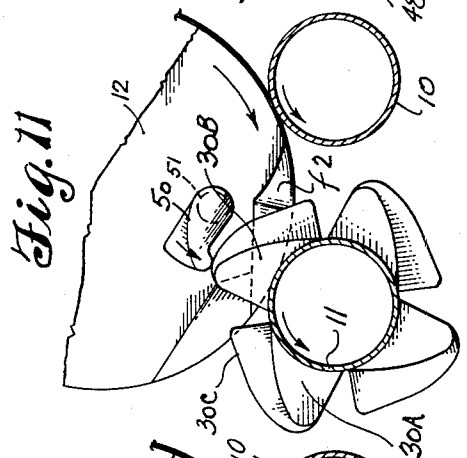
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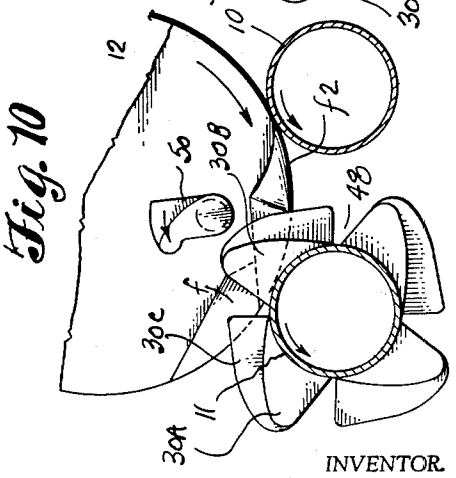












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3,139,716

INTERLOCKING CRIMPING MACHINES

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Filed Mar. 15, 1962, Ser. No. 179,953
5 Claims. (Cl. 53—389)

This invention relates to crimping machines as employed for the crimping of the projecting end portions of paper wrappers as normally applied about rolls of paper or the like, against the roll end surfaces.

More particularly, this invention relates to a crimping machine capable of accommodating paper rolls of various diameters and operable for the formation of successively interlocked crimps against the end faces of the rolls that will remain overlapped and reasonably flat thereagainst preparatory to the application and gluing of the usual outside heads or covers against the roll ends for completion of the package.

An ideal condition in crimp forming exists when the angle of the successively formed crimps is such as to produce an interlocking effect that keeps the individual crimps closely against each other and the faces of the roll and eliminates objectionable "dog ears" as sometimes formed by the crimping operation.

The geometric shapes of the crimp forming blades of the crimping heads become critical when it is required that they be able to satisfactorily crimp rolls of various diameters. A blade shaped to successfully form crimps on a minimum diameter roll may fail completely in forming crimps on a maximum diameter roll. The shape of the crimp forming blades must be such as to do an acceptable job on paper rolls of various diameters even though their efficiency may be sacrificed to more or less extent on the greater percentage of the paper rolls being handled.

In most presently employed crimping machines, each crimping head has four evenly spaced crimp forming blades and the paper roll carrier rollers of the machine are about twelve inches in diameter. The paper roll being crimped is supported on and rotated by the carrier rollers with the incident rotation of the crimping heads. It is of importance, therefore, that in the formation of each crimping blade, its trailing edge be so shaped that it shall not in the formation of any crimp, interfere with or influence the formation of the next or following crimp.

In view of the above requirements for crimp forming and the desirability for effecting the interlocking overlap of successively formed crimps, it has been the principal object of this invention to provide and employ an auxiliary blade of novel kind in association with each crimping head which blade will, by reason of its design and use enable the trailing end of each of the four blades of the crimping head to stay for a longer time in contact with each crimp as formed and hold it more tightly and to greater arcuate extent against the periphery and end face of the paper roll thus to insure the better or more effective interlocking characteristic of successive crimps. Furthermore, to provide the above mentioned auxiliary blade with a driving means that causes it to rotate opposite to and successively in predetermined timing with the rotation of the crimping head with which it is associated, to cause it to coact with each of its blades to insure the interlocking of crimps, and permit the blades of the head to get over the tops of the preceding crimps at the proper time.

Further objects and advantages of this invention reside in the details of construction of its various parts; in their relationship to each other and in their mode of operation, as is hereinafter described.

In accomplishing these and other objects, I have provided the improved details of construction, the preferred

forms of which are illustrated in the accompanying drawings wherein:

FIG. 1 is a plan view of a paper roll wrapper crimping machine embodying the improvements of the present invention therein.

FIG. 2 is a vertical cross-section on line 2—2 in FIG. 1 showing the position of the crimping head at that end and the position relative thereto of the auxiliary blade which will hereinafter be designated as the "crimp interlocking blade."

FIG. 3 is an enlarged elevational end view of a roll crimping head and crimp interlocking blade of this invention and their driving mechanism.

FIG. 4 is a section taken through the crimping head substantially on line 4—4 in FIG. 3.

FIG. 5 is a perspective view showing the relationship of the present auxiliary or interlock forming blade with one of the crimp forming blades of the coacting crimping head.

FIG. 6 is an enlarged fragmental detail showing the relationship of the crimp interlocking blade to the crimping head and end of a paper roll.

FIG. 6*a* is an elevation of one of the crimp forming elements of a crimping head of this device shown apart therefrom for explanatory purposes.

FIG. 7 through FIG. 12 are sequential views of a crimp forming operation as carried out by the coaction of the blades of a crimping head and the interlock crimping blade.

Referring more in detail to the drawings:

In the plan view of the present paper roll wrapper crimping mechanism as shown in FIG. 1, reference numerals **10** and **11** designate, respectively, paired and coextensive horizontal rollers of the same length and diameter, mounted in parallel relationship for the support thereon of a wrapped paper roll **12** for the crimping of the extended end portions of the roll wrapper against the ends of the roll. The two rollers **10** and **11** have supporting trunnions **13** at their opposite ends mounted for rotation in bearings **14** of a supporting frame structure F. At one end of this machine the trunnion of roller **11** at that end extends through and beyond its mounting bearing **14** and it is equipped with a driving sprocket wheel **15**. This roller is shown in FIG. 1 to be driven by an electric motor **16** operating through a reduction gear transmission mechanism designated at **17** having a drive shaft mounting a sprocket **17'**, and a sprocket chain belt **18** extended over sprockets **15** and **17'**.

Wrapper crimping heads **21—21** are mounted on opposite end portions of the roller **11** in the conventional or in such manner that both may be adjusted longitudinally thereon as required for the accommodation of paper rolls of different lengths. These heads **21—21** are alike in construction and mode of operation. Therefore, the following description, as applied to the head at the right hand end of roller **11** in FIG 1. will apply equally to that at the other end.

Each crimping head mechanism as best shown in FIG. 4, has a short, cylindrical or annular supporting bearing portion **24** that is disposed about and coaxially of roll **11** for limited endwise adjustment thereon. Roller **11** has an annular supporting hub **25** projecting into and fixed within its end as seen in FIG. 4 and it is from this that the trunnion **13** extends. The annular bearing portion **24** is revoluble in a cylindrical band **26** with a downwardly directed adjusting arm **27** adjustably fixed at its lower end to a block **28** that is slidable along a horizontal guide bar **29** that extends below and longitudinally of roll **11** and which is a part of the main frame structure F. The roller supporting and driving trunnion **13** of roller **11** extends coaxially from the roller as best shown in FIG. 4 and it is there shown that this trunnion

is tubular. It is also shown in this view that the head mounting member **24** is fixed to and is rotatable with roller **11** as is also the hub **25** as contained in the bearing **26**.

The two wrapper crimping heads **21—21** are longitudinally adjustable on opposite end portions of roller **11** to locations that accommodate them for the crimping of wrappers on paper rolls of different lengths, and to move them clear of the wrapper ends but since this particular head adjusting means forms no part of the present claimed invention, it will not be described beyond the statement that the head adjustment is effected by controlled application of air pressure to air cylinders **36** that are disposed in alignment with roller **11** at its opposite ends and which have piston rods **36***r* that are operatively connected at their ends to the heads by spider devices **37** for this purpose as well shown in FIG. 4; the spider being joined to the head **21** which is joined for movement to band **24**.

Each crimping head **21** in the present instance, comprises four crimp forming elements **30**, equally angularly and symmetrically spaced about roll **11**; all elements being alike in size and shape. All elements **30** are in the same plane which is perpendicular to the axis of roll **11** and equally spaced therefrom. Each element comprises a mounting block **30***b* to the outer face of which a plate **30***c* is fixed to extend along and project beyond its outer edge as in FIGS. 4 and 5. Each element or blade, as shown best in FIGS. 3 and 5 to 12, has a leading edge **30'**, a leading tip **30***d*, a trailing edge **30***e* and a trailing tip **30***f*.

In a crimp forming operation, the leading edge **30'** of each blade is the crimp turning and initial crimp creasing portion of the blade. Each element **30** while functioning is so positioned relative to the paper roll that it acts against and turns a projecting end portion of the roll wrapper inwardly over the roll edge and flattens it against the end face of the roll. The leading tip of each blade determines how wide an overhang of wrapper can be crimped, i.e. if the tip swings on a radius of 8 inches over the roll and, then 8 inches becomes the maximum amount of wrapper that should project beyond the end of the roll.

The trailing edge **30***e* of each blade falls away from the leading tips at a sharp angle for the reason that if it was on the same radius as the leading tip, it would be creasing that portion of the wrapper approaching the blade, causing a crimp to be formed therein before the leading edge of the following blade could turn a new flap against the roll. Therefore, the trailing edge of each blade must have a constantly decreasing radius from leading tip to trailing tip so as not to influence the formation of the next flap.

The four blades of the head in the present instance are spaced at 90° intervals and have narrow open spaces between the trailing edge of each blade and leading edge of the following blade. Such spaces, herein designated at **48**, are best shown in FIGS. 7 to 12.

Associated with each crimping head **21** is the single auxiliary blade **50**, designated herein as the "interlock forming blade." This is mounted on and for rotation by a drive shaft **51** that is parallel to the axis of roll **10** and the crimping head mounted thereon and is disposed at a location within the extended circumferential limits of the paper roll **12** as seen in FIG. 7, closely outside the radial limits of the elements **30** of the crimping head but inside the circle of the crimps as formed thereby on the end of the roll **12**. It is shown in FIGS. 4 and 5 that the blade driving shaft **51** is rotatably mounted in a bearing **52** that is formed at the outer end of a rigid supporting arm **53**, shown in FIG. 3, to extend radially outward from the annular bearing band or hub **26** that is mounted about the annular bearing **24** as fitted about the end portion of roller **11**. Bearing **24**, as shown in FIG. 4, has a sprocket ring gear **56** formed or fixed thereon at its inner end in alignment with a sprocket wheel **57** mounted on the drive shaft **51** and a sprocket chain belt **58** operates about these sprockets **56** and **57** to cause the interlock blade **50** to be rotated opposite to the direction of rotation of the wrapped roll **12** four times with each rotation of the crimping head and in the same direction. With each rotation of the roller **11** against which the paper roll **12** bears, the crimping head **21** turns three hundred sixty degrees and the interlocking blade **50** makes four complete turns, that is, blade **50** makes one complete turn for each 90° advancement of the crimping elements **30** of the crimping head and the paper roll **12** in its turning advances a lineal distance of approximately 9.4 inches at its periphery.

For a roll crimping operation, the paper roll **12** is first moved onto the two rolls **10–11** as shown in FIG. 2. Assuming that the wrapper has been previously applied about roll **12** with its opposite end portions projecting predetermined distances beyond the roll ends, the roll **12** is then caused to be rotated clockwise in reference to its showing in FIG. 2 by driving the roll **11** counter-clockwise. The crimping heads **21** are then adjusted by suitable means inwardly to proper relationship with the opposite end surfaces of the roll **12**. Thus, as each head turns, its crimping blades successively sweep across the end surface of the roll, each to press a projecting end portion of the roll wrapper inwardly against the end surface of the roll. The sequence of operations, as has been illustrated in FIGS. 7 through 12, is as follows:

It has been shown in FIG. 7 that the element **30A** has advanced across the end of the paper roll **12** a distance sufficient to press a projecting portion of the roll wrapper against the end surface of roll **12**. As the blade or plate **30***c* of the element **30A** moves across the roll end it flattens the flap *f* thereagainst. FIG. 7 also shows that the interlock blade **50** has at that time swept counter-clockwise across the front face of plate **30***c* and has flattened and tucked the trailing end portion of the flap *f* as formed by blade **30A** against the roll end surface and is holding it there during that period that element **30B**, in FIG. 8, engages the wrapper to fold a second flap *f2* inwardly across the end portion as then retained by blade **50**. Thus, in the flattening of the crimp or flap *f2* by blade **30B** against the roll end, it is overlapped across the trailing end portion of the previous flap *f*.

While the crimp forming blade **30A** is swinging across the formed crimp *f* and flattening it against the roll end, the second forming blade **30B** swings upwardly against the wrapper edge and forms the second crimp (*f2*) and incident to its formation, the wrapper material between overlapped end portions of the crimps *f* and *f2* is troughed. With the formation of this troughed position the interlocking blade **50** swings into and along the trough, as in FIG. 8, and creases the base of the trough and tucks the end of the trough between the flaps. This trough grooving and tucking operation is carried out between the ends of successive flaps, thus insuring that the bases of the troughs will be creased for easy flattening and no undesirable buckling or rumpling of wrapper material will occur in the overlapping and flattening of the crimps.

Thus, each crimp as formed by an element **30** of the head **21** is flattened, tucked and creased to provide the interlocking relationship shown in FIG. 12.

In the event that any adjustment of the interlocking blade relative to the blades of the head **21** is required, this may be effected by arcuately adjusting the arm **27** of hub **26** relative to block **23**.

It is further to be explained that when the operator starts the motor to rotate the rollers **10–11** this operation also activates a solenoid air valve to admit air to the cylinders **36** to advance the heads **21—21** toward the ends of the paper roll. In this operation the roll **12** can be crimped as the wrapper bands come onto the roll instead of after it is completely wrapped. However, in either instance, the crimp forming and interlocking is the same.

When the operator stops the machine after a crimping

operation and this institutes an automatic retraction of the heads from the roll ends. The wrapped roll is then ejected.

What I claim as new is:

1. Means for crimping the projecting end portion of the wrapping material of a wrapped roll against the end surface of the roll, comprising in combination, means for supporting and axially rotating said wrapped roll, a crimping head rotatably mounted adjacent and parallel with the end surface of the wrapped roll and driven in the opposite direction; said head having a plurality of radial, angularly spaced crimp forming blades extended therefrom in such spacing as to successively engage successive arcuate portions of the projecting roll wrapper, each to form the engaged portion inwardly against the end of the roll in a crimp, each formed crimp having its forward end portion overlapped with the trailing end portion of the next previously formed crimp, and a crimp interlocking blade equipped with means for its support and rotation opposite to the wrapped roll in a plane parallel with the roll end surface, and in timing with the passage of a crimping head blade across the roll end in its formation of a crimp, said interlocking blade being positioned to enter and move longitudinally along the base of the trough as it is formed between adjacent crimps and to swing free of the trough for the flattening of the last formed crimp against the trailing end of the next previously formed crimp by the crimp forming blade.

2. A crimping means according to claim 1 wherein each of said crimp forming blades of said crimping head comprises a block-like body projecting radially from the head and formed with a flat forward surface merging into a rounded nose for initially engaging the wrapped edge to turn the flap inwardly against the roll end and wherein each block-like body has a flat plate fixed to its inside surface parallel with the roll end surface to engage and flatten the flap formed thereby, with the turning of the head, against the roll end; the trailing edge of said plate being directed at a constantly decreasing angle away from the leading tip, to the trailing end.

3. A machine according to claim 1 wherein the crimp forming blades of the crimping head extend outwardly therefrom in a common plane that is perpendicular to the axes of the roll and head in evenly arcuately spaced relationship and the crimp interlocking blade extends from its mounting and rotating shaft in a plane parallel with the plane of the blades of the mounting head and performs a complete crimp interlocking operation incident to the passage of each blade of the head in its crimp forming operation across the end of the wrapped roll.

4. A machine according to claim 1 wherein the blades of the crimping head rotates in a direction opposite the direction of rotation of said wrapped roll and its blades each move across segmental portion of the wrapped roll in the same general direction of travel of that portion of the roll but at a faster lineal speed and said crimp interlocking blade moves across the outer peripheral portion of each crimp forming blade in a direction opposite to its travel and finally engages the troughed end portion of the flattened crimp to draw it taut and, against the roll end as the forward end of the next crimp is formed thereover.

5. A machine according to claim 4 wherein the blades of the crimping head form each crimp with its trailing end portion joined in a back turned fold joined with the forward edge of the overlapping crimp thus defining a trough between the crimp in which the crimp interlocking blade is received and within which it moves in its tucking and crimp interlocking operation.

References Cited in the file of this patent

UNITED STATES PATENTS

2,660,846	Bryans	Dec. 1, 1953
2,904,946	Ullstrom	Sept. 22, 1959
2,927,413	Turnbull et al.	Mar. 8, 1960